

Opasraportti

OMS - Geology - 2014-15 (2014 - 2015)

THE DEGREE PROGRAMME IN GEOSCIENCES

The geosciences include all branches of science that study the structure, composition, evolution and dynamics of the planet Earth and its natural mineral and energy resources. The social significance of geoscientific research has increased recently due to many factors, including the growing world population and the expanding global economy, resulting in an increasing demand for new raw materials and, at the same time, the enhanced awareness of the significance of environmental protection and sustainable development of the society.

The main aim of geoscientific research is to understand the Earth's ancient and current geological processes and related factors affecting the well-being of humankind. Geologists study different geological processes operating within and on the Earth, such as magmatism, metamorphism, deformation, erosion and sedimentation, and geological formations which are and were generated by these processes. Earth materials are constantly processed and recycled by physical, chemical and biological processes of our dynamic planet, which provides investigators with many challenging questions.

Fundamental research focusing on the origin and evolution of the bedrock and its sedimentary cover provides a scientific basis for the research of renewable and non-renewable natural resources. Environmental research has recently attracted much attention along with the more traditional research fields such as mineral exploration and geological mapping. Also, the interest in the environment and natural resources of Arctic areas is currently strongly growing.

The degree programme in geosciences aims at providing students with the competence to work as experts in different fields of geosciences, with different duties in the public and private sector. It guides them to understand the action of geological processes and the mechanisms of formation of different geological formations. Teaching helps to develop skills that are needed in mineral exploration, mapping and exploitation of natural resources and also in their protection. More and more geological information is needed in environmental planning and research and the solution of environmental problems. The research field is multidisciplinary and therefore useful minor subjects include Chemistry, (Geo)physics, Geography, Biology, Mathematics, Information Sciences and Process, Water and Environmental Technology.

Field and laboratory training forms an important component of geological education, complementing theoretical studies. Among the general learning outcomes are various communicational and problem solving skills. Other typical competences in the field are: 1) adoption of four-dimensional time-spatial visualization skills in understanding processes that deform rocks, 2) capability to integrate versatile information obtained from the field or laboratory, and skills to synthesize and perform modeling, 3) ability to acquire diverse and comprehensive information on currently operating environmental processes, and 4) ability of develop a profound understanding on the needs of the society to exploit and protect natural resources. Internationalisation is a self-evident part of the training and future work relations, as the boundaries of geological formations do not follow those between countries or linguistic regions. The education thus creates good possibilities for the graduated student to move abroad either to continue his/her studies at other universities or work for international exploration and mining companies.

In Oulu Mining School, teaching and research of geosciences is distributed amongst the following three main subjects:

Geology and Mineralogy
 Quaternary Geology
 Geochemistry
 Geophysics

Geology and Mineralogy is the study of the solid Earth, the materials which it is made of, including minerals, rocks and geological formations, and the physical, chemical and biological processes responsible for their generation.

Mineralogy focuses on the structure, composition, occurrence and utilization of minerals and forms the foundation to geological research. *Regional Geology* deals with general characteristics of a given area and the evolution of the bedrock. Using field studies and geochronological tools, geologists determine and date the time sequences of events in the *Earth's history*, from the beginning to the present time. In *Igneous Petrology*, the focus is on understanding the nature and origin of rocks crystallized from molten rock or magma, while *Sedimentary and Metamorphic Petrology* deal with the nature and origin of sedimentary and metamorphic rocks, respectively. *Structural Geology* is the study of mechanical deformation of the bedrock and the resultant three-dimensional structural forms. An important branch of Geology and Mineralogy is *Ore Geology* dealing with the characteristics and genesis of different ore deposits, forming a basis for mineral exploration. Metals and minerals are essential for the sustainable development of the society, and their geological occurrence and exploitation have been chosen as one of the key topics in our department.

In **Quaternary Geology**, the focus is on the surface of the Earth's crust, which largely comprises different types of sediments. These were mainly formed during the youngest geological time period of the Earth's history, the Quaternary period, explaining the name given to this field of research. The sub-fields of Quaternary Geology include *Physical Geology* and, especially in Finland, its branch dealing with *Glacial Geology*, and *Historical Geology*, *Palaeontology* and many other fields (e.g., *Hydrogeology*, *Environmental Geology*, *Peat Geology*, and *Ore Prospecting*). The aim of *Historical Geology* is to unravel the chronology of geological events, age relations of different geological formations and the evolution of life and climate on Earth. *Physical Sedimentology* is the study of soils, their characteristics and generation, and geomorphological landforms which they form. This is an economically important sub-field, because the information is used in regional planning, agricultural and forestry research, mineral exploration, studies of groundwater and peat resources and addressing various environmental issues.

Geochemistry is the study of the source and fate of chemical species in natural environments, using chemical analysis of minerals, rocks, soils and waters. One of the aims is to describe and quantify the processes that control the recycling of elements and isotopes in nature. The main applications are geochemical exploration, environmental issues, and determining the age and genesis of different rock types. There are several subfields in Geochemistry. In *Isotope Geochemistry*, radiogenic and stable isotopes are analysed in order to perform age determinations and make inferences on the mechanisms and conditions of rock formations or other research targets. In *Environmental Geochemistry*, geochemists try to identify natural and anthropological chemical changes in the environment. *Geochemical Exploration* utilises geochemical properties of the bedrock and its Quaternary cover for discovering new ore deposits.

Geophysics is a natural science that involves the study of the physical structure and physical properties of the Earth and its surrounding space environment, and related physical processes. At the Oulu University, teaching and research in Geophysics are focused on *A pplied Geophysics*, with emphasis on the use of geophysical methods in exploration and mapping of natural resources and in environmental and engineering studies. A central subject is *Computational Geophysics*, in which multidimensional numerical modelling and inversion are taught and investigated as an essential part in the interpretation of geophysical data. *Lithosphere Geophysics* is also taught and studied, dealing with the structure, composition and evolution of the Earth's crust and upper mantle, which are linked to the genesis and distribution of geological resources.

Students graduated from geosciences have been employed by public sector organizations, such as the Geological Survey of Finland, Finland's environmental administration, ELY Centres (Centres for Economic Development, Transport and the Environment) and universities. In the private sector, significant employers are domestic and foreign exploration companies, mining industry, and companies providing environmental consulting and construction services. The main duties of geologists in these organisations are research and the mapping of bedrock and Quaternary deposits, studying ore deposits, carrying out mineral exploration projects and inventories of sediment and peat resources, groundwater investigations, and various environmental research and administrative tasks.

Major subjects, structure of the degrees and lines of specialisation

In the degree programme of geosciences, it is possible to obtain a lower university degree, Bachelor's degree (B.Sc.), in Geology amounting to 180 credits. After the Bachelor's degree, students have the possibility to continue to study for a higher university degree, the Master's degree (M.Sc.), which can be done in two major subjects: Geology and Mineralogy or Quaternary Geology. The Master's degree consists of a total of 120 credits of intermediate- and advanced-level studies. The amount of advanced studies in the chosen major subject must be at least 60 credits including the 35 credits of the Master's thesis. The post-graduate degrees in geosciences are the Licenciate of Philosophy degree and the Doctor of Philosophy degree, of which the latter can be obtained without the former.

The basic and intermediate level studies of geophysics can be done in the degree programme of physics. After completing a BSc degree in physics with a sufficient amount of courses in geophysics, student can apply for transfer to Oulu Mining School for studying geophysics as their major subject.

The Master's degree in geosciences can be obtained in five different ways depending on the line of specialisation:

- Master of Science in Geology and Mineralogy, specialisation in Economic Geology
- Master of Science in Geology and Mineralogy, specialisation in exploration and mining
- Master of Science in Quaternary Geology (Quaternary Geology as the major subject)
- Master of Science in Geology and Mineralogy or Quaternary Geology, specialisation in geoenvironment
- Master of Science in Geophysics

Students can freely choose the line of specialisation. It is recommended that the decision is made during the second year and not later than during the third year. The choice is not binding, as the line of specialisation can be changed within the degree programme still later through bridging studies.

In addition to the educational programme described above, the Department of Geosciences will offer students a Master's Degree Programme in Economic Geology from 2013. For these students, Geology and Mineralogy is the major subject. Courses in the programme are given exclusively in English.

The emphasis of the advanced-level teaching in Geology and Mineralogy is on courses which lead to specialisation in **Economic Geology**. The goal is that after obtaining a M.Sc. degree, students are sufficiently competent to cope with duties requiring detailed knowledge of the bedrock and its resources. The prime purpose of the education is to meet the need for experts in the growing ore exploration and mining industry. An important aspect of the teaching is to make students familiar with the occurrence, characteristics and genesis of different metallic ore deposits. Other topics include the evolution of the Finnish bedrock, isotope geochemistry, applied geophysics, geometallurgy, GIS applications, and geochemistry of mining environment.

Teaching related to the specialisation in **Exploration and Mining** is given in collaboration with the Department of Process and Environmental Engineering (Technical Faculty) and aims at increasing the understanding of processes and activities that are part of the whole life cycle of a mining project. The most important topics in this specialisation are exploration, ore geology, ore mineralogy, technical mineralogy, ore beneficiation, mining technology, environmental technology related to mining activities, industrial economy and environmental and mining law. The course selection will create a good basis for future geologists to collaborate with mining engineers in solving problems related to exploration, excavation and beneficiation of ore deposits.

The M.Sc. degree programme in **Quaternary Geology** offers the student high level education to understand how exogenic processes operate in different sedimentary environments and what is the human impact on these natural processes today. The core issues in the Quaternary research and education is to understand glacial sedimentology and stratigraphy in order to understand the relationship between the natural environmental change and its links to climate. This knowledge on the mechanisms that operate in sedimentary environments can be utilized in many fields ranging from sustainable use of groundwater resources to ore exploration and various environmental issues.

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 the 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 climates; hydrogeology and hydrotechnology. Teaching is given in collaboration with the Department of Process and Environmental Engineering.

Note. The Board of Directors of the University of Oulu made the decision in December 2013 to establish a new faculty, Oulu Mining School, starting in August 2014. Teaching in Geosciences moved to this faculty in August 2014 together with Geophysics. A new degree programme on mining technology and mineral processing is planned during

the academic year 2014-2015. This will give the students the possibility to acquire a comprehensive education in the mining field in the future. The contents of the study programmes and the lines of specialisation will be developed accordingly.

Because of the recent transfer of Geophysics to Oulu Mining School, course description and degree requirements are still found in the Physics part of the guide book of the Faculty of Science. Persons who help in detailed questions related to Geophysics include Pertti Kaikkonen and Kari Moisio. The following part of this guide concerns studies in Geology and Mineralogy, Geochemistry and Quaternary Geology.

General aspects of the studies

The education in geosciences is given in the form of lecture courses, practical exercises, seminars, workshops and field courses. The amanuensis of the department will guide students with regard to general questions on the studies in the department and help students to compile a personal study plan (PSP). Students sketch a preliminary PSP in the first autumn during their orientation studies and will design a more precise PSP for the entire study period later on. Persons who help in detailed questions related to each subject are: Eero Hanski in Geology and Mineralogy and Geochemistry, Tiina Eskola in Quaternary Geology and Kari Moisio in Geophysics.

The geosciences courses are divided into basic studies (code P), intermediate studies (code A) and advanced studies (code S). In addition, language studies and orientation studies (code Y) are part of the curriculum. The geologic education begins with basic studies in geosciences, which are completed during the first academic year. During the first spring semester it is possible to conduct the first compulsory intermediate-level studies. It is advised to start compulsory minor subject studies for the B.Sc. degree as early as possible, especially a basic chemistry course, which is recommended to be taken during the first autumn semester.

All students study for a joint Bachelor's degree in Geology, but they can already prepare themselves for the future decision on their line of specialisation by choosing Geology and Mineralogy or Quaternary Geology as one of their minor subjects in their B.Sc. degree. Other minor subjects are also needed to widen students' possibilities to carry out duties in their future work life. Appropriate minor courses include those given in chemistry, information processing science, geophysics, physics, mathematics, and technical sciences.

BACHELOR'S DEGREE IN GEOLOGY (B.Sc.), 180 credits

The Bachelor's degree in geology, which is normally completed within three years, constitutes the following studies:

- **General studies, 9 credits**
- **Basic studies in geology, 28 credits**
- **Compulsory intermediate studies in geology, 52 credits**

including a Bachelor's thesis and maturity test (9 credits)

- **Optional intermediate courses in geosciences**
- **Compulsory minor subject studies**
- **Optional minor subject studies**

GENERAL STUDIES (9 credits)

770001Y Orientation course for new students, 2 credits 1st autumn

030005Y Information skills, 1 credit 3rd spring

Language studies, 6 credits:

902002Y English I, 2 credits 1st spring

902004Y English II, 2 credits 2nd spring

901004Y Swedish, 2 credits 3rd autumn

BASIC STUDIES IN GEOLOGY, 28 credits

Mineralogy:

771102P Basic course in mineralogy, 6 credits 1st autumn

Geological processes:

771111P Endogenic processes, 6 credits 1st autumn

771112P Exogenic processes, 4 credits 1st autumn

Geology of Finland:

771106P Introduction to bedrock geology of Finland, 2 credits 1st spring

771107P Introduction to surficial geology of Finland and historical

geology, 2 credits 1st spring

771108P Introduction to ore geology, 2 credits 1st spring

772102P Field course in bedrock geology, 3 credits 1st spring

773103P Field course in Quaternary geology, 3 credits 1st spring

COMPULSORY INTERMEDIATE STUDIES IN GEOLOGY (52 credits)

771302A Digital modelling and geological information systems in geosciences

5 credits

772339A Optical mineralogy, 6 credits

772316A Structural geology, 5 credits

773314A Environmental geology, 3 credits

773303A Basics of glacial geology, 4 credits

773317A Physical sedimentology, 5 credits

774301A Basic course in geochemistry, 6 credits

772337A or 773343A Seminar in geology I, 5 credits

771304A Practical training, 4 credits

771303A Bachelor's thesis and maturity test, 9 credits

OPTIONAL INTERMEDIATE COURSES

Besides compulsory intermediate courses, each subject offers optional courses for the Bachelor's degree. When choosing intermediate courses in geosciences, attention should be paid to the requirement that the number of credits in the major subject is at least 60 credits, including basic and intermediate studies and the Bachelor's thesis. It is important to note that, depending on the major subject, certain courses marked with (P) in the lists below should be completed during the M.Sc. studies at the latest.

OPTIONAL COURSES IN GEOLOGY AND MINERALOGY

- 772334A Bedrock mapping, 3 credits (P)
- 772341A Igneous petrology, 7 credits (P)
- 772344A Sedimentary petrology, 5 credits (P)
- 772345A Petrology of metamorphic rocks, 6 credits (P)
- 772357A Technical use of rocks and minerals, 4 credits
- 772385A Ore geology, 5 credits (P)
- 772335A Introduction to ore mineralogy, 5 credits (P)
- 772310A General mineralogy, 5 credits (P)
- 772320A Tectonics, 5 credits
- 772338A Practical training II, 4 credits

OPTIONAL COURSES IN QUATERNARY GEOLOGY

- 773324A Field mapping of Quaternary deposits, 5 credits (P)
- 773306A Quaternary geology of Finland, 5 credits (P)
- 773316A Technical properties of sediments, 8 credits (P)
- 773337A Biostratigraphy: Pollen course, 5 credits (P)
- 773341A Biostratigraphy: Diatom course, 5 credits (P)
- 773322A Surficial geology in ore exploration, 5 credits
- 773300A Quaternary stratigraphy, 5 credits (P)
- 773310A Hydrogeology, 5 credits
- 773345A Practical training II, 4 credits

GEOCHEMISTRY COURSES

- 774329A Introduction to environmental geochemistry, 5 credits
- 774304A Analytical methods in geochemistry, 5 credits

COMPULSORY MINOR SUBJECT COURSES

The Bachelor's degree in geology must contain at least one minor subject entity that is compiled from the optional intermediate-level studies in Geology and Mineralogy or Quaternary Geology.

Other compulsory studies for all Bachelor students in geology are:

Chemistry:

A minimum of 4 credits; course 780109P Basics of chemistry (4 credits) recommended

Geophysics:

A minimum of 4 credits; 762302A Geophysical research methods of rock and soil (6/8 credits) recommended.

In addition, those who will choose geoenvironment or exploration and mining as their lines of specialisation need to strengthen their skills in mathematics with the following course :

03101P Calculus I, 5 credits (Technical Faculty)

OPTIONAL MINOR SUBJECT COURSES

For complementing the chosen major subject, students can select appropriate optional minor courses from the curriculum of geosciences or other departments, preferably from the Faculty of Science or the Technical Faculty. Most recommendable are courses in chemistry, physics, mathematics, information processing science and geography. Minor subject entities are determined by the curriculum of the respective department.

A Bachelor of Science degree can include basic- and intermediate-level studies in one minor subject (minimum 60 credits) or basic studies in two minors subjects ($2 \times \geq 25$ credits).

GEOENVIRONMENT COURSES

Students who will specialise in geoenvironment can do a minor in process and environmental engineering (TTK = Technical Faculty) by selecting courses corresponding to 15 credits from the list below.

031010P Calculus I (TTK), 5 credits

488102A Hydrological processes, 6 credits (TTK)

773331A Hydrogeology, 5 credits

488012A Environmental legislation, 5 credits (TTK)

774329A Introduction to environmental geochemistry, 5 credits

488104A Industrial and municipal waste management, 5 credits (TTK)

477011P Introduction to Process and Environmental Engineering I, 5 credits (TTK)

488010P Introduction to Process and Environmental Engineering II, 5 credits (TTK)

488103A Environmental impact assessment, 4-8 credits (TKK)

STUDIES IN PROCESS AND ENVIRONMENTAL ENGINEERING

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 of one other geosciences subject (Geology and Mineralogy, Quaternary 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.

Those students who will specialise in exploration and mining can select a minor subject entity with ≥ 15 credits from the following courses:

031010P Calculus I, 5 credits

488012A Environmental legislation, 5 credits

477011P Introduction to Process and Environmental Engineering I, 5 credits (TTK)

488010P Introduction to Process and Environmental Engineering II, 5 credits (TTK)

488103A Environmental impact assessment, 4 op

477101A Fluid and particle engineering I, 3 credits

BACHELOR'S THESIS 9 credits

The thesis is based on individual research of literature, field work or laboratory work and is commonly done during the third study year after a sufficient amount of studies have been conducted for the Bachelor's degree. Before starting the thesis, students must agree upon its details with a supervising professor or lecturer.

MATURITY TEST

After completing their Bachelor's thesis, students write an essay in their native language on the topic of the thesis, to show a good command of the language and the topic of the thesis.

Master of science degree (M.Sc.)

(B.Sc. + 120 credits)

The degree of Master of Science is a higher university degree and can be obtained by complementing the Bachelor's degree with additional studies of at least 120 credits, which include a Master's thesis worth of 35 credits. Minor subject studies should be selected in such a way that they support the major subject studies and the field of specialisation chosen in the Master's programme.

The major subject in the Master of Science degree is either Geology and Mineralogy or Quaternary Geology, and the degree can be done in four different ways as stated earlier, depending on the line of specialisation:

- Master of Science in Geology and Mineralogy, specialisation in economic geology
- Master of Science in Geology and Mineralogy, specialisation in exploration and mining
- Master of Science in Quaternary Geology (Quaternary Geology as the major subject)
- Master of Science in Geology and Mineralogy or Quaternary Geology, specialization in geoenvironment

Irrespective of the line of specialisation, the minimum extent of the required advanced-level studies in the major subject is 60 credits, which include the 35 credits of the Master's thesis. The maturity test has to be done also in the Master's degree and consists of an abstract of the Master's thesis written on a separate form.

Students majoring in Geology and Mineralogy are required to have passed the following intermediate courses in Geology and Mineralogy before obtaining the Master's degree: Optical mineralogy, Igneous petrology, General mineralogy, Sedimentary petrology, Petrology of metamorphic rocks, Structural geology, Bedrock mapping, Ore geology and Introduction to ore minerals. Advanced-level studies in Geology and Mineralogy lead automatically to specialisation in Economic Geology.

For a Master's degree with specialisation in exploration and mining, the same intermediate-level courses in Geology and Mineralogy as listed above are required. An entity comprising 15 credits of intermediate studies in process and environmental engineering (see above) is also mandatory. Advanced level studies include a Master's thesis on a relevant topic and a minimum of 40 credits of minor subject courses in exploration and mining as listed later.

Teaching is given in collaboration with the Department of Process and Environmental Engineering. The students can also choose some courses from the Technical University of Luleå. The studies in the exploration and mining specialisation are focused on understanding and controlling the processes and operations connected to the life span of mines.

Students majoring in Quaternary Geology must have completed the following optional intermediate-level courses in Quaternary Geology latest during their Master studies: Biostratigraphy: diatom course, Biostratigraphy: pollen course, Quaternary geology of Finland, Quaternary stratigraphy and Technical properties of sediments and from the advanced level studies the course in Aerial photo interpretation in Quaternary geology. The topic of the Master's thesis must be compatible with the major subject.

A Master's degree with specialisation in geoenvironment can be granted provided that the intermediate studies in geoenvironment (see above) reach at least 15 credits, the extent of advanced-level studies in geoenvironment is at least 20 credits, the Master's thesis is relevant for the specialisation and the advanced-level major subject studies are sufficient (25 credits). The advanced studies in geoenvironment are listed later.

ADVANCED COURSES IN GEOLOGY AND MINERALOGY

Ore geology:

772671S Magmatic ore deposits, 7 credits

772672S Hydrothermal ore deposits, 7 credits

772674S Sedimentary ore deposits, 7 credits

772675S Geophysics in economic geology, 5 credits

772675S Applied field techniques in economic geology, 5 credits

772632S Regional ore geology of Fennoscandia, 5 credits

772687S Gold deposits, 5 credits

772628S Layered intrusions and their ore deposits, 5 credits

772689S Nickel deposits of the Fennoscandian Shield, 5 credits

772621S Geology of alkaline rocks, carbonatites and kimberlites, 5 credits

772608S Mining geology, 3 credits

772667S Seminar in ore geology, 5 credits

772694S Geometallurgy and mineral processing, 5 credits

772688S Mining geology, resource calculation, 5 credits

772640S Excursion, 5 credits

Structural geology and tectonics, mapping:

772683S Structural geology for economic geologists 7 credits

772614S Workshop on bedrock mapping and bedrock map production

5 credits

Regional geology:

772631S Archaean geology, 5 credits

772613S Bedrock geology of Finland, 5 credits

Other advanced-level courses:

772658S Special issues in geology and mineralogy, 1-9 credits

772684S GIS applications, 5 credits

772615S Literature essay, 4 credits

773615S Studia Generalia lectures, 2 credits

772690S Courses taken at other universities

772666S Master's thesis, 35 credits

ADVANCED COURSES IN QUATERNARY GEOLOGY

Glacial geology and exploration:

773601S Glacial geology II, 5 credits

773616S Aerial photo interpretation in Quaternary geology, 5 credits (compulsory)

773641S Advanced course of surficial geology in ore exploration I, 5 credits

773642S Advanced course of surficial geology in ore exploration II, 5 credits

Environmental geology:

773621S Global environmental and climate change during the Cenozoic, 4 credits

773673S Field course in environmental geology and geophysics, 3 credits

Sedimentology:

773612S Excursion on regional surficial geology, 3-6 credits

773646S Advanced field techniques, 3 credits

773648S Sedimentary structures, 5 credits

773647S Sedimentology, 6 credits

Other advanced-level courses:

773613S Literature essay, 5 credits

773607S Literature study, 5 credits

773608S Special issues in Quaternary geology, 5 credits

773619S Seminar in Quaternary geology II, 5 credits

773615S Studia Generalia lectures, 2 credits

773679S Courses taken at other universities

773657S Master's thesis, 35 credits

ADVANCED COURSES IN GEOCHEMISTRY

774636S Geochemistry of mining environment, 5 credits

774637S Isotope geochemistry for economic geologists, 5 credits

ADVANCED COURSES IN GEOENVIRONMENT

774636S Geochemistry of mining environment, 5 credits

488115S Geomechanics, 5 credits

488121S Municipality geotechnics, 5 credits

477715S Environmental and social responsibility on mining, 5 credits

488111S Modelling in geoenvironmental engineering, 5 credits

773673S Field course in environmental geology and geophysics, 3 credits

488205S Environmental load of process industry, 4 credits

488103A Environmental impact assessment, 4 credits

488110S Water and wastewater treatment, 5 credits

COMPULSORY MINOR SUBJECT COURSES IN SPECIALISATION IN EXPLORATION AND MINING ENGINEERING

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Students specializing in exploration and mining need to select a course entity of at least 40 credits from the following options:

477711S Rock and mining engineering, 5 credits

477703A Surface chemistry principles of minerals, 3 credits

477704A Principles of mineral processing, 5 credits

762302A Geophysical research methods of rock and soil, 6 credits (if not incl. in BSc degree)

488110S Water and wastewater treatment, 5 credits

- 488205S Environmental load of process industry, 4 credits
- 477709S Financial and project valuation of mining project, 3 credits
- 774636S Geochemistry of mining environment, 5 credits
- 772694S Geometallurgy and mineral processing, 5 credits
- 774304A Analytical methods in geochemistry, 5 credits
- 773322A Surficial geology in ore exploration, 5 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
- 772608S Mining geology, 3 credits
- 477715S Environmental and Social Responsibility in Mining, 5 credits
- 477708S Mining project feasibility study, 4 credits
- 477712S Phenomena in mineral processing, 5 credits
- 477713S Automation in mineral processing, 5 op
- 477721S Mineral processing, 7.5 credits (in Luleå)
- 477723S Mineral economy and risk evaluation, 7.5 credits (in Luleå)
- 477725S Mine automation, 7.5 credits (in Luleå)

MASTER'S THESIS 35 credits

The Master's thesis is prepared on the last (5th) year of studies. It is a research assignment with a workload corresponding to 35 credits. The thesis is based on student's own field or laboratory studies and in many cases, these studies are closely related to student's summer work. Before starting the Master's project, the subject and other details are agreed with the supervising professor or lecturer.

OTHER STUDIES (recommended to all students preparing their Master's thesis)

300002M Advanced information skills, 1 credit

POST-M.Sc. DEGREES

Having completed his/her Master of Science degree, a student will be able proceed to pursue the Licenciate of Philosophy degree or the Doctor of Philosophy degree, provided that he/she has obtained his/her Master's degree with good rates (at least 60% of the maximum, 3/5, for both the courses and the Master's thesis), and his/her research plan has been accepted. The research plan for the Licenciate of Philosophy degree is accepted by the educational board of the geosciences degree programme, while that for the Doctor of Philosophy degree is accepted by the University of Oulu Graduate School (UniOGS).

The licenciate degree consists of the licenciate thesis (90 credits) and additional advanced- or intermediate-level studies of at least 35 credits, including the licenciate examination (9 credits). The requirements for the Doctoral degree are the same with the exception that the licenciate thesis is replaced with the doctoral dissertation. For more information on the doctoral studies, see the website of the Oulu Graduate School (<http://www.oulu.fi/tutkijakoulu/>).

POSTGRADUATE COURSES

- 771605J Teaching tasks, 1-6 op
- 771606J Scientific conferences, 1-7 op
- 771607J Research visit, 0.5-2 op
- 771608J Research Plan and Seminar, 1 op
- 771602J Licenciate thesis in geosciences, 90 credits
- 771604J Licenciate examination, 9 credits
- 771603J Doctoral dissertation

GeologY AS A MINOR SUBJECT

Students in other degree programmes can complete a minor subject entity in geology consisting of 15 credits of basic studies in geosciences. A minor course entity of 15 credits can also be done in Geology and Mineralogy, Quaternary Geology or Geochemistry. It needs to be noted that the number of participants in some cases (especially in field courses) is limited.

Detailed descriptions of each course can be found in WebOodi (<https://weboodi.oulu.fi/oodi/>).

Examinations and grading

An examination is organised within two weeks after the completion of each lecture course. After that students can participate in two additional examinations for each course on general examination days. Registration for an exam is regarded as participation. General examination days are arranged once a month on Fridays at 9-12 in room GO101 unless otherwise informed. **The examination days in the academic year 2014-2015 are the following: September 12, October 10, November 14 and December 12, January 16, February 13, March 13, April 10 and May 22.** Students must register for these examinations using WebOodi latest at 12.00 on the Monday preceding the exam. Summer examinations of the department are organised in June and August and the dates are provided separately during the late spring term. Registration for the summer examinations should be done in May.

A numerical scale 0-5 in whole numbers is used in assessing a completed course. 0 = fail, 1 = sufficient, 2 = satisfactory, 3 = good, 4 = very good and 5 = excellent. In some courses, verbal grading Pass or Fail is applied. For study courses consisting of several subunits, the grade is the weighted average of all subunits. Evaluation of the Master's thesis is based on the same scale 0-5, and the grade of the thesis is not considered when determining the average grade of the advanced studies.

Tutkintorakenteet

B.SC. IN GEOLOGY

Tutkintorakenteen tila: archived

Lukuvuosi: 2014-15

Lukuvuoden alkamispäivämäärä: 01.08.2014

Bs.C, OBLIGATORY GENERAL-, BASIC- AND INTERMEDIATE-LEVEL STUDIES

The Bachelor of Science degree in geology is a joint degree for all geology students. It includes 80 credits of obligatory major subject studies, which are divided into basic studies (28 cr), intermediate-level studies (43 cr), and the Bachelor thesis (9 cr) and related maturity test. It is recommended that during the Bachelor studies, the student takes a sufficient amount of courses in his/her future majors subject to ensure that courses needed as pre-requirements for the Master's studies are done.

OBLIGATORY GENERAL- AND MINOR STUDIES

902002Y: English 1 (Reading for Academic Purposes), 2 op
 902004Y: English 2 (Scientific Communication), 2 op
 030005P: Information Skills, 1 op
 770001Y: Orientation course for new students, 1 op
 901004Y: Swedish, 2 - 3 op

BASIC STUDIES IN GEOSCIENCES

771102P: Basic course in mineralogy, 6 op
 771111P: Endogenic Processes, 6 op
 771112P: Exogenic Processes, 4 op
 772103P: Field course in bedrock geology, 3 op
 773103P: Field course in surficial geology, 3 op
 771108P: Introduction to Ore Geology, 2 op
 771106P: Introduction to bedrock geology of Finland, 2 op
 771107P: Introduction to historical geology and surficial geology of Finland, 2 op

OBLIGATORY INTERMEDIATE STUDIES IN GEOSCIENCES

774301A: A Basic Course in Geochemistry, 6 op
 771303A: Bachelor of Science thesis, 9 op
 773303A: Basics of glacial geology, 4 op
 771302A: Digital modelling and geological information systems in geosciences, 5 op
 773314A: Environmental Geology, 3 op
 770390A: Maturity test, 0 op
 772339A: Optical mineralogy, 6 op
 773317A: Physical Sedimentology, 5 op
 771304A: Practical training, 4 - 5 op
 772316A: Structural geology, 5 op

MINOR SUBJECT STUDIES (10 - 16 op)

Students are required to do a 25 credit entity in a minor subject, which is recommended to be either geology and mineralogy or Quaternary geology, but can also be some other that supports the studies (e.g. geophysics, chemistry, process engineering, mathematics, environmental protection).

Select one from the options below or select at least one other minor subject entity with a minimum of 25 credits. When you have one 25-credit minor subject entity, you can do other 15-credit minor subject entities, classified as "studies" in that particular subject.

Those students who will specialize in geoenvironment can select a minor subject entity with a minimum of 15 credits from a specific set of the process and environmental engineering courses (see below). Note that if you choose this entity Calculus I is obligatory and should be completed during the M.Sc. studies at the latest.

Those students who will specialize in exploration and mining can select a minor subject entity with a minimum of 15 credits from a specific set of the process and environmental engineering courses (see below). Note that if you choose this entity, Calculus I is obligatory and should be completed during the M.Sc. at the latest.

MINOR SUBJECT ENTITY IN QUATERNARY GEOLOGY (25 ECTS)

A326104: Surficial Geology Minor, 25 op

E1

- 773324A: Field mapping of Quaternary deposits, 5 op
- 773306A: Quaternary Geology of Finland, 5 op
- 773316A: Technical Properties of Sediments, 8 op
- 773337A: Biostratigraphy: pollen analyses, 5 op
- 773341A: Biostratigraphy: diatom analyses, 5 op
- 773322A: Surficial geology in ore exploration, 5 op
- 773300A: Quaternary Stratigraphy, 5 op
- 773331A: Hydrogeology, 5 op

MINOR SUBJECT ENTITY IN GEOLOGY AND MINERALOGY

A325604: Geology and Mineralogy Minor, 25 op

E2

- 772334A: Bedrock mapping, 3 op
- 772341A: Igneous Petrology, 7 op
- Compulsory*
- 772341A-01: Igneous Petrology, lectures, 0 op
- 772341A-02: Igneous Petrology, exercises, 0 op
- 772344A: Sedimentary Petrology, 5 op
- 772345A: Metamorphic Petrology, 6 op
- 772357A: Technical use of rocks and minerals, 4 op
- 772385A: Ore geology, 5 op
- 772335A: Introduction to ore mineralogy, 5 op
- 772310A: General mineralogy, 5 op
- 772320A: Tectonics, 5 op

STUDIES IN QUATERNARY GEOLOGY (15 ECTS)

A326108: Studies in Surficial Geology, 15 op

E3

- 773324A: Field mapping of Quaternary deposits, 5 op
- 773306A: Quaternary Geology of Finland, 5 op
- 773316A: Technical Properties of Sediments, 8 op
- 773337A: Biostratigraphy: pollen analyses, 5 op
- 773341A: Biostratigraphy: diatom analyses, 5 op
- 773322A: Surficial geology in ore exploration, 5 op
- 773300A: Quaternary Stratigraphy, 5 op
- 773331A: Hydrogeology, 5 op

STUDIES IN GEOLOGY AND MINERALOGY (15 ECTS)

A325608: Studies in Geology and Mineralogy, 15 op

E4

- 772334A: Bedrock mapping, 3 op
- 772341A: Igneous Petrology, 7 op
- Compulsory*
- 772341A-01: Igneous Petrology, lectures, 0 op
- 772341A-02: Igneous Petrology, exercises, 0 op
- 772344A: Sedimentary Petrology, 5 op
- 772345A: Metamorphic Petrology, 6 op
- 772357A: Technical use of rocks and minerals, 4 op
- 772385A: Ore geology, 5 op
- 772335A: Introduction to ore mineralogy, 5 op
- 772310A: General mineralogy, 5 op
- 772320A: Tectonics, 5 op

STUDIES IN GEOCHEMISTRY (10 ECTS)

A323702: Studies in Geochemistry, 15 - 100 op

E5

774329A: Introduction to Environmental Geochemistry, 5 op

774304A: Analytical methods in geochemistry, 5 op

OTHER MINOR SUBJECT

COURSES IN GEOENVIRONMENT (MIN 15 ECTS)

H327030: Studies in Geoenvironment, 15 - 100 op

E7

488102A: Hydrological Processes, 5 op

773331A: Hydrogeology, 5 op

488012A: Environmental Legislation, 5 op

774329A: Introduction to Environmental Geochemistry, 5 op

477011P: Introduction to Process and Environmental Engineering I, 5 op

488103A: Environmental Impact Assessment, 4 - 8 op

031010P: Calculus I, 5 op

488010P: Introduction to Process and Environmental Engineering II, 5 op

488104A: Industrial and municipal waste management, 5 op

COURSES IN PROCESS AND ENVIRONMENTAL ENGINEERING RELATED TO SPECIALIZATION IN EXPLORATION AND MINING

H327031: Studies in Process and environmental engineering, 15 - 100 op

E8

488012A: Environmental Legislation, 5 op

477011P: Introduction to Process and Environmental Engineering I, 5 op

477101A: Particle Technology, 3 op

031010P: Calculus I, 5 op

488010P: Introduction to Process and Environmental Engineering II, 5 op

488103A: Environmental Impact Assessment, 4 - 8 op

INTERMEDIATE-LEVEL STUDIES IN MAJOR SUBJECT

GEOLOGY AND MINERALOGY AS MAJOR SUBJECT

772334A: Bedrock mapping, 3 op

772310A: General mineralogy, 5 op

772341A: Igneous Petrology, 7 op

Compulsory

772341A-01: Igneous Petrology, lectures, 0 op

772341A-02: Igneous Petrology, exercises, 0 op

772335A: Introduction to ore mineralogy, 5 op

772345A: Metamorphic Petrology, 6 op

772385A: Ore geology, 5 op

772344A: Sedimentary Petrology, 5 op

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

772320A: Tectonics, 5 op

772338A: Work practice II, 4 - 5 op

QUATERNARY GEOLOGY AS MAJOR SUBJECT

773341A: Biostratigraphy: diatom analyses, 5 op

773337A: Biostratigraphy: pollen analyses, 5 op

773324A: Field mapping of Quaternary deposits, 5 op

773331A: Hydrogeology, 5 op

773306A: Quaternary Geology of Finland, 5 op

773300A: Quaternary Stratigraphy, 5 op

773322A: Surficial geology in ore exploration, 5 op

773316A: Technical Properties of Sediments, 8 op

773345A: Work practice 2, 4 - 5 op

OTHER STUDIES

Other optional studies can include separate courses which are not part of the major and minor subject entities, such as languages or other courses of interest.

MASTER OF SCIENCE (M.Sc.)

Tutkintorakenteen tila: archived

Lukuvuosi: 2014-15

Lukuvuoden alkamispäivämäärä: 01.08.2014

MASTER OF SCIENCE IN GEOLOGY AND MINERALOGY, SPECIALIZATION IN ECONOMIC GEOLOGY (vähintään 120 op)

Completion of the Master's degree requires that the student has completed at least 60 credits of advanced studies in his/her master subject, including the 35-credit Master's thesis and related maturity test and other studies corresponding to at least 25 credits. Select here advanced studies in geology and mineralogy amounting to a minimum of 60 credits. Select the other studies in such a way that they support your field specialisation. In addition, it is required that the following intermediate-level courses in geology and mineralogy have been completed: Optical mineralogy 772339A, Igneous petrology 772341A, General mineralogy 772310A, Sedimentary petrology 772344A, Petrology of metamorphic rocks 772345A, Structural geology 772316A, Bedrock mapping 772334A, Ore geology 772385A, Introduction to ore mineralogy 772335A.

Advanced studies , min. 60 ects.

A325603: Geology and Mineralogy, advanced studies, 60 - 85 op

engl/

- 772671S: Magmatic ore deposits, 7 op
- 772672S: Hydrothermal ore deposits, 7 op
- 772674S: Sedimentary ore deposits, 7 op
- 772675S: Geophysics in economic geology, 5 op
- 772682S: Applied Field Techniques in Economic Geology, 5 op
- 772632S: Regional ore geology of Fennoscandia, 5 op
- 772687S: Gold deposits, 5 op
- 772631S: Archean Geology, 5 op
- 772628S: Layered intrusions and their ore deposits, 5 op
- 774637S: Isotope geochemistry for economic geologists, 6 op
- 772683S: Structural geology for economic geologists, 5 op
- 772667S: Seminar in ore geology, 5 op
- 772694S: Geometallurgy and mineral processing, 5 op
- 772608S: Mining geology, 3 op
- 772640S: Excursion, 5 op
- 774636S: Geochemistry of Mining Environment, 5 op
- 772613S: Bedrock geology of Finland, 6 op
- 772658S: Special issues in geology and mineralogy, 1 - 9 op
- 772684S: GIS applications, 5 op
- 773679S: Studies in other universities, 0 op
- 772614S: Workshop in bedrock mapping, 5 op
- 772615S: Literature study, 5 op
- 773615S: Studia Generalia -lectures, 2 op
- 772666S: Master's thesis, 30 op
- 770690S: Maturity test, 0 op

Optional studies

MASTER OF SCIENCE IN GEOLOGY AND MINERALOGY, SPECIALIZATION IN EXPLORATION AND MINING (vähintään 120 op)

Completion of the Master's degree requires that the student has completed at least 60 credits of advanced studies in his/her master subject, including the 35-credit Master's theses and related maturity test and other studies corresponding to at least 25 credits. Minor subject studies in process and environmental engineering (min. 15 cr) have to be completed latest at this stage. In addition, students should do the courses entity of at least 30 credits selected from set of specific advanced courses in exploration and mining.

Advanced studies in geology and mineralogy (min 60 ects)

A325603: Geology and Mineralogy, advanced studies, 60 - 85 op

engl/

- 772671S: Magmatic ore deposits, 7 op
- 772672S: Hydrothermal ore deposits, 7 op
- 772674S: Sedimentary ore deposits, 7 op
- 772675S: Geophysics in economic geology, 5 op
- 772682S: Applied Field Techniques in Economic Geology, 5 op
- 772632S: Regional ore geology of Fennoscandia, 5 op
- 772687S: Gold deposits, 5 op
- 772631S: Archean Geology, 5 op
- 772628S: Layered intrusions and their ore deposits, 5 op
- 774637S: Isotope geochemistry for economic geologists, 6 op
- 772683S: Structural geology for economic geologists, 5 op
- 772667S: Seminar in ore geology, 5 op
- 772694S: Geometallurgy and mineral processing, 5 op
- 772608S: Mining geology, 3 op
- 772640S: Excursion, 5 op
- 774636S: Geochemistry of Mining Environment, 5 op
- 772613S: Bedrock geology of Finland, 6 op
- 772658S: Special issues in geology and mineralogy, 1 - 9 op
- 772684S: GIS applications, 5 op
- 773679S: Studies in other universities, 0 op
- 772614S: Workshop in bedrock mapping, 5 op
- 772615S: Literature study, 5 op
- 773615S: Studia Generalia -lectures, 2 op
- 772666S: Master's thesis, 30 op
- 770690S: Maturity test, 0 op

Process and environmental engineering studies related to specialization in exploration and mining studies (min. 15 ects)

031010P: Calculus I, 5 op

H327031: Studies in Process and environmental engineering, 15 - 100 op

E8

- 488012A: Environmental Legislation, 5 op
- 477011P: Introduction to Process and Environmental Engineering I, 5 op
- 477101A: Particle Technology, 3 op
- 031010P: Calculus I, 5 op
- 488010P: Introduction to Process and Environmental Engineering II, 5 op
- 488103A: Environmental Impact Assessment, 4 - 8 op

Advanced studies, specialization on Exploration and mining (min. 30 ects)

A325606: Exploration and Mining Studies, 30 - 100 op

E6

- 477703A: Surface Chemistry Principles of Minerals, 3 op
- 477704A: Principles of Mineral Processing, 5 op
- 762302A: Geophysical research methods of rock and soil, 6 - 8 op
- 488110S: Water and Wastewater Treatment, 5 op
- 488205S: Environmental Load of Process Industry, 4 op
- 477725S: Mine Automation, 7,5 op
- 477709S: Financial and Project Valuation of Mining Project, 3 op

- 774636S: Geochemistry of Mining Environment, 5 op
 774304A: Analytical methods in geochemistry, 5 op
 773322A: Surficial geology in ore exploration, 5 op
 773641S: Surficial geology in ore exploration, advanced course 1, 5 op
 773642S: Surficial geology in ore exploration, advanced course 2, 5 op
 772608S: Mining geology, 3 op
 477711S: Rock and Mining Engineering, 5 op
 772694S: Geometallurgy and mineral processing, 5 op
 477715S: Environmental and Social Responsibility in Mining, 5 op
 477708S: Mining Project Feasibility Study, 4 op
 477712S: Phenomena in Mineral Processing, 5 op
 477713S: Automation in Mineral Processing, 5 op
 477721S: Mineral Processing, 7,5 op
 477723S: Mining Economy and Risk Evaluation, 7,5 op

Other studies

MASTER OF SCIENCE IN QUATERNARY GEOLOGY (vähintään 120 op)

Completion of the master's degree requires that the student has completed at least 60 credits of advanced studies in his/her master subject, including the 35-credit Master thesis and related maturity test and other studies corresponding to at least 25 credits. In addition, it is required that the following intermediate-level courses in quaternary geology have been completed: 773337A Biostratigraphy: pollen course, 773341A Biostratigraphy: diatom course, 773317A Physical sedimentology, 773303A Basics of glacial geology, 773300A Quaternary stratigraphy, 773306A Quaternary geology of Finland, 773324A Field mapping of Quaternary deposits, 773316A Technical properties of sediments.

A326103: Surficial Geology, advanced studies, 60 op

engl/

- 773601S: Glacial Geology II, 5 op
 773616S: Aerial photo interpretation in surficial geology, 5 op
 773641S: Surficial geology in ore exploration, advanced course 1, 5 op
 773642S: Surficial geology in ore exploration, advanced course 2, 5 op
 773621S: Global environmental and climate change during the Cenozoic, 4 op
 773646S: Advanced field techniques, 3 op
 773648S: Sedimentary Structures, 5 op
 773647S: Sedimentology, 6 op
 773613S: Literature essay, 5 op
 773607S: Literature study, 5 op
 773608S: Special questions in Quaternary geology, 5 op
 773612S: Excursion on regional surficial geology, 3 - 6 op
 773619S: Quaternary geology seminar II, 5 op
 773673S: Environmental geology and geophysicfield course, 3 op
 773679S: Studies in other universities, 0 op
 773657S: Pro gradu thesis, 30 op
 770690S: Maturity test, 0 op

MASTER OF SCIENCE, SPECIALIZATION IN GEOENVIRONMENT (vähintään 120 op)

Completion of the master's degree requires that the student has completed at least 60 credits of advanced studies in his/her master subject, including 35-credit master theses and related maturity test. In addition, it is required that a minimum of 15 credits of intermediate-level courses in geoenvironment have been completed, the extent of accepted advanced studies in geoenvironment is at least 20 credits and the subject of the Master's thesis is in the field of geoenvironmental studies.

H327032: Advanced studies in Geoenvironment, 20 - 100 op

E9

- 774636S: Geochemistry of Mining Environment, 5 op
 488121S: Fundamentals of Civil Engineering, 5 op
 488111S: Modelling in Geoenvironmental Engineering, 5 op
 773673S: Environmental geology and geophysicfield course, 3 op
 488115S: Geomechanics, 5 op

477715S: Environmental and Social Responsibility in Mining, 5 op
 488205S: Environmental Load of Process Industry, 4 op
 488103A: Environmental Impact Assessment, 4 - 8 op
 488110S: Water and Wastewater Treatment, 5 op
 A326103: Surficial Geology, advanced studies, 60 op

engl/

773601S: Glacial Geology II, 5 op
 773616S: Aerial photo interpretation in surficial geology, 5 op
 773641S: Surficial geology in ore exploration, advanced course 1, 5 op
 773642S: Surficial geology in ore exploration, advanced course 2, 5 op
 773621S: Global environmental and climate change during the Cenozoic, 4 op
 773646S: Advanced field techniques, 3 op
 773648S: Sedimentary Structures, 5 op
 773647S: Sedimentology, 6 op
 773613S: Literature essay, 5 op
 773607S: Literature study, 5 op
 773608S: Special questions in Quaternary geology, 5 op
 773612S: Excursion on regional surficial geology, 3 - 6 op
 773619S: Quaternary geology seminar II, 5 op
 773673S: Environmental geology and geophysicfield course, 3 op
 773679S: Studies in other universities, 0 op
 773657S: Pro gradu thesis, 30 op
 770690S: Maturity test, 0 op

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksoit

488132S: Cold Climate Engineering, 5 op
 488131S: Geoenvironmental Engineering, 5 op
 772621S: Geology of alkaline rocks, carbonatites and kimberlites, 5 op
 488108S: Groundwater Engineering, 5 op
 774629S: Literature essay, 4 - 5 op
 772689S: Nickel deposits of the Fennoscandian Shield, 5 op
 477412S: Phenomena-based modelling in extractive metallurgy, 10 op
 477414S: Process Simulation in Extractive Metallurgy, 10 op
 773343A: Quaternary Geology Seminar I, 5 op
 772337A: Seminar in geology and mineralogy I, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

902002Y: English 1 (Reading for Academic Purposes), 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Proficiency level:

B2/C1 on the [Common European Framework of Reference](#) scale.

Status:

In the Faculty of Science, this course is mandatory for all degree programmes except Geography. Please consult the Faculty Study Guide to establish the language requirements for your own degree programme.

Required proficiency level:

English must have been the A1 or A2 language at school or equivalent English skills should have been acquired otherwise.

ECTS Credits:

2 ECTS credits (total work load 54 hours including classroom meetings.)

Language of instruction:

English

Timing:

Biology: 1st year spring term

Chemistry: 1st year autumn term

Geology: 1st year spring term

Information Processing Science: 1st year spring term

Mathematical Sciences: 1st year spring term

Physical Sciences: 1st year autumn term

Learning outcomes:

By the end of the course, you are expected

- to have acquired effective vocabulary learning techniques by being able to distinguish parts of words to infer meanings
- to understand and be able to construct basic grammatical structures used in formal written English
- to be able to utilize text structure and cohesion markers when reading academic texts
- to be able to apply effective reading techniques and have necessary skills to extract global and detailed information with considerable ease and speed from general texts related to Natural Sciences as well as texts /textbooks of their own field

Contents:

In this course, students improve their understanding of written academic English used in texts in Natural Sciences as well as expand their general and scientific vocabulary. Students become aware of their own role in learning and use a variety of different study methods in order to develop their own language learning strategies, which will enhance their academic English.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

Contact teaching (26 hours) and self-study 28 hours

Target group:

1st year students of Biology, Chemistry, Geology, Information Processing Science, Physics, and Mathematics

Prerequisites and co-requisites:

-

Recommended optional programme components:

In addition to this course, students are required to take 902004Y Scientific Communication.

Recommended or required reading:

Set books for substance studies; journal articles in print and on-line.

Assessment methods and criteria:

Continuous assessment takes into account active and regular participation in classroom sessions and successful completion of all homework tasks, vocabulary quizzes, and an end of course exam.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/Fail

Person responsible:

Biology, Geology, Information Processing: Karen Niskanen

Chemistry, Physics, Mathematics: Patrick Nesbitt

Working life cooperation:

-

Other information:

N.B. Students with grades *laudatur* or *eximia* in their A1 English school-leaving examination can be exempted from this course and will be granted the credits by the Faculty of Science.

Retake examinations: Two retake examinations are allowed on the dates set by the Extension School. See the dates and registration instructions at: <http://www.oulu.fi/kielikoulutus>

902004Y: English 2 (Scientific Communication), 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

ay902004Y English 2 (Scientific Communication) (OPEN UNI) 2.0 op

Proficiency level:

B2/C1 on the CEFR scales

Status:

This course is mandatory for all 2nd year students (except **geographers**) who will have English as their foreign language in their B.Sc. degree. This includes the students who were exempted from 'Reading for Academic Purposes'(902002Y). Please consult the faculty study guide to establish the language requirements on your own degree programme.

Required proficiency level:

Students taking this course must have had English as the A1 or A2 language at school or the equivalent English skills should have been acquired otherwise. The course 'Reading for Academic Purposes' (902002Y) is a pre-requisite, unless exempted.

ECTS Credits:

The student workload is 53 hrs work/ 2 ECTS credits.

Language of instruction:

English

Timing:

Biology: 2nd year autumn term

Chemistry: 2nd year spring term

Geology: 2nd year spring term

Information Processing Science : 2nd year autumn term

Mathematics: 2nd year spring term

Physics: 2nd year autumn term

Learning outcomes:

By the end of the course, you are expected:

1. to have provided evidence of oral fluency in pair work communication and small group discussions.
2. to have developed effective language learning strategies through autonomous homework.
3. to have demonstrated the ability to prepare and present scientific subjects, using appropriate field-related vocabulary.
4. to have demonstrated lecture listening skills in field-related situations.

Contents:

Skills in listening, speaking, and giving presentations are practised in the course. Homework tasks include autonomous work to support the classroom learning and the task of preparing and presenting a scientific presentation.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

Contact teaching 28 hours, homework 28 hours

Target group:

2nd year students of Biology, Chemistry, Geology, Information Processing Science, Mathematics, Physics

Prerequisites and co-requisites:

-

Recommended optional programme components:

Also required: [902002Y Reading for Academic Purposes Englannin kieli 1](#)

Recommended or required reading:

Course materials will be provided by the teacher.

Assessment methods and criteria:

Continuous assessment is based on regular attendance, active participation in all lessons and the successful completion of all homework tasks.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass / fail.

Person responsible:

Jolene Gear

Working life cooperation:**- Other information:**

Alternative method of course completion: An optional exemption test is offered twice per year. The student can only participate in the exemption exam once. See [exemption exam details and schedule](#).

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuuyksikkö: Faculty of Technology

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivuniemi, Mirja-Liisa, Sassali, Jani Henrik

Opintokohteen kielet: Finnish

Leikkaavuudet:

030004P Introduction to Information Retrieval 0.0 op

ECTS Credits:

1 ECTS credit

Language of instruction:

Finnish

Timing:

2nd or 3rd year

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.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises in Optima environment, a final assignment on a topic of the student's own choice

Learning activities and teaching methods:

Training sessions 8h, group working 7h, self-study 12h

Target group:

Compulsory for all students of the Faculty of Technology, the Faculty of Information Technology and Electrical Engineering and the Faculty of Architecture. In the Faculty of Science compulsory for students of biology, physics, geosciences, chemistry and geography. Optional for students of biochemistry and mathematics.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Web learning material <https://wiki.oulu.fi/display/030005P>.

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Science and Technology Library Tellus, tellustieto (at) oulu.fi

Working life cooperation:

-

Other information:

-

770001Y: Orientation course for new students, 1 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

2 credits

Language of instruction:

finnish

Timing:

1st year fall semester (September)

Learning outcomes:

Students will become familiar with the university environment and practical issues of their study and be able find appropriate of advice if needed.

Contents:

Students are tutored to the study system of the university and will be given information on the contents and goals of the study programme of the department.

Mode of delivery:

Face to face teaching.

Learning activities and teaching methods:

15 to 18 h of tutoring

Target group:

All students conducting basic courses in geology.

Assessment methods and criteria:

Participation in team tutoring.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

amanuensis S. Roman

Working life cooperation:

No.

901004Y: Swedish, 2 - 3 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Opintokohteen kielet: Swedish

Leikkaavuudet:

901035Y Second Official Language (Swedish), Oral Skills 1.0 op

901034Y Second Official Language (Swedish), Written Skills 1.0 op

ay901004Y Swedish (OPEN UNI) 2.0 op

Proficiency level:

B1/B2/C1 (CEFR scale)

Status:

This course is compulsory to all students except those who have at least 60 ECTS credits of Swedish studies in their degrees. The language proficiency provided by the course unit is equivalent to the language proficiency required of a state official with an academic degree working in a bilingual municipality area (Act 424/03 and Decree 481/03).

Required proficiency level:

The required starting proficiency level for students of all faculties is a grade of 7 or higher from the Swedish studies at secondary school (B-syllabus) or matriculation examination grade A - L or a passing grade from the Brush up course in Swedish 901018Y.

If a student doesn't meet these requirements or his/her language skills are otherwise lacking, he/she must achieve the required proficiency level BEFORE taking this compulsory Swedish course

ECTS Credits:

2 ECTS credits (Biochemistry 3 ECTS credits)

Language of instruction:

Swedish

Timing:

See the study guide of your own faculty

Learning outcomes:

Upon completion of the course the student should have acquired the necessary proficiency level in Swedish to be able to manage in the most common communication situations related to his/her professional work tasks. He/she should be able to use basic grammatical structures fairly well in both speech and writing. He/she should be able to use the most common situational phrases understandably in various communication situations. He/she should be able to find the main points in general academic texts and texts related to his/her field of study and relay this information to colleagues or an audience of laymen using Swedish. He/she should be able to write short texts relating to his/her field of study.

Contents:

Communicative oral and written exercises, which aim to develop the student's Swedish proficiency in areas relevant to his/her academic field and future professional tasks. The student practises oral presentation and pronunciation.

Situational oral exercises done individually and in pairs and groups. Discussions in small groups. Current texts about the student's special field. Listening comprehension exercises. Written exercises relating to the student's professional field.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

2 ECTS credits: 28 hours of contact teaching (1 x 180 minutes per week) and related exercises, self-directed study.

The course unit's total workload is 53 hours.

Target group:

Students of the Faculty of Science, students of biochemistry and students of electrical engineering.

Prerequisites and co-requisites:

See Required Proficiency Level

Recommended optional programme components:

-

Recommended or required reading:

The material, which is special field-specific, authentic and up to date, is distributed during the course. Students must pay for their course material.

Assessment methods and criteria:

The course focuses on improving both oral and written language skills and requires active attendance and participation in exercises, which also require preparation time. 100% attendance is required. The course unit tests both oral and written language skills. Students participate in the teaching in either autumn semester or spring semester.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Assessment is based on continuous assessment and exams. Approved completion of the course unit requires that the student achieves at least satisfactory oral and written language skills. The grades are based on continuous assessment and the course exams. Oral and written language skills are graded separately. The possible grades are satisfactory skills (CERF proficiency level B1) and good skills (CERF proficiency levels B2-C1). For more information on the proficiency levels of oral and written language skills, see Assessment Criteria (in Finnish).

Person responsible:

Lecturer Rauno Varonen

Working life cooperation:

-

Other information:

Teaching will begin according to the schedule

771102P: Basic course in mineralogy, 6 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen oppimateriaali:

Risto Piispanen ja Pekka Tuisku (<http://cc.oulu.fi/petuisku/Mineralogia/MinPer.htm>, , 2005

Opintokohteen kielet: Finnish

ECTS Credits:

6 credits

Language of instruction:

Finnish

Timing:

1st year, autumn semester

Learning outcomes:

Students obtain 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

20 h lectures, 16 h exercises. Exercises are compulsory.

Target group:

1st year geosciences students

Prerequisites and co-requisites:

No

Recommended optional programme components:

- **Recommended or required reading:**

Risto Piispala ja Pekka Tuisku (2005) Mineralogian perusteet. <http://cc.oulu.fi/~petuisku/Mineralogia/MinPer.htm>

Assessment methods and criteria:

Examination, compulsory exercises

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

-

771111P: Endogenic Processes, 6 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

ECTS Credits:

6 credits

Language of instruction:

Finnish

Timing:

1st year, autumn semester

Learning outcomes:

The student will have an understanding of the basic *concepts* of the geological *processes* affecting rocks under the earth surface.

Contents:

Origin of elements, solar system, history of evolution, structure and composition of the Earth. Magmatism, tectonics, origin and crystallization of magmas, volcanism, metamorphism and formation of metamorphic rocks, plate tectonics and tectonic structures.

Mode of delivery:

Face to face

Learning activities and teaching methods:

36 h lectures, 6 h practicals

Target group:

1 year geology students

Prerequisites and co-requisites:

Basic course in mineralogy (771102P)

Recommended optional programme components:

This course is intended as an introduction to the scope and methods of igneous and metamorphic petrology.

Recommended or required reading:

Lecture material. Martti Lehtinen, Pekka Nurminen ja Tapani Rämö: Suomen kallioperä - 3000 vuosimiljoonaa. Suomen geologinen Seura, Gummerus Jyväskylä 1998, ISBN 952-90-9260-1. Chapters 2-3. The other textbook will be informed later.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

S. Gehör

Working life cooperation:

No

771112P: Exogenic Processes, 4 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Peuraniemi, Vesa Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay771112P Exogenic Processes (OPEN UNI) 4.0 op

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

1st year, autumn semester

Learning outcomes:

Upon completion of the course, students should have acquired basic knowledge on the concepts and processes of surficial geology. Students should also be able to identify basic sediment types and soils.

Contents:

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

Mode of delivery:

Face to face

Learning activities and teaching methods:

16 hr lectures, 6 hr exercises

Target group:

1st year geoscience students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Handout. Oheislukemistona: Monroe, J.S. & Wicander, R.: The Changing Earth. Exploring Geology and Evolution. Brooks/Cole, 2001. pp. 113-147, 210-233, 301-483.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

Other information:

-

772103P: Field course in bedrock geology, 3 op

Voimassaolo: 01.08.2006 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Kärki, Aulis Juhani

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits

Language of instruction:

Finnish/ English

Timing:

1st year, spring semester

Learning outcomes:

Upon completion of the course, students should be able to identify rocks and minerals in the field and recognize main features of the Finnish bedrock.

Contents:

Methods of description and identification of rock types and bedrock units in the field work. Map types (geological, geophysical, topographic maps) and usage of geologist's field tools.

Mode of delivery:

Face to face teaching in the field

Learning activities and teaching methods:

Field works and demonstrations, short presentation on the given subject.

Target group:

First year geology students

Prerequisites and co-requisites:

Basic studies in geosciences

Recommended optional programme components:

The field course is complementary to the lecture course "Introduction to bedrock geology of Finland" by introducing the students the "cross section" of the Finnish bedrock in the field.

Assessment methods and criteria:

Compilation of a learning diary

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

-

773103P: Field course in surficial geology, 3 op

Voimassaolo: 01.01.2006 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Peuraniemi, Vesa Juhani

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits

Language of instruction:

Finnish

Timing:

1st year, spring semester

Learning outcomes:

Upon completion of the course, students should be able to identify the most important sediment types in the field and make observations on the ice flow directions.

Contents:

During this field course students will be introduced to the most important sediment types and their determination, and the methods of their study. Also different glacial landforms are discussed. Different sediment types and their characteristics in Finland are described.

Mode of delivery:

Face to face

Learning activities and teaching methods:

8 h lectures, 32 h exercises

Target group:

1st year geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

compulsory exercises

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

Ei

Other information:

-

771108P: Introduction to Ore Geology, 2 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

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 gain 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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

14 h lectures

Target group:

all geology students

Recommended or required reading:

Craig, J.R., Vaughan, D.J. & Skinner, B.J.: Resources of the Earth - Origin, Use, and Environmental Impact. Prentice Hall, 1996, 472 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

written examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

S. Gehör

Working life cooperation:

No

771106P: Introduction to bedrock geology of Finland, 2 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Kärki, Aulis Juhani

Opintokohteen kielet: Finnish

ECTS Credits:

2 credits

Language of instruction:

Finnish

Timing:

1st year, spring semester

Learning outcomes:

After the course students know main geological features of bedrock of Finland and main features of lithostratigraphy and chronostratigraphy.

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 10 h and self-study 30 h

Target group:

First year geology students and students of secondary subject

Prerequisites and co-requisites:

The required prerequisite is the participation in the following courses: Introduction to mineralogy, Endogenic processes, Exogenic processes.

Recommended optional programme components:

-

Recommended or required reading:

Lehtinen, M., Nurmi, P. ja Rämö, T., 1998: Suomen Kallioperä, Suomen Geologinen Seura; or selected parts from Lehtinen et al. (eds.) 2005. Precambrian Geology of Finland. Elsevier, Amsterdam, 736 s.
<http://www.geologinenseura.fi/suomenkalliopera/index.html>

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5/ fail.

Person responsible:

A. Kärki

Working life cooperation:

No

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

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Peuraniemi, Vesa Juhani

Opintokohteen kielet: Finnish

ECTS Credits:

2 credits

Language of instruction:

Finnish

Timing:

1st year, spring semester

Learning outcomes:

Upon completion of the course, students should have acquired basic knowledge 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

10 h lectures

Target group:

1st year geoscience students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Monroe, J.S. & Wicander, R.: The Changing Earth. Exploring Geology and Evolution. Brooks/Cole, 2001. Pages 514-537, 560-733.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

Other information:

-

774301A: A Basic Course in Geochemistry, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

finnish

Timing:

1st spring

Learning outcomes:

Upon completion of this course, students will have a broad overview of the different fields of geochemistry and be able to relate the behavior of elements to different physico-chemical processes in nature. They will be able to convert geochemical data from one form to another (wt%, molar and cation proportions, milliequivalents), plot these data on different diagrams, and carry out simple mineral dissolution/precipitation and mass balance calculations.

Contents:

Geochemistry as a field of science; history of geochemistry; tasks and fields of geochemistry; origin and electron configuration of chemical elements; origins and structure of the Earth; meteorites; the geochemical classification of the elements; composition of earth's different spheres; geochemical differentiation; composition of magmas; dissolution and precipitation of minerals; pH-Eh-diagrams; introduction to isotope geochemistry.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

32 h lectures, 12 h exercises

Target group:

All students conducting basic courses in geology

Prerequisites and co-requisites:

It is recommended that a basic course in chemistry (e.g. 780109P) has been taken during the previous fall semester.

Recommended or required reading:

Gill, Robin, Chemical Fundamentals of Geology, Chapman & Hall, London, 1996, 298 p. And Mason, B. & Moore, C. B.: Principles of Geochemistry, 4th Student Edition, J. Wiley, New York, 1982, p. 187-209.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examinations in theory and calculations

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

E. Hanski

771303A: Bachelor of Science thesis, 9 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

9 credits

Language of instruction:

finnish/English

Timing:

3rd year

Learning outcomes:

Depending on the assignment, students will be able to conduct research work including hypothesis formulation, sampling and interpretation of data, and writing a report, or alternatively, they will be able to make a literature search of a given research topic and write a synthesis of previously published relevant studies.

Contents:

Individual research of literature, field work or laboratory work.

Mode of delivery:

Independent work and personal tuition.

Learning activities and teaching methods:

Literature study or small research project.

Target group:

All Bachelor students

Prerequisites and co-requisites:

Circa two years of previous studies in geology

Assessment methods and criteria:

A 20-30 page thesis

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass / fail

Person responsible:

professors and lecturers

Working life cooperation:

No

Other information:

Before starting the thesis, students must agree upon the details of the thesis with their professor.

773303A: Basics of glacial geology, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

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, students should have acquired basic knowledge of glaciogenic sediment types and of morphological landforms and can present theories of how glaciers are formed.

Contents:

A review to history of glacial research and its methods; theories of how glaciers are generated and factors that affect 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

26 h lectures

Target group:

2nd and 3rd year geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P

Recommended or required reading:

Bennet, M. R. & Glasser, N. F. 1996. Glacial Geology, Ice sheet and Landforms. Wiley. 364 s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

Other information:

This course is obligatory for students having Quaternary geology as their major subject and needs to be done latest for the Master's degree.

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

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Kärki, Aulis Juhani

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd year, autumn semester

Learning outcomes:

This course familiarizes the students with the usage of GIS systems in geological research. The students are able to utilize the programs in solving geological problems and they have learned to use at least one 2D GIS program.

Contents:

Basic knowledge on 2D and 3D digital modeling and GIS-softwares.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 8 h, demonstrations 20 h and exercises as self-study 50 h.

Target group:

Geology students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Tokola, T., Soimasuo, J., Turkia, A., Talkkari, A., Store, R. & Kangas, A., (toim.) 1994: Paikkatieto ja paikkatietojärjestelmät. Silva Carelica 28. Joensuun Yliopisto. Blom, T., 1995: Paikkatietojärjestelmien perusteet. Helsingin yliopiston maantieteen laitoksen opetusmonisteita 37; Bonham-Carter, G. F., 1994: Geographical information systems for geoscientist. Modelling with GIS .

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Skill test

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5/ fail.

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

-

773314A: Environmental Geology, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

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, students should have acquired basic knowledge of 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 use, environmental geochemistry.

Mode of delivery:

Face to face

Learning activities and teaching methods:

24 h lectures

Target group:

2nd and 3rd year geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P

Recommended or required reading:

Murck, B.W., Skinner, B.J. & Porter, S.C., 1996: Environmental Geology, John Wiley & Sons, 535 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

770390A: Maturity test, 0 op

Voimassaolo: 01.08.2008 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

0 credits

Language of instruction:

Finnish or English

Timing:

3rd autumn or spring

Learning outcomes:

The student knows the vocabulary of the research field of his/her thesis and can independently produce text related to the thesis.

Contents:

Written test on the subject of the B.Sc. thesis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Independent work

Target group:

Compulsory in B.Sc. degree for student of geosciences.

Prerequisites and co-requisites:

B.Sc. thesis

Recommended optional programme components:

No alternative course units.

Recommended or required reading:

No reading

Assessment methods and criteria:

The test event. The length of the text is recommended to be one exam paper.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Professors

Working life cooperation:

No work placement period.

772339A: Optical mineralogy, 6 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

ECTS Credits:

6 credits

Language of instruction:

Finnish

Timing:

1st year, autumn semester

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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 30h, practicals 40 h

Target group:

1st year geoscience students

Prerequisites and co-requisites:

Basic course in mineralogy 771102P

Recommended optional programme components:

-

Recommended or required reading:

Wm. Revell Phillips (1971) Mineral Optics, s. 1-170; Risto Piispanen (1981) Kideoptiikka, osa I, Isotrooppisten aineiden kideoptiikka; Risto Piispanen ja Pekka Tuisku (1996) Kideoptiikka, osa II, anisotrooppisten aineiden

kideoptiikka; Käsikirjat: Alexander ja Horace Winchell (1967) Elements of Optical Mineralogy. Part II: Description of Minerals. 6. painos; W. E. Tröger (1971) Optische Bestimmung der gesteinbildenden Minerale. Teil 1, Bestimmungstabellen. 4. uudistettu painos; W. E. Tröger (1967) Optische Bestimmung der gesteinbildenden Minerale. Teil 2, Textband.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest during the Master's studies.

773317A: Physical Sedimentology, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

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:

Upon completion the student should be able to recognize the main geological agents that control erosion and deposition in different sedimentary environments.

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 discussed 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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures

Target group:

Geology students, geography students (pursuing minor in geology)

Prerequisites and co-requisites:

Exogenic processes 771112P

Recommended optional programme components:

The course is a pre-requisite for other courses in the Quaternary Geology

Recommended or required reading:

Press, F. & Siever, R. 1998. Understanding Earth. W. H. Freeman and Company, p. 134 - 161, p. 264 - 455 and other selected readings.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specialization of Quaternary geology.

771304A: Practical training, 4 - 5 op

Opiskelumuoto: Intermediate Studies

Laji: Practical training

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

finnish/english

Timing:

2nd or 3rd summer

Learning outcomes:

Students will get familiar with geologists' duties in real-world situations and can assess the development of their own expertise during the training.

Contents:

Practical training accomplished under the guidance of a qualified geologist in Finland or abroad. 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.

Mode of delivery:

Attending work life

Learning activities and teaching methods:

A period of 1.5 to 3 month of practical work in a company or research institute, written report

Target group:

all geology students

Assessment methods and criteria:

a written report on the training work

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

professors

Working life cooperation:

yes

Other information:

compulsory to the Bachelor's degree

772316A: Structural geology, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

The student is able to analyze and describe deformation structures of the bedrock, and based on the result, he/she can evaluate the mechanisms of deformation and characteristics of the deformation processes.

Contents:

Development of structural geology and principles of the stress and strain theory, microscopic structural elements, fractures and fault structures, folding and fold structures, multiphase deformation and interference structures.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 24 h and self study 85 h

Target group:

Geology major students

Prerequisites and co-requisites:

Basic studies in geology

Recommended optional programme components:

-

Recommended or required reading:

Haakon Fossen, 2010, Structural Geology, Cambridge University Press, 480 s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5/ fail.

Person responsible:

A. Kärki

Working life cooperation:

No

A326104: Surficial Geology Minor, 25 op

Opiskelumuoto: Basic Studies

Laji: Study module

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Peuraniemi, Vesa Juhani

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksovaauksia.

E1

773324A: Field mapping of Quaternary deposits, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

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:

Upon the completion of the course, the student will be able to produce a Quaternary geology map based on own field data.

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures and exercises in the field

Target group:

Geology students

Prerequisites and co-requisites:

The required pre-requisite is the completion of the following courses prior to enrolling for the course unit: Basic courses in Geology, Physical Sedimentology 773317A, Basics of Glacial Geology 773303A and Technical Properties of Sediments 773316A.

Recommended optional programme components:

No

Recommended or required reading:

No

Assessment methods and criteria:

Participation and quality of the map produced during the mapping course

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

J.P. Lunkka

Working life cooperation:

Ei

773306A: Quaternary Geology of Finland, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Upon completion of the course, students should have acquired knowledge of the Finnish glacial landforms and deglaciation in Finland.

Contents:

The pre-Quaternary landform of Finland; thermometers and cryometers 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

2nd or 3rd year geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P

Recommended or required reading:

Koivisto M. 2004: Jääkaudet. WSOY, Helsinki, 233s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773316A: Technical Properties of Sediments, 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tiina Eskola

Opintokohteen kielet: Finnish

ECTS Credits:

8 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

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: determining consistency and structure of different sediments; determining different mechanical properties of sediments.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 30 h/ group work 60 h/ independent work 90 h.

Target group:

The course unit is aimed primarily at major students

Prerequisites and co-requisites:

Basic studies in geosciences, Surficial geology of Finland (773306A).

Recommended optional programme components:

Exogenic processes (771109P), Field course in surficial geology (773302A), Surficial geology of Finland (773306A)

Recommended or required reading:

A handout. Rantamäki, Jääskeläinen & Tammirinne: Geotekniikka. pp. 31-161, 249-274, Otakustantamo, 1984, Velde.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Students participate actively in teaching, written reports

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/ fail

Person responsible:

T. Eskola

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specializations of Quaternary geology and geoenvironment.

773337A: Biostratigraphy: pollen analyses, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tiina Eskola

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students should be able to prepare pollen samples in the laboratory and identify the most common pollen types and spores in Finland.

Contents:

Theory of the pollen analysis and laboratory methods, the most common pollen and spore types, manufacturing preparations, sediment analysis.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 20 h/ exercises 38 h/ independent work 40 h.

Target group:

The course unit is aimed primarily at major students

Prerequisites and co-requisites:

Basic studies in geosciences

Recommended optional programme components:

-

Recommended or required reading:

Bennett, K.D. & Willis, K.J., 2001. Pollen. In: Smol, J.P., Birks, H.J.B., Last, W.M. (eds.). Tracking Environmental Change Using Lake Sediments. Volume 3: Terrestrial, Algal, and Siliceous Indicators. Kluwer, Dordrecht, The Netherlands, pp. 5 - 32. Berglund, B. (ed.). Handbook of Holocene Palaeoecology and Palaeohydrology. Wiley & Sons, 1988, ss. 455-484. Plus class handouts.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Students participate actively in teaching, written report and an examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

T. Eskola

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specialization of Quaternary geology.

773341A: Biostratigraphy: diatom analyses, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tiina Eskola

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students should be able to prepare diatom samples in the laboratory and identify some of the most general diatoms in Finland.

Contents:

Theory of the diatom analysis and laboratory methods, the most general diatom genera and species, manufacturing preparations, sediment analysis.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 22 h/ exercises 42 h/ independent work 30 h.

Target group:

The course unit is aimed primarily at major students

Prerequisites and co-requisites:

Basic studies in geosciences

Recommended optional programme components:

-

Recommended or required reading:

Battarbee, R.W., Jones, V.J., Flower, R.J., Cameron, N.g., Bennion, H., Varvalho, L., Juggins, S., 2001. Diatoms. In: Smol, J.P., Birks, H.J.B., Last, W.M. (eds.). Tracking Environmental Change Using Lake Sediments. Volume 3: Terrestrial, Algal, and Siliceous Indicators. Kluwer, Dordrecht, The Netherlands, pp. 155 - 202. Berglund, B. (ed.) Handbook of Holocene Palaeoecology and Palaeohydrology. Wiley & Sons., 1988, ss. 527-570. Forsström, L. Piikuoriset levät. Opintomoniste, Oulun yliopisto Geotieteiden laitos 1999, 104 p. Plus class handouts.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Students participate actively in teaching, written report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

T. Eskola

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specialization of Quaternary geology.

773322A: Surficial geology in ore exploration, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Upon completion of the course, students should have a basic knowledge of the dispersal of ore boulders and how boulders and till geochemistry are utilized 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

2nd or 3rd year geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P, Surficial geology in Finland 773306A, Basics of glacial geology 773303A

Recommended or required reading:

Kujansuu, R. ja Saarnisto, M. (eds.): Glacial Indicator Tracing, A.A. Balkema, 1990, 252 p
The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773300A: Quaternary Stratigraphy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Upon the completion of the course, the student will be able to explain the stratigraphical methods used in Quaternary Geology, to discuss stratigraphical issues using basic concepts of stratigraphy. The student will also be able to explain how environments and climate have changed during the Quaternary.

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

26 h lectures

Target group:

Geology students, geography students (pursuing minor in geology)

Prerequisites and co-requisites:

No

Recommended optional programme components:

No

Recommended or required reading:

Ehlers, J.: Quaternary and Glacial Geology. Wiley & Sons, New York. Lowe, J.J. & Walker, M.J.C.: Reconstructing Quaternary Environments, Longman, Hong Kong, 2. ed, 1997. Donner, J.: The Quaternary History of Scandinavia. World and Regional Geology 7. Cambridge University Press, 200 pp. 1995. The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specialization of Quaternary geology.

773331A: Hydrogeology, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyskikkö: Oulu Mining School

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:

Upon the completion of course, the student: 1) knows the basic facts and research methods used in hydrogeology, 2) can define different aquifer types and their relationship to superficial deposits and bedrock-types, 3) can explain the basic principles that govern ground water flow.

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

26 h lectures and exercises

Target group:

Geology students, geography students (pursuing minor in geology)

Prerequisites and co-requisites:

The required pre-requisites is the completion of the following courses prior to enrolling for the course unit: Physical Sedimentology 773317A, Basics of Glacial Geology 773303A.

Recommended optional programme components:

No

Recommended or required reading:

Grundvatten, Teori & Tillämpning. Knutsson, G. & Morfeldt, C-O. Svensk Byggtjänst. 1993, 304 s.
 Maanalaiset vedet - pohjavesigeologian perusteet. Korkka-Niemi, K. & Salonen, V-P.
 Täydennyskoulutuskeskus. Turun yliopisto. 1996. 181 s. Pohjavesi ja pohjaveden ympäristö. Mälki, E.
 Tammi.1999 304 s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

No

A325604: Geology and Mineralogy Minor, 25 op

Opiskelumuoto: Basic Studies

Laji: Study module

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksovaauksia.

E2

772334A: Bedrock mapping, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion the student should be able to:

- compile a bedrock map
- utilize different source materials in this work.

Contents:

Map materials and coordinate systems, methods of bedrock mapping and geological field work, supervised exercise to produce a bedrock map.

Mode of delivery:

Face to face teaching in the classroom and field

Learning activities and teaching methods:

Lectures 8 h, exercises and field work 32 h

Target group:

Geology major students

Prerequisites and co-requisites:

Courses in petrology and structural geology, basics studies of geosciences

Recommended optional programme components:

-

Assessment methods and criteria:

Compilation of a geological map and its explanation

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest for the Master's degree.

772341A: Igneous Petrology, 7 op

Voimassaolo: 01.01.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Students will be able to describe and classify the main types of igneous rocks in the field, and identify the main rock forming minerals and the textures of the rocks under the microscope. Students also are able to classify basic petrogenetic processes, including partial melting, crystallization, and contamination, and will be able to place igneous rocks into a broad geotectonic framework.

Contents:

The course provides an introduction to the main concepts of Igneous Petrology, including nomenclature, classification, processes of melting and crystallization, and identification of rocks and minerals under the microscope, as well as the distribution of igneous rocks in a global tectonic framework (mid-ocean ridges, subduction zones, continental rifts, oceanic island volcanism, continental anorogenic magmatism). The petrogenesis of the main types of igneous rocks (komatiites, basalts, andesites, dacites- rhyolites, granite family, gabbro-norites, alkaline rocks) will be discussed

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 30 h, microscope and hand specimen practicals 30 h

Target group:

geology majors

Prerequisites and co-requisites:

The required requisite is the completion of the following course: Introduction to optical mineralogy 772339A

Recommended or required reading:

JD Winter (2001) An Introduction to Igneous and Metamorphic Petrology, Prentice Hall, 697p

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fall

Person responsible:

W. Maier

Working life cooperation:

No

*Compulsory***772341A-01: Igneous Petrology, lectures, 0 op**

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Partial credit

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

772341A-02: Igneous Petrology, exercises, 0 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Partial credit

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

772344A: Sedimentary Petrology, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

During the course students will get familiar with the basic concepts of sedimentary rocks and develop a general understanding on their classification and processes of formation. They will know about the major sedimentary structures, major depositional environments and their facies and stratigraphic characteristics and be able to interpret potential sources and transportation mechanisms of sediments based on their macroscopic and microscopic characteristics.

Contents:

Characteristics and classification of sedimentary rocks, their mode of occurrence and processes of formation. Identification of sedimentary rocks and their minerals using microscope.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 20 h, practicals 20 h

Target group:

2nd or 3rd year geosciences students

Prerequisites and co-requisites:

Basic course of mineralogy 771102P, Igneous Petrology 772341A

Recommended optional programme components:

-

Recommended or required reading:

Blatt and Tracy, Petrology: Igneous, sedimentary and metamorphic, Freeman, 2006, 3rd edition.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Written report or examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest during the Master's studies.

772345A: Metamorphic Petrology, 6 op

Voimassaolo: 01.08.2011 - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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:

During the course students will get familiar with the basic concepts of metamorphic rocks and develop a general understanding on their classification and processes of formation. They will know about the major structures of metamorphic rocks and be able identify their minerals and textures based on macroscopic and microscopic characteristics. In addition they will be able to relate their mineralogical and textural observations to the processes that generate different kinds of metamorphic rocks.

Contents:

Metamorphism and factors that control it; metamorphic facies and their textures and occurrences.
Identification of metamorphic rocks and their minerals using microscope.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 26 h, practicals 30 h

Target group:

2nd or 3rd year geoscience students

Prerequisites and co-requisites:

Petrology of sedimentary rocks 772344A

Recommended optional programme components:

-

Recommended or required reading:

Blatt and Tracy, Petrology: Igneous, sedimentary and metamorphic, Freeman, 2006, 3rd edition.
The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Written report or examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest during the Master's studies.

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

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students will be able to describe main rock types and mineral species used technically, and their potential in industry and construction. They can describe quality requirements and testing methods needed for technical use and know the most important natural stone and industrial mineral occurrences in Finland.

Contents:

The most important industrial mineral species and their material properties, methods to measure needed parameters, technical use and sources. Finnish natural stones and their sources. Geological research methods in bedrock construction and technical parameters to be determined from bedrock building targets.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 20 h, ca. 15 page written report on a given topic.

Target group:

Geology major students

Prerequisites and co-requisites:

Basic studies in geology

Recommended optional programme components:

-

Recommended or required reading:

Lecture material and literature that is informed separately

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5/fail.

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

-

772385A: Ore geology, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettaja: Eero Hanski

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

english

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students should have a basic knowledge of the classification of ore deposits and an understanding of igneous, hydrothermal and sedimentary ore-forming processes. Students can identify the main types of ores in the field, perform basic mineralogical characterization of ores, and can formulate a petrogenetic model of ore formation.

Contents:

The course covers ore-forming processes of orthomagmatic, hydrothermal and sedimentary mineral deposits, examples of different ore types, and interpretation of ore forming processes in a plate tectonic context.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures and hand specimen examination 30 h lectures

Target group:

geology majors

Prerequisites and co-requisites:

Igneous petrology (772341A)

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

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

N.N.

Working life cooperation:

No

772335A: Introduction to ore mineralogy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

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 and textures 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. Identification of ore minerals and ore mineral assemblages.

Mode of delivery:

Face to face.

Learning activities and teaching methods:

14 h lectures, 21 h exercises

Target group:

Students specializing in geology and mineralogy.

Prerequisites and co-requisites:

Introduction to ore geology (771108P), Basic mineralogy (771102P) and Optical mineralogy (772339A).

Recommended or required reading:

Craig, J.P. & Vaughan, D.J. Ore Microscopy and Ore Petrography. Wiley & Sons, 1994 2nd ed. 434 p.
 Ramdohr, P.: The Ore Minerals and their Intergrowths, vol. 1. and 2. Pergamon Press, 1980, 1205 p. Spry P.G. & Gedlinski B.L. 1987 Tables for Determination of Common Opaque Minerals. Economic Geology Publishing Co. 52 p. Barnes H.L. 1997 Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd. 992 p.

Nesse W.D. (2012) Introduction to Mineralogy, Oxford University Press. 480 p. Pracejus B. (2008) The ore minerals under the microscope - An optical guide. Atlases in Geosciences 3, Elsevier, 875 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination, lab exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772310A: General mineralogy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

26 h lectures

Target group:

2nd and 3rd year geosciences students

Prerequisites and co-requisites:

Basic course in Mineralogy 771102P

Recommended optional programme components:

Basic Mineralogy 771102P

Recommended or required reading:

Wenk & Bulakh, Minerals: their Constitution and Origin, Cambridge University Press.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest during the Master's studies.

772320A: Tectonics, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, spring semester

Learning outcomes:

The student is able to explain the methods of world tectonic action and influence of these processes on the generation of tectonic structures. He/she is able to use tectonic concepts and can make conclusions on the relationship between the characteristics of different orogens and tectonic evolution.

Contents:

Development of tectonic world view, research methods, Earth's crust and crustal types, mantle and core, activity of the tectonic systems, mantle tectonics, megacycles, divergent plate boundaries, transform belts, island arc systems, convergent systems (collision/accretion) orogeny, passive continental margins, intra-plate tectonics, orogens, exhumation and cratonization.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures, 90 h independent work

Target group:

Bachelor students in geology

Prerequisites and co-requisites:

Basic studies in geology

Recommended optional programme components:

-

Recommended or required reading:

Condie K. C. 1997, Plate tectonics and Crustal Evolution. Butterworth – Heineman, Oxford, 282 s. or Moores, M. E. & Twiss, R. J., 1995, Tectonics, W.H. Freeman and Company, 415 s or R.G. Park, Geological Structures and Moving Plates, 1988, Blackie, Glasgow, 337 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5/ fail.

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

-

A326108: Studies in Surficial Geology, 15 op

Opiskelumuoto: Basic Studies

Laji: Study module

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Peuraniemi, Vesa Juhani

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

E3

773324A: Field mapping of Quaternary deposits, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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:

Upon the completion of the course, the student will be able to produce a Quaternary geology map based on own field data.

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures and exercises in the field

Target group:

Geology students

Prerequisites and co-requisites:

The required pre-requisite is the completion of the following courses prior to enrolling for the course unit: Basic courses in Geology, Physical Sedimentology 773317A, Basics of Glacial Geology 773303A and Technical Properties of Sediments 773316A.

Recommended optional programme components:

No

Recommended or required reading:

No

Assessment methods and criteria:

Participation and quality of the map produced during the mapping course

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

J.P. Lunkka

Working life cooperation:

Ei

773306A: Quaternary Geology of Finland, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Upon completion of the course, students should have acquired knowledge of the Finnish glacial landforms and deglaciation in Finland.

Contents:

The pre-Quaternary landform of Finland; thermomeres and cryomeres 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

2nd or 3rd year geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P

Recommended or required reading:

Koivisto M. 2004: Jääkaudet. WSOY, Helsinki, 233s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773316A: Technical Properties of Sediments, 8 op**Opiskelumuoto:** Intermediate Studies**Laji:** Course**Vastuuysikkö:** Oulu Mining School**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Tiina Eskola**Opintokohteen kielet:** Finnish**ECTS Credits:**

8 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

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: determining consistency and structure of different sediments; determining different mechanical properties of sediments.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 30 h/ group work 60 h/ independent work 90 h.

Target group:

The course unit is aimed primarily at major students

Prerequisites and co-requisites:

Basic studies in geosciences, Surficial geology of Finland (773306A).

Recommended optional programme components:

Exogenic processes (771109P), Field course in surficial geology (773302A), Surficial geology of Finland (773306A)

Recommended or required reading:

A handout. Rantamäki, Jääskeläinen & Tammirinne: Geotekniikka. pp. 31-161, 249-274, Otakustantamo, 1984, Velde.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Students participate actively in teaching, written reports

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/ fail

Person responsible:

T. Eskola

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specializations of Quaternary geology and geoenvironment.

773337A: Biostratigraphy: pollen analyses, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Oppettajat: Tiina Eskola

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students should be able to prepare pollen samples in the laboratory and identify the most common pollen types and spores in Finland.

Contents:

Theory of the pollen analysis and laboratory methods, the most common pollen and spore types, manufacturing preparations, sediment analysis.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 20 h/ exercises 38 h/ independent work 40 h.

Target group:

The course unit is aimed primarily at major students

Prerequisites and co-requisites:

Basic studies in geosciences

Recommended optional programme components:

-

Recommended or required reading:

Bennett, K.D. & Willis, K.J., 2001. Pollen. In: Smol, J.P., Birks, H.J.B., Last, W.M. (eds.). Tracking Environmental Change Using Lake Sediments. Volume 3: Terrestrial, Algal, and Siliceous Indicators. Kluwer, Dordrecht, The Netherlands, pp. 5 - 32. Berglund, B. (ed.). Handbook of Holocene Palaeoecology and Palaeohydrology. Wiley & Sons, 1988, ss. 455-484. Plus class handouts.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Students participate actively in teaching, written report and an examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

T. Eskola

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specialization of Quaternary geology.

773341A: Biostratigraphy: diatom analyses, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tiina Eskola

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students should be able to prepare diatom samples in the laboratory and identify some of the most general diatoms in Finland.

Contents:

Theory of the diatom analysis and laboratory methods, the most general diatom genera and species, manufacturing preparations, sediment analysis.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 22 h/ exercises 42 h/ independent work 30 h.

Target group:

The course unit is aimed primarily at major students

Prerequisites and co-requisites:

Basic studies in geosciences

Recommended optional programme components:

-

Recommended or required reading:

Battarbee, R.W., Jones, V.J., Flower, R.J., Cameron, N.g., Bennion, H., Varvalho, L., Juggins, S., 2001. Diatoms. In: Smol, J.P., Birks, H.J.B., Last, W.M. (eds.). Tracking Environmental Change Using Lake Sediments. Volume 3: Terrestrial, Algal, and Siliceous Indicators. Kluwer, Dordrecht, The Netherlands, pp. 155 - 202. Berglund, B. (ed.) Handbook of Holocene Palaeoecology and Palaeohydrology. Wiley & Sons., 1988, ss. 527-570. Forsström, L. Piikuoriset levät. Opintomoniste, Oulun yliopisto Geotieteiden laitos 1999, 104 p. Plus class handouts.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Students participate actively in teaching, written report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

T. Eskola

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specialization of Quaternary geology.

773322A: Surficial geology in ore exploration, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Upon completion of the course, students should have a basic knowledge of the dispersal of ore boulders and how boulders and till geochemistry are utilized in ore exploration.

Contents:

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

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

2nd or 3rd year geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P, Surficial geology in Finland 773306A, Basics of glacial geology 773303A

Recommended or required reading:

Kujansuu, R. ja Saarnisto, M. (eds.): Glacial Indicator Tracing, A.A. Balkema, 1990, 252 p

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773300A: Quaternary Stratigraphy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Upon the completion of the course, the student will be able to explain the stratigraphical methods used in Quaternary Geology, to discuss stratigraphical issues using basic concepts of stratigraphy. The student will also be able to explain how environments and climate have changed during the Quaternary.

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

26 h lectures

Target group:

Geology students, geography students (pursuing minor in geology)

Prerequisites and co-requisites:

No

Recommended optional programme components:

No

Recommended or required reading:

Ehlers, J.: Quaternary and Glacial Geology. Wiley & Sons, New York. Lowe, J.J. & Walker, M.J.C.: Reconstructing Quaternary Environments, Longman, Hong Kong, 2. ed, 1997. Donner, J.: The Quaternary History of Scandinavia. World and Regional Geology 7. Cambridge University Press, 200 pp. 1995. The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specialization of Quaternary geology.

773331A: Hydrogeology, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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:

Upon the completion of course, the student: 1) knows the basic facts and research methods used in hydrogeology, 2) can define different aquifer types and their relationship to superficial deposits and bedrock-types, 3) can explain the basic principles that govern ground water flow.

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

26 h lectures and exercises

Target group:

Geology students, geography students (pursuing minor in geology)

Prerequisites and co-requisites:

The required pre-requisites is the completion of the following courses prior to enrolling for the course unit:
Physical Sedimentology 773317A, Basics of Glacial Geology 773303A.

Recommended optional programme components:

No

Recommended or required reading:

Grundvatten, Teori & Tillämpning. Knutsson, G. & Morfeldt, C-O. Svensk Byggtjänst. 1993, 304 s.

Maanalaiset vedet - pohjavesigeologian perusteet. Korkka-Niemi, K. & Salonen, V-P.

Täydennyskoulutuskeskus. Turun yliopisto. 1996. 181 s. Pohjavesi ja pohjaveden ympäristö. Mälki, E. Tammi.1999 304 s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

No

A325608: Studies in Geology and Mineralogy, 15 op

Opiskelumuoto: Basic Studies

Laji: Study module

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksolevyauksia.

E4

772334A: Bedrock mapping, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion the student should be able to:

- compile a bedrock map
- utilize different source materials in this work.

Contents:

Map materials and coordinate systems, methods of bedrock mapping and geological field work, supervised exercise to produce a bedrock map.

Mode of delivery:

Face to face teaching in the classroom and field

Learning activities and teaching methods:

Lectures 8 h, exercises and field work 32 h

Target group:

Geology major students

Prerequisites and co-requisites:

Courses in petrology and structural geology, basics studies of geosciences

Recommended optional programme components:

-

Assessment methods and criteria:

Compilation of a geological map and its explanation

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest for the Master's degree.

772341A: Igneous Petrology, 7 op

Voimassaolo: 01.01.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Students will be able to describe and classify the main types of igneous rocks in the field, and identify the main rock forming minerals and the textures of the rocks under the microscope. Students also are able to classify basic petrogenetic processes, including partial melting, crystallization, and contamination, and will be able to place igneous rocks into a broad geotectonic framework.

Contents:

The course provides an introduction to the main concepts of Igneous Petrology, including nomenclature, classification, processes of melting and crystallization, and identification of rocks and minerals under the microscope, as well as the distribution of igneous rocks in a global tectonic framework (mid-ocean ridges, subduction zones, continental rifts, oceanic island volcanism, continental anorogenic magmatism). The petrogenesis of the main types of igneous rocks (komatiites, basalts, andesites, dacites- rhyolites, granite family, gabbronorites, alkaline rocks) will be discussed

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 30 h, microscope and hand specimen practicals 30 h

Target group:

geology majors

Prerequisites and co-requisites:

The required requisite is the completion of the following course: Introduction to optical mineralogy 772339A

Recommended or required reading:

JD Winter (2001) An Introduction to Igneous and Metamorphic Petrology, Prentice Hall, 697p

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fall

Person responsible:

W. Maier

Working life cooperation:

No

Compulsory

772341A-01: Igneous Petrology, lectures, 0 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Partial credit

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

772341A-02: Igneous Petrology, exercises, 0 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Partial credit

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

772344A: Sedimentary Petrology, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

During the course students will get familiar with the basic concepts of sedimentary rocks and develop a general understanding on their classification and processes of formation. They will know about the major sedimentary structures, major depositional environments and their facies and stratigraphic characteristics and be able to interpret potential sources and transportation mechanisms of sediments based on their macroscopic and microscopic characteristics.

Contents:

Characteristics and classification of sedimentary rocks, their mode of occurrence and processes of formation. Identification of sedimentary rocks and their minerals using microscope.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 20 h, practicals 20 h

Target group:

2nd or 3rd year geosciences students

Prerequisites and co-requisites:

Basic course of mineralogy 771102P, Igneous Petrology 772341A

Recommended optional programme components:

-

Recommended or required reading:

Blatt and Tracy, Petrology: Igneous, sedimentary and metamorphic, Freeman, 2006, 3rd edition.
The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Written report or examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest during the Master's studies.

772345A: Metamorphic Petrology, 6 op

Voimassaolo: 01.08.2011 - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyskikkö: Oulu Mining School

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:

During the course students will get familiar with the basic concepts of metamorphic rocks and develop a general understanding on their classification and processes of formation. They will know about the major structures of metamorphic rocks and be able identify their minerals and textures based on macroscopic and microscopic characteristics. In addition they will be able to relate their mineralogical and textural observations to the processes that generate different kinds of metamorphic rocks.

Contents:

Metamorphism and factors that control it; metamorphic facies and their textures and occurrences.

Identification of metamorphic rocks and their minerals using microscope.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 26 h, practicals 30 h

Target group:

2nd or 3rd year geoscience students

Prerequisites and co-requisites:

Petrology of sedimentary rocks 772344A

Recommended optional programme components:

-

Recommended or required reading:

Blatt and Tracy, Petrology: Igneous, sedimentary and metamorphic, Freeman, 2006, 3rd edition.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Written report or examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest during the Master's studies.

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

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students will be able to describe main rock types and mineral species used technically, and their potential in industry and construction. They can describe quality requirements and testing methods needed for technical use and know the most important natural stone and industrial mineral occurrences in Finland.

Contents:

The most important industrial mineral species and their material properties, methods to measure needed parameters, technical use and sources. Finnish natural stones and their sources. Geological research methods in bedrock construction and technical parameters to be determined from bedrock building targets.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 20 h, ca. 15 page written report on a given topic.

Target group:

Geology major students

Prerequisites and co-requisites:

Basic studies in geology

Recommended optional programme components:

-

Recommended or required reading:

Lecture material and literature that is informed separately

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5/fail.

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

-

772385A: Ore geology, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

english

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students should have a basic knowledge of the classification of ore deposits and an understanding of igneous, hydrothermal and sedimentary ore-forming processes. Students can identify the main types of ores in the field, perform basic mineralogical characterization of ores, and can formulate a petrogenetic model of ore formation.

Contents:

The course covers ore-forming processes of orthomagmatic, hydrothermal and sedimentary mineral deposits, examples of different ore types, and interpretation of ore forming processes in a plate tectonic context.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures and hand specimen examination 30 h lectures

Target group:

geology majors

Prerequisites and co-requisites:

Igneous petrology (772341A)

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

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

N.N.

Working life cooperation:

No

772335A: Introduction to ore mineralogy, 5 op**Opiskelumuoto:** Intermediate Studies**Laji:** Course**Vastuuysikkö:** Oulu Mining School**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** English**Voidaan suorittaa useasti:** Kyllä**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 and textures 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. Identification of ore minerals and ore mineral assemblages.

Mode of delivery:

Face to face.

Learning activities and teaching methods:

14 h lectures, 21 h exercises

Target group:

Students specializing in geology and mineralogy.

Prerequisites and co-requisites:

Introduction to ore geology (771108P), Basic mineralogy (771102P) and Optical mineralogy (772339A).

Recommended or required reading:

Craig, J.P. & Vaughan, D.J. Ore Microscopy and Ore Petrography. Wiley & Sons, 1994 2nd ed. 434 p.
 Ramdohr, P.: The Ore Minerals and their Intergrowths, vol. 1. and 2. Pergamon Press, 1980, 1205 p. Spry P.G. & Gedlinski B.L. 1987 Tables for Determination of Common Opaque Minerals. Economic Geology Publishing Co. 52 p. Barnes H.L. 1997 Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd. 992 p.

Nesse W.D. (2012) Introduction to Mineralogy, Oxford University Press. 480 p. Pracejus B. (2008) The ore minerals under the microscope - An optical guide. Atlases in Geosciences 3, Elsevier, 875 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination, lab exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.**Grading:**

1-5/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772310A: General mineralogy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

26 h lectures

Target group:

2nd and 3rd year geosciences students

Prerequisites and co-requisites:

Basic course in Mineralogy 771102P

Recommended optional programme components:

Basic Mineralogy 771102P

Recommended or required reading:

Wenk & Bulakh, Minerals: their Constitution and Origin, Cambridge University Press.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest during the Master's studies.

772320A: Tectonics, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, spring semester

Learning outcomes:

The student is able to explain the methods of world tectonic action and influence of these processes on the generation of tectonic structures. He/she is able to use tectonic concepts and can make conclusions on the relationship between the characteristics of different orogens and tectonic evolution.

Contents:

Development of tectonic world view, research methods, Earth's crust and crustal types, mantle and core, activity of the tectonic systems, mantle tectonics, megacycles, divergent plate boundaries, transform belts, island arc systems, convergent systems (collision/accretion) orogeny, passive continental margins, intra-plate tectonics, orogens, exhumation and cratonization.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures, 90 h independent work

Target group:

Bachelor students in geology

Prerequisites and co-requisites:

Basic studies in geology

Recommended optional programme components:

-

Recommended or required reading:

Condie K. C. 1997, Plate tectonics and Crustal Evolution. Butterworth – Heineman, Oxford, 282 s. or Moores, M. E. & Twiss, R. J., 1995, Tectonics, W.H. Freeman and Company, 415 s or R.G. Park, Geological Structures and Moving Plates, 1988, Blackie, Glasgow, 337 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5/ fail.

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

-

A323702: Studies in Geochemistry, 15 - 100 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Basic Studies

Laji: Study module

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

E5

774329A: Introduction to Environmental Geochemistry, 5 op

Voimassaolo: 01.01.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 credits

Language of instruction:

finnish

Timing:

2nd or 3rd year

Learning outcomes:

The student will acquire knowledge of the physico-chemical processes and factors controlling the dispersion of elements in the surface environments. The will be able to carry out calculations related to hydrogeochemical processes such dissolution/precipitation, solubility of gases, absorption, and metal complex formation.

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures, 12 h computer exercises

Target group:

Geology students interested in environmental issues. The course is also applicable to chemistry or process and environmental technology students.

Prerequisites and co-requisites:

Basic course in geochemistry (774301A)

Recommended or required reading:

Sawyer, C.N., McCarty, P.L, Parkin, G.F., Chemistry for Environmental Engineering and Science, Boston, McGraw-Hill, 2003, s. 1-397 ja Alloway, B. J. (ed.) Heavy Metals in Soils, London, Blackie Academic & Professional, 1995, s. 1-57.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination on theory and calculations as homework

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

E. Hanski

Working life cooperation:

No

774304A: Analytical methods in geochemistry, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures and visit to a laboratory

Target group:

Bachelor or Master level geology students

Prerequisites and co-requisites:

Basic course in geochemistry (774301A)

Recommended or required reading:

Gill, Robin (ed.): Modern analytical geochemistry: an introduction to quantitative chemical analysis for earth, environmental and materials scientists, Harlow, Longman, 1997, 329 p. and Sawyer, C.N., McCarty, P.L., Parkin, G.F.: Chemistry for Environmental Engineering and Science, Boston, McGraw-Hill, 2003, p. 410-451.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

E. Hanski

Working life cooperation:

No

H327030: Studies in Geoenvironment, 15 - 100 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Basic Studies

Laji: Study module

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksovaauksia.

E7

488102A: Hydrological Processes, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field 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

ECTS Credits:

5 cr

Language of instruction:

Finnish, self-study package in English

Timing:

The course unit is held in the spring semester, during periods 4-5 but the self-study package in English can be done in periods 1-6.

Learning outcomes:

After the course, the student understands and can describe the main hydrological processes, water movements and hydraulics phenomenon quantitatively through mathematical methods. The student also understands and quantifies the relation between state and flow with relation to snowmelt, evaporation, infiltration and groundwater flow.

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 of rivers and lakes, open channel flow, flow in pipe systems.

Mode of delivery:

Face-face teaching in Finnish, self-study package in English

Learning activities and teaching methods:

For self-study package course, 4 tutor sessions are arranged during the semester.

Target group:

Students in international programs of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

The course is a prerequisite for Master level studies.

Recommended or required reading:

Physical Hydrology (Dingman SL, 2002, 2nd Edition, ISBN 978-1-57766-561-8), Fluid Mechanics and Hydraulics (Giles, Evett and Liu, 3rd Edition, ISBN 0-07-020509-4)

Assessment methods and criteria:

Both hydrology and hydraulics assignments must be returned and passed with threshold of 50% in order to get final examination. The final grade of the course is weighted average of assignments (80%) and examination (20%).

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Lecturer A-K Ronkanen

Working life cooperation:

No

Other information:

-

773331A: Hydrogeology, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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:

Upon the completion of course, the student: 1) knows the basic facts and research methods used in hydrogeology, 2) can define different aquifer types and their relationship to superficial deposits and bedrock-types, 3) can explain the basic principles that govern ground water flow.

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

26 h lectures and exercises

Target group:

Geology students, geography students (pursuing minor in geology)

Prerequisites and co-requisites:

The required pre-requisites is the completion of the following courses prior to enrolling for the course unit: Physical Sedimentology 773317A, Basics of Glacial Geology 773303A.

Recommended optional programme components:

No

Recommended or required reading:

Grundvatten, Teori & Tillämpning. Knutsson, G. & Morfeldt, C-O. Svensk Byggtjänst. 1993, 304 s.

Maanalaiset vedet - pohjavesigeologian perusteet. Korkka-Niemi, K. & Salonen, V-P.

Täydennyskoulutuskeskus. Turun yliopisto. 1996. 181 s. Pohjavesi ja pohjaveden ympäristö. Mälki, E. Tammi.1999 304 s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

No

488012A: Environmental Legislation, 5 op

Voimassaolo: 01.01.2011 - 31.07.2017

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

488101A Environmental Legislation 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during periods 4-5

Learning outcomes:

Upon completion of the course, the student will be able to explain the main component of Finnish environmental legislation and knows the structure of environmental administration in governmental and municipal level; authorities, jurisdiction and duties. The student will be able to understand differences between EIA and environmental permits. Having completed the course, the student knows what permits and acts must be considered in different cases relating to mining, water and energy initiatives.

Contents:

Environmental Legislation of Finland

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 11 h, seimar 9 h and self-study 115 h. Totally 135 h.

Target group:

Students in bachelor program of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

-

Recommended or required reading:

Ympäristöoikeuden päätökit (Ekroos, Kumpula 2010, ISBN: 9789510361283), lecture notes

Assessment methods and criteria:

Group work (50% of the final grade of the course) and seminar (50%). Seminar includes presentation and discussion.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Lecturer A-K Ronkanen

Working life cooperation:

No

Other information:

-

774329A: Introduction to Environmental Geochemistry, 5 op

Voimassaolo: 01.01.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 credits

Language of instruction:

finnish

Timing:

2nd or 3rd year

Learning outcomes:

The student will acquire knowledge of the physico-chemical processes and factors controlling the dispersion of elements in the surface environments. The will be able to carry out calculations related to hydrogeochemical processes such dissolution/precipitation, solubility of gases, absorption, and metal complex formation.

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures, 12 h computer exercises

Target group:

Geology students interested in environmental issues. The course is also applicable to chemistry or process and environmental technology students.

Prerequisites and co-requisites:

Basic course in geochemistry (774301A)

Recommended or required reading:

Sawyer, C.N., McCarty, P.L, Parkin, G.F., Chemistry for Environmental Engineering and Science, Boston, McGraw-Hill, 2003, s. 1-397 ja Alloway, B. J. (ed.) Heavy Metals in Soils, London, Blackie Academic & Professional, 1995, s. 1-57.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination on theory and calculations as homework

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

E. Hanski

Working life cooperation:

No

477011P: Introduction to Process and Environmental Engineering I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa, Sanna Taskila

Opintokohteen kielet: Finnish

Leikkaavuudet:

470219A Introduction to Process Engineering 3.5 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation during periods 1-3

Learning outcomes:

Objective: To give insight to the whole perspective of process and environmental engineering and to familiarise the students with the terminology involved. The objective is also to outline the connections between process and environmental engineering and other fields closely related to them.

Learning outcomes: After the course, the student can analyse the process and environmental engineering aspects of an industrial process. He/She can, for example, divide the process into unit processes, analyse the process or a chain of processes based on the material balances, identify and evaluate the significance of essential mechanical, chemical and transport phenomena, analyse the control and process design aspects of a process etc. He/She can also evaluate the significance of different aspects of process and environmental engineering to the overall production system when these aspects are further examined in forthcoming courses.

Contents:

The course divides into eight separate themes: 1. Unit processes and material balances. 2. Environmental impacts and their classification. 3. Mechanical phenomena. 4. Momentum, heat and mass transfer phenomena. 5. Chemical reactions and reactors. 6. The possibilities of biological process engineering. 7. Process dynamics and control. 8. Process measurements and measurability.

Mode of delivery:

Contact lectures

Learning activities and teaching methods:

Assignments (8 altogether) carried out in small groups and contact lectures supporting them (16 hours).

Target group:

Bachelor's degree students in the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

None

Recommended optional programme components:

The course serves as an introduction to the studies in process and environmental engineering.

Recommended or required reading:

The material is provided during the contact lectures and through the course webpages. It is expected also that the students seek the material for completing the assignments independently.

Assessment methods and criteria:

The assignments (8 altogether) covering the course themes carried out in small groups.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course utilises a numerical grading scale 1-5 and fail.

Person responsible:

M.Sc. (eng) Aki Sorsa

Working life cooperation:

No.

Other information:

The assessment method utilised requires the attendance in contact lectures from the beginning of the course.

488103A: Environmental Impact Assessment, 4 - 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Björn Klöve

Opintokohteen kielet: English

Leikkaavuudet:

488133A Environmental Impact Assessment 5.0 op

ay488103A Environmental Impact Assessment (OPEN UNI) 5.0 op

480170S Environmental Impact Assesment and Diminishing Harmful Effects in Water Resource Management 5.0 op

ECTS Credits:

4 or 8 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-4

Learning outcomes:

The student will acquire a broad and multidisciplinary and sustainable approach to environmental impact assessment (EIA). The student will know the all steps in EIA process and the different methods used in environmental impact assessment. During the course students develop their working life skills (e.g. writing, communication and presentation skills) and the ability to review environmental problems. They also learn how to resolve extensive environmental projects related problems, causes and consequences.

Contents:

EIA process and legislation, environmental change, principles and assessment methods in ecology, hydrology, economics and social sciences.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The whole course contains lectures 18 or 32 h, independent works (assignments and learning diaries, 90 or 175 h and seminars 0 or 9 h. Totally 108 h or 216 h

Target group:

Master students in the Environmental Engineering study program

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course or to have corresponding knowledge prior to enrolling for the course unit: 488011P Introduction to Environmental Engineering

Recommended optional programme components:

-

Recommended or required reading:

Environmental Impact Assessment: Cutting Edge for the Twenty-First Century (Gilpin A, 1995, ISBN 0-521-42967-6). Lecture hand-outs and other materials delivered in lectures.

Assessment methods and criteria:

The course includes 5 modules, which are evaluated separately (with the scale 1-5). The first module is 4 ECTS credits and it is requisite for next modules. Other modules are 4 ECTS credits including seminar. The final grade of the course is weighted average of modules. Credit points of the modules are used as a weighted factor. Assessment methods of modules vary including learning diaries and different kind of assignments. More information about assessment methods of each module is given during the course. Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Björn Klöve

Working life cooperation:

No

Other information:

The course is arranged in alternate years (even autumn semesters). The course is organised in a co-operation with faculty of Technology, the company Pöyry Finland Oy, and the Thule institute.

031010P: Calculus I, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Lusikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031010P Calculus I (OPEN UNI) 5.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-3.

Learning outcomes:

After completing the course the student identifies concepts of vector algebra and can use vector algebra for solving problems of analytic geometry. The student can also explain basic characteristics of elementary functions and is able to analyse the limit and the continuity of real valued functions of one variable. Furthermore, the student can solve problems associated with differential and integral calculus of real valued functions of one variable.

Contents:

Vector algebra and analytic geometry. Limit, continuity, differential and integral calculus and applications of real valued functions of one variable. Complex numbers.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 55 h / Group work 22 h.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Grossmann, S.I.: Calculus of One Variable; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations (partly); Adams, R.A.: A Complete Course Calculus (partly).

Assessment methods and criteria:

Intermediate exams or a final exam.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Illi Lusikka

Working life cooperation:

-

Other information:

-

488010P: Introduction to Process and Environmental Engineering II, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Fabritius, Timo Matti Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

488011P Introduction to Environmental Engineering 5.0 op

477012P Introduction to Automation Engineering 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation in 4th to 6th periods.

Learning outcomes:

Students can examine industrial processes using the methods and perspectives of process and environmental engineering (e.g. environmental load of processes, use of land and water resources, control and design of processes...) and they recognize the role of different areas of the process and environmental engineering, when these areas are considered in the forthcoming courses.

Contents:

1. Environmental thinking and industrial ecology.
2. Materials in production processes.
3. Water resources and land use.
4. Municipal and industrial water supply.
5. PI diagrams.
6. Process design.
7. Control and operation of processes.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Group exercises and contact-education that supports these exercises. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

None

Recommended optional programme components:

This course is an introduction to the other courses of process and environmental engineering.

Recommended or required reading:

Material will be distributed during lectures and exercises.

Assessment methods and criteria:

Group-exercises. Please note that the course is not organised for the English speaking students.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Failed, 1, 2, 3, 4 and 5.

Person responsible:

professor Timo Fabritius

Working life cooperation:

No.

Other information:

It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

488104A: Industrial and municipal waste management, 5 op

Voimassaolo: 01.08.2005 - 31.07.2017

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisangela Heiderscheidt

Opintokohteen kielet: English

Leikkaavuudet:

480160S Waste Management of Communities and Industry 5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the spring semester, during periods 5-6

Learning outcomes:

The student will acquire a wider view of what is waste and how it is generated and managed in communities and industries. Student will be familiar with waste management hierarchy and how waste legislation regulates waste management. She/he will get basic knowledge about waste treatment methods including their sustainability and related environmental impacts. As well as, how a series of factors influence the planning of waste management activities in industries and municipalities. The student will also be able to understand the energy and material recovery potential within the waste sector.

Contents:

Waste management hierarch, waste prevention principle, municipal waste management, waste management in industries, waste legislation, municipal and industrial waste treatment methods, international treaties related to waste management (Basel convention and Clean Development Mechanism projects: carbon trading), waste to energy principle.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Learning methods: A) Active learning method: Lectures (24 h), group work (45 h), self-study for examination (55,5 h) and field visits (8 h) or alternatively B) Group work (45 h), self-study for examination (87,5 h).

Target group:

Students in bachelor program of environmental engineering

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture hand-outs, notes and other materials delivered in lectures. Waste management: a reference handbook illustrated edition, 2008 (electronic book, ISBN 9781598841510).

Assessment methods and criteria:

The students' performance during the course is assessed by successful completion of stages A and B as follow: A) Completion of the course work which consists of group exercises 1 and 2 each carrying 30% weight in the course final grade; B) Course examination carrying 40% weight in the course final grade (Note that a passing grade (1-5) for the course examination is required for the completion of the course). Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Reseacher Elisangela Heiderschedt

Working life cooperation:

No

Other information:

-

H327031: Studies in Process and environmental engineering, 15 - 100 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Basic Studies

Laji: Study module

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

E8

488012A: Environmental Legislation, 5 op

Voimassaolo: 01.01.2011 - 31.07.2017

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

488101A Environmental Legislation 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during periods 4-5

Learning outcomes:

Upon completion of the course, the student will be able to explain the main component of Finnish environmental legislation and knows the structure of environmental administration in governmental and municipal level; authorities, jurisdiction and duties. The student will be able to understand differences between EIA and environmental permits. Having completed the course, the student knows what permits and acts must be considered in different cases relating to mining, water and energy initiatives.

Contents:

Environmental Legislation of Finland

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 11 h, seminar 9 h and self-study 115 h. Totally 135 h.

Target group:

Students in bachelor program of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

-

Recommended or required reading:

Ympäristöoikeuden pääpiirteet (Ekroos, Kumpula 2010, ISBN: 9789510361283), lecture notes

Assessment methods and criteria:

Group work (50% of the final grade of the course) and seminar (50%). Seminar includes presentation and discussion.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Lecturer A-K Ronkanen

Working life cooperation:

No

Other information:

-

477011P: Introduction to Process and Environmental Engineering I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa, Sanna Taskila

Opintokohteen kielet: Finnish

Leikkaavuudet:

470219A Introduction to Process Engineering 3.5 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation during periods 1-3

Learning outcomes:

Objective: To give insight to the whole perspective of process and environmental engineering and to familiarise the students with the terminology involved. The objective is also to outline the connections between process and environmental engineering and other fields closely related to them.

Learning outcomes: After the course, the student can analyse the process and environmental engineering aspects of an industrial process. He/She can, for example, divide the process into unit processes, analyse the process or a chain of processes based on the material balances, identify and evaluate the significance of essential mechanical, chemical and transport phenomena, analyse the control and process design aspects of a process etc. He/She can also evaluate the significance of different aspects of process and environmental engineering to the overall production system when these aspects are further examined in forthcoming courses.

Contents:

The course divides into eight separate themes: 1. Unit processes and material balances. 2. Environmental impacts and their classification. 3. Mechanical phenomena. 4. Momentum, heat and mass transfer phenomena. 5. Chemical reactions and reactors. 6. The possibilities of biological process engineering. 7. Process dynamics and control. 8. Process measurements and measurability.

Mode of delivery:

Contact lectures

Learning activities and teaching methods:

Assignments (8 altogether) carried out in small groups and contact lectures supporting them (16 hours).

Target group:

Bachelor's degree students in the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

None

Recommended optional programme components:

The course serves as an introduction to the studies in process and environmental engineering.

Recommended or required reading:

The material is provided during the contact lectures and through the course webpages. It is expected also that the students seek the material for completing the assignments independently.

Assessment methods and criteria:

The assignments (8 altogether) covering the course themes carried out in small groups.
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course utilises a numerical grading scale 1-5 and fail.

Person responsible:

M.Sc. (eng) Aki Sorsa

Working life cooperation:

No.

Other information:

The assessment method utilised requires the attendance in contact lectures from the beginning of the course.

477101A: Particle Technology, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ari Ämmälä

Opintokohteen kielet: Finnish

Leikkaavuudet:

477121A Particle Technology 5.0 op

470101A Mechanical Process Engineering I 5.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish

Timing:

Implementation in period 4.

Learning outcomes:

Upon completion of the course, a student should be able to identify the mainline mechanical processes enhancing the degree of upgrading, as well as recovery operations related to those mechanical main processes. The student is able to identify the equipments related to the mechanical processes and can explain their purpose of use and their operational principles.

Contents:

Granular material and sampling, particle size and particle size distribution, specific surface area, basics in grinding, crushing, sieving and mineral concentration, froth flotation, mineral concentration methods based on density difference, magnetic concentration and other concentration methods, granulation, separation from suspensions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises.

Target group:

Bachelor students in process and environmental engineering

Prerequisites and co-requisites:

Introduction to Process Engineering 477011P

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

Exam.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

0-5

Person responsible:

Education coordinator

Working life cooperation:

No

Other information:

Literature exam possible for foreign students.

031010P: Calculus I, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Lusikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031010P Calculus I (OPEN UNI) 5.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-3.

Learning outcomes:

After completing the course the student identifies concepts of vector algebra and can use vector algebra for solving problems of analytic geometry. The student can also explain basic characteristics of elementary functions and is able to analyse the limit and the continuity of real valued functions of one variable. Furthermore, the student can solve problems associated with differential and integral calculus of real valued functions of one variable.

Contents:

Vector algebra and analytic geometry. Limit, continuity, differential and integral calculus and applications of real valued functions of one variable. Complex numbers.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 55 h / Group work 22 h.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Grossmann, S.I.: Calculus of One Variable; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations (partly); Adams, R.A.: A Complete Course Calculus (partly).

Assessment methods and criteria:

Intermediate exams or a final exam.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Ilikka Lusikka

Working life cooperation:

-

Other information:

-

488010P: Introduction to Process and Environmental Engineering II, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Fabritius, Timo Matti Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

488011P Introduction to Environmental Engineering 5.0 op

477012P Introduction to Automation Engineering 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation in 4th to 6th periods.

Learning outcomes:

Students can examine industrial processes using the methods and perspectives of process and environmental engineering (e.g. environmental load of processes, use of land and water resources, control and design of processes...) and they recognize the role of different areas of the process and environmental engineering, when these areas are considered in the forthcoming courses.

Contents:

1. Environmental thinking and industrial ecology. 2. Materials in production processes. 3. Water resources and land use. 4. Municipal and industrial water supply. 5. PI diagrams. 6. Process design. 7. Control and operation of processes.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Group exercises and contact-education that supports these exercises. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

None

Recommended optional programme components:

This course is an introduction to the other courses of process and environmental engineering.

Recommended or required reading:

Material will be distributed during lectures and exercises.

Assessment methods and criteria:

Group-exercises. Please note that the course is not organised for the English speaking students.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Failed, 1, 2, 3, 4 and 5.

Person responsible:

professor Timo Fabritius

Working life cooperation:

No.

Other information:

It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

488103A: Environmental Impact Assessment, 4 - 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Björn Klöve

Opintokohteen kielet: English

Leikkaavuudet:

488133A Environmental Impact Assessment 5.0 op

ay488103A Environmental Impact Assessment (OPEN UNI) 5.0 op

480170S Environmental Impact Assesment and Diminishing Harmful Effects in Water Resource Management 5.0 op

ECTS Credits:

4 or 8 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-4

Learning outcomes:

The student will acquire a broad and multidisciplinary and sustainable approach to environmental impact assessment (EIA). The student will know the all steps in EIA process and the different methods used in environmental impact assessment. During the course students develop their working life skills (e.g. writing, communication and presentation skills) and the ability to review environmental problems. They also learn how to resolve extensive environmental projects related problems, causes and consequences.

Contents:

EIA process and legislation, environmental change, principles and assessment methods in ecology, hydrology, economics and social sciences.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The whole course contains lectures 18 or 32 h, independent works (assignments and learning diaries, 90 or 175 h and seminars 0 or 9 h. Totally 108 h or 216 h

Target group:

Master students in the Environmental Engineering study program

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course or to have corresponding knowledge prior to enrolling for the course unit: 488011P Introduction to Environmental Engineering

Recommended optional programme components:

-

Recommended or required reading:

Environmental Impact Assessment: Cutting Edge for the Twenty-First Century (Gilpin A, 1995, ISBN 0-521-42967-6). Lecture hand-outs and other materials delivered in lectures.

Assessment methods and criteria:

The course includes 5 modules, which are evaluated separately (with the scale 1-5). The first module is 4 ECTS credits and it is requisite for next modules. Other modules are 4 ECTS credits including seminar. The final grade of the course is weighted average of modules. Credit points of the modules are used as a weighted factor. Assessment methods of modules vary including learning diaries and different kind of assignments. More information about assessment methods of each module is given during the course. Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Björn Klöve

Working life cooperation:

No

Other information:

The course is arranged in alternate years (even autumn semesters). The course is organised in a co-operation with faculty of Technology, the company Pöyry Finland Oy, and the Thule institute.

772334A: Bedrock mapping, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion the student should be able to:

- compile a bedrock map
- utilize different source materials in this work.

Contents:

Map materials and coordinate systems, methods of bedrock mapping and geological field work, supervised exercise to produce a bedrock map.

Mode of delivery:

Face to face teaching in the classroom and field

Learning activities and teaching methods:

Lectures 8 h, exercises and field work 32 h

Target group:

Geology major students

Prerequisites and co-requisites:

Courses in petrology and structural geology, basics studies of geosciences

Recommended optional programme components:**Assessment methods and criteria:**

Compilation of a geological map and its explanation

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest for the Master's degree.

772310A: General mineralogy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

26 h lectures

Target group:

2nd and 3rd year geosciences students

Prerequisites and co-requisites:

Basic course in Mineralogy 771102P

Recommended optional programme components:

Basic Mineralogy 771102P

Recommended or required reading:

Wenk & Bulakh, Minerals: their Constitution and Origin, Cambridge University Press.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest during the Master's studies.

772341A: Igneous Petrology, 7 op

Voimassaolo: 01.01.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Students will be able to describe and classify the main types of igneous rocks in the field, and identify the main rock forming minerals and the textures of the rocks under the microscope. Students also are able to classify basic petrogenetic processes, including partial melting, crystallization, and contamination, and will be able to place igneous rocks into a broad geotectonic framework.

Contents:

The course provides an introduction to the main concepts of Igneous Petrology, including nomenclature, classification, processes of melting and crystallization, and identification of rocks and minerals under the microscope, as well as the distribution of igneous rocks in a global tectonic framework (mid-ocean ridges, subduction zones, continental rifts, oceanic island volcanism, continental anorogenic magmatism). The petrogenesis of the main types of igneous rocks (komatiites, basalts, andesites, dacites- rhyolites, granite family, gabbronrites, alkaline rocks) will be discussed

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 30 h, microscope and hand specimen practicals 30 h

Target group:

geology majors

Prerequisites and co-requisites:

The required requisite is the completion of the following course: Introduction to optical mineralogy 772339A

Recommended or required reading:

JD Winter (2001) An Introduction to Igneous and Metamorphic Petrology, Prentice Hall, 697p

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fall

Person responsible:

W. Maier

Working life cooperation:

No

Compulsory

772341A-01: Igneous Petrology, lectures, 0 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Partial credit

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

772341A-02: Igneous Petrology, exercises, 0 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Partial credit

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

772335A: Introduction to ore mineralogy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

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 and textures 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. Identification of ore minerals and ore mineral assemblages.

Mode of delivery:

Face to face.

Learning activities and teaching methods:

14 h lectures, 21 h exercises

Target group:

Students specializing in geology and mineralogy.

Prerequisites and co-requisites:

Introduction to ore geology (771108P), Basic mineralogy (771102P) and Optical mineralogy (772339A).

Recommended or required reading:

Craig, J.P. & Vaughan, D.J. Ore Microscopy and Ore Petrography. Wiley & Sons, 1994 2nd ed. 434 p. Ramdohr, P.: The Ore Minerals and their Intergrowths, vol. 1. and 2. Pergamon Press, 1980, 1205 p. Spry P.G. & Gedlinski B.L. 1987 Tables for Determination of Common Opaque Minerals. Economic Geology Publishing Co. 52 p. Barnes H.L. 1997 Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd. 992 p.

Nesse W.D. (2012) Introduction to Mineralogy, Oxford University Press. 480 p. Pracejus B. (2008) The ore minerals under the microscope - An optical guide. Atlases in Geosciences 3, Elsevier, 875 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination, lab exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772345A: Metamorphic Petrology, 6 op

Voimassaolo: 01.08.2011 - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuyksikkö: Oulu Mining School

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:

During the course students will get familiar with the basic concepts of metamorphic rocks and develop a general understanding on their classification and processes of formation. They will know about the major structures of metamorphic rocks and be able identify their minerals and textures based on macroscopic and microscopic characteristics. In addition they will be able to relate their mineralogical and textural observations to the processes that generate different kinds of metamorphic rocks.

Contents:

Metamorphism and factors that control it; metamorphic facies and their textures and occurrences. Identification of metamorphic rocks and their minerals using microscope.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 26 h, practicals 30 h

Target group:

2nd or 3rd year geoscience students

Prerequisites and co-requisites:

Petrology of sedimentary rocks 772344A

Recommended optional programme components:

-

Recommended or required reading:

Blatt and Tracy, Petrology: Igneous, sedimentary and metamorphic, Freeman, 2006, 3rd edition.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Written report or examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest during the Master's studies.

772385A: Ore geology, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

english

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students should have a basic knowledge of the classification of ore deposits and an understanding of igneous, hydrothermal and sedimentary ore-forming processes. Students can identify the main types of ores in the field, perform basic mineralogical characterization of ores, and can formulate a petrogenetic model of ore formation.

Contents:

The course covers ore-forming processes of orthomagmatic, hydrothermal and sedimentary mineral deposits, examples of different ore types, and interpretation of ore forming processes in a plate tectonic context.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures and hand specimen examination 30 h lectures

Target group:

geology majors

Prerequisites and co-requisites:

Igneous petrology (772341A)

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

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

N.N.

Working life cooperation:

No

772344A: Sedimentary Petrology, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tuisku

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

During the course students will get familiar with the basic concepts of sedimentary rocks and develop a general understanding on their classification and processes of formation. They will know about the major sedimentary structures, major depositional environments and their facies and stratigraphic characteristics and be able to interpret potential sources and transportation mechanisms of sediments based on their macroscopic and microscopic characteristics.

Contents:

Characteristics and classification of sedimentary rocks, their mode of occurrence and processes of formation. Identification of sedimentary rocks and their minerals using microscope.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 20 h, practicals 20 h

Target group:

2nd or 3rd year geosciences students

Prerequisites and co-requisites:

Basic course of mineralogy 771102P, Igneous Petrology 772341A

Recommended optional programme components:

-

Recommended or required reading:

Blatt and Tracy, Petrology: Igneous, sedimentary and metamorphic, Freeman, 2006, 3rd edition.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Written report or examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

P. Tuisku

Working life cooperation:

No

Other information:

This course is obligatory for students having geology and mineralogy as their major subject and needs to be done latest during the Master's studies.

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

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students will be able to describe main rock types and mineral species used technically, and their potential in industry and construction. They can describe quality requirements and testing methods needed for technical use and know the most important natural stone and industrial mineral occurrences in Finland.

Contents:

The most important industrial mineral species and their material properties, methods to measure needed parameters, technical use and sources. Finnish natural stones and their sources. Geological research methods in bedrock construction and technical parameters to be determined from bedrock building targets.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 20 h, ca. 15 page written report on a given topic.

Target group:

Geology major students

Prerequisites and co-requisites:

Basic studies in geology

Recommended optional programme components:

-

Recommended or required reading:

Lecture material and literature that is informed separately

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5/fail.

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

-

772320A: Tectonics, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, spring semester

Learning outcomes:

The student is able to explain the methods of world tectonic action and influence of these processes on the generation of tectonic structures. He/she is able to use tectonic concepts and can make conclusions on the relationship between the characteristics of different orogens and tectonic evolution.

Contents:

Development of tectonic world view, research methods, Earth's crust and crustal types, mantle and core, activity of the tectonic systems, mantle tectonics, megacycles, divergent plate boundaries, transform belts, island arc systems, convergent systems (collision/accretion) orogeny, passive continental margins, intra-plate tectonics, orogens, exhumation and cratonization.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures, 90 h independent work

Target group:

Bachelor students in geology

Prerequisites and co-requisites:

Basic studies in geology

Recommended optional programme components:

-

Recommended or required reading:

Condie K. C. 1997, Plate tectonics and Crustal Evolution. Butterworth – Heineman, Oxford, 282 s. or Moores, M. E. & Twiss, R. J., 1995, Tectonics, W.H. Freeman and Company, 415 s or R.G. Park, Geological Structures and Moving Plates, 1988, Blackie, Glasgow, 337 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5/ fail.

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

-

772338A: Work practice II, 4 - 5 op

Opiskelumuoto: Intermediate Studies

Laji: Practical training

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

Finnish/English

Timing:

2nd or 3rd year summer

Learning outcomes:

Students will get familiar with geologists' duties in real-world situations and can assess the development of their own expertise during the training.

Contents:

Practical training accomplished under the guidance of a qualified geologist in Finland or abroad. 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.

Mode of delivery:

Attending work life.

Learning activities and teaching methods:

A period of 1.5 to 3 month of practical work in a company or research institute, written report.

Target group:

Students majoring in geology.

Assessment methods and criteria:

A written report on the training work.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Professor Eero Hanski

Working life cooperation:

Yes.

Other information:

Can be included in the Master's degree.

773341A: Biostratigraphy: diatom analyses, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tiina Eskola

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students should be able to prepare diatom samples in the laboratory and identify some of the most general diatoms in Finland.

Contents:

Theory of the diatom analysis and laboratory methods, the most general diatom genera and species, manufacturing preparations, sediment analysis.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 22 h/ exercises 42 h/ independent work 30 h.

Target group:

The course unit is aimed primarily at major students

Prerequisites and co-requisites:

Basic studies in geosciences

Recommended optional programme components:

-

Recommended or required reading:

Battarbee, R.W., Jones, V.J., Flower, R.J., Cameron, N.g., Bennion, H., Varvalho, L., Juggins, S., 2001. Diatoms. In: Smol, J.P., Birks, H.J.B., Last, W.M. (eds.). Tracking Environmental Change Using Lake Sediments. Volume 3: Terrestrial, Algal, and Siliceous Indicators. Kluwer, Dordrecht, The Netherlands, pp. 155 - 202. Berglund, B. (ed.) Handbook of Holocene Palaeoecology and Palaeohydrology. Wiley & Sons., 1988, ss. 527-570. Forsström, L. Piikuoriset levät. Opintomoniste, Oulun yliopisto Geotieteiden laitos 1999, 104 p. Plus class handouts.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Students participate actively in teaching, written report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

T. Eskola

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specialization of Quaternary geology.

773337A: Biostratigraphy: pollen analyses, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tiina Eskola

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

Learning outcomes:

Upon completion of the course, students should be able to prepare pollen samples in the laboratory and identify the most common pollen types and spores in Finland.

Contents:

Theory of the pollen analysis and laboratory methods, the most common pollen and spore types, manufacturing preparations, sediment analysis.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 20 h/ exercises 38 h/ independent work 40 h.

Target group:

The course unit is aimed primarily at major students

Prerequisites and co-requisites:

Basic studies in geosciences

Recommended optional programme components:

-

Recommended or required reading:

Bennett, K.D. & Willis, K.J., 2001. Pollen. In: Smol, J.P., Birks, H.J.B., Last, W.M. (eds.). Tracking Environmental Change Using Lake Sediments. Volume 3: Terrestrial, Algal, and Siliceous Indicators. Kluwer, Dordrecht, The Netherlands, pp. 5 - 32. Berglund, B. (ed.). Handbook of Holocene Palaeoecology and Palaeohydrology. Wiley & Sons, 1988, ss. 455-484. Plus class handouts.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Students participate actively in teaching, written report and an examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

T. Eskola

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specialization of Quaternary geology.

773324A: Field mapping of Quaternary deposits, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

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:

Upon the completion of the course, the student will be able to produce a Quaternary geology map based on own field data.

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures and exercises in the field

Target group:

Geology students

Prerequisites and co-requisites:

The required pre-requisite is the completion of the following courses prior to enrolling for the course unit: Basic courses in Geology, Physical Sedimentology 773317A, Basics of Glacial Geology 773303A and Technical Properties of Sediments 773316A.

Recommended optional programme components:

No

Recommended or required reading:

No

Assessment methods and criteria:

Participation and quality of the map produced during the mapping course

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

J.P. Lunkka

Working life cooperation:

Ei

773331A: Hydrogeology, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

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:

Upon the completion of course, the student: 1) knows the basic facts and research methods used in hydrogeology, 2) can define different aquifer types and their relationship to superficial deposits and bedrock-types, 3) can explain the basic principles that govern ground water flow.

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

26 h lectures and exercises

Target group:

Geology students, geography students (pursuing minor in geology)

Prerequisites and co-requisites:

The required pre-requisites is the completion of the following courses prior to enrolling for the course unit: Physical Sedimentology 773317A, Basics of Glacial Geology 773303A.

Recommended optional programme components:

No

Recommended or required reading:

Grundvatten, Teori & Tillämpning. Knutsson, G. & Morfeldt, C-O. Svensk Byggtjänst. 1993, 304 s. Maanalaiset vedet - pohjavesigeologian perusteet. Korkka-Niemi, K. & Salonen, V-P. Täydennyskoulutuskeskus. Turun yliopisto. 1996. 181 s. Pohjavesi ja pohjaveden ympäristö. Mälkki, E. Tammi.1999 304 s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

No

773306A: Quaternary Geology of Finland, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Upon completion of the course, students should have acquired knowledge of the Finnish glacial landforms and deglaciation in Finland.

Contents:

The pre-Quaternary landform of Finland; thermomeres and cryomeres 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

2nd or 3rd year geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P

Recommended or required reading:

Koivisto M. 2004: Jääkaudet. WSOY, Helsinki, 233s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773300A: Quaternary Stratigraphy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Upon the completion of the course, the student will be able to explain the stratigraphical methods used in Quaternary Geology, to discuss stratigraphical issues using basic concepts of stratigraphy. The student will also be able to explain how environments and climate have changed during the Quaternary.

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

26 h lectures

Target group:

Geology students, geography students (pursuing minor in geology)

Prerequisites and co-requisites:

No

Recommended optional programme components:

No

Recommended or required reading:

Ehlers, J.: Quaternary and Glacial Geology. Wiley & Sons, New York. Lowe, J.J. & Walker, M.J.C.: Reconstructing Quaternary Environments, Longman, Hong Kong, 2. ed, 1997. Donner, J.: The Quaternary History of Scandinavia. World and Regional Geology 7. Cambridge University Press, 200 pp. 1995.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specialization of Quaternary geology.

773322A: Surficial geology in ore exploration, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Upon completion of the course, students should have a basic knowledge of the dispersal of ore boulders and how boulders and till geochemistry are utilized in ore exploration.

Contents:

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

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

2nd or 3rd year geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P, Surficial geology in Finland 773306A, Basics of glacial geology 773303A

Recommended or required reading:

Kujansuu, R. ja Saarnisto, M. (eds.): Glacial Indicator Tracing, A.A. Balkema, 1990, 252 p

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773316A: Technical Properties of Sediments, 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tiina Eskola

Opintokohteen kielet: Finnish

ECTS Credits:

8 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year, autumn semester

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: determining consistency and structure of different sediments; determining different mechanical properties of sediments.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures 30 h/ group work 60 h/ independent work 90 h.

Target group:

The course unit is aimed primarily at major students

Prerequisites and co-requisites:

Basic studies in geosciences, Surficial geology of Finland (773306A).

Recommended optional programme components:

Exogenic processes (771109P), Field course in surficial geology (773302A), Surficial geology of Finland (773306A)

Recommended or required reading:

A handout. Rantamäki, Jääskeläinen & Tammirinne: Geotekniikka. pp. 31-161, 249-274, Otakustantamo, 1984, Velde.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Students participate actively in teaching, written reports

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/ fail

Person responsible:

T. Eskola

Working life cooperation:

No

Other information:

The course must be completed latest during the Master studies in the specializations of Quaternary geology and geoenvironment.

773345A: Work practice 2, 4 - 5 op

Opiskelumuoto: Intermediate Studies

Laji: Practical training

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

finnish/english

Timing:

2nd or later year (normally as summer work)

Learning outcomes:

Students will get familiar with geologists' duties in real-world situations and can assess the development of their own expertise during the training.

Contents:

Practical training accomplished under the guidance of a qualified geologist in Finland or abroad. 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.

Mode of delivery:

Attending work life under the guidance of a qualified geologist

Learning activities and teaching methods:

A period of 1.5 to 3 month of practical work in a company or research institute, written report

Target group:

All geology students

Recommended or required reading:

Evaluated case by case

Assessment methods and criteria:

a written report on the training work

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

professor

Working life cooperation:

yes

Other information:

Only one practical training (771304A) is compulsory to and valid for the Bachelor degree. The second one (773345A) can be included in the Master's degree.

A325603: Geology and Mineralogy, advanced studies, 60 - 85 op

Opiskelumuoto: Advanced Studies

Laji: Study module

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

engl/

772671S: Magmatic ore deposits, 7 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Shenghong Yang

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

After completion of the course students should have a knowledge of the occurrence of the most important magmatic ore deposits, including PGE- Ni-Cu, Cr, V-Ti, apatite, and diamond deposits. Students are familiar with the geology, and can comprehend the petrogenesis, of the main Finnish and global magmatic mineral deposits, including the deposits at Kemi (Cr), Portimo and Penikat (PGE), and Kevitsa (Ni-Cu-PGE), Mustavaara (Fe-Ti-V) and Otanmäki (Fe-Ti-V) as well as global deposits including the Bushveld (PGE, Cr, V), Pechenga (Ni), Monchegorsk (PGE), Noril'sk (Ni-Cu-PGE), Sudbury (Ni), Kambalda (Ni), Jinhuan (Ni-Cu-PGE) and Panzhihua (Fe-Ti-V). Students will thus have gained an improved capability to contribute to exploration for magmatic ore deposits in Finland.

Contents:

Global distribution, geology and petrogenesis of magmatic ore deposits.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 30 h, handspecimen examination, microscopy sessions and exploration modeling.

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Igneous Petrology (772341A).

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Li C and Ripley EM (2011) Magmatic Ni-Cu and PGE deposits: geology, geochemistry, and genesis.

Reviews in Economic Geology, vol. 17, Society of Economic Geologists

Hedenquist JW et al. (2005) Economic Geology 100th Anniversary volume, Society of Economic Geologists, 1136 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Sheng-Hong Yang

Working life cooperation:

No

772672S: Hydrothermal ore deposits, 7 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyskikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tobias Weisenberger

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

: Hydrothermal ore deposits are ore deposits that are formed in the presence of fluids. Thereby, fluids play a significant role in ore formation, whether in its interaction with the metal source, as transport medium, and consequently during trapping of the metals. Thereby the physics and chemistry of fluids are relevant to the basic understanding of hydrothermal solutions, hydrothermal processes, and systems.

The aim of this course is to teach the fundamental physical and chemical aspects of hydrothermal processes, covering the aspects of metal source and leaching, transport, and trapping. Thereby, a basic knowledge in physics and chemistry is required.

Especially in fossil hydrothermal system the hydrothermal fluids are not any more present. Therefore, geoscientist use several methods to get information about the paleo-fluid from secondary phases, like fluid inclusion analysis, stable isotope geochemistry, and from modeling aqueous systems from solid phases.

During the course we will get familiar with the basics of these significant techniques.

Different geotectonic and hydrological environments form different types of hydrothermal ore deposits. In the course, we will cover the fundamental characteristics and formation process of the major hydrothermal ore deposits, like VMS-, porphyry-, skarn-, MVT-, orogenic-gold- and epithermal deposits.

Contents:

Petrogenesis of hydrothermal ore deposits.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 26 h, lab exercises (incl. hand specimen examination, microscopy practicals and modeling) 10 h.

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Ore geology (772385A), Igneous Petrology (772341A), Metamorphic petrology (772345A), Introduction to ore mineralogy (772335A).

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

- Pirajno F. (2009) Hydrothermal Processes and Mineral Systems. Springer, 1250 p.
 Robb L. (2005) Introduction to Ore-Forming Processes. Wiley-Blackwell Publishing, 373 p.
 Pohl W.L. (2011) Economic Geology: Principles and Practice. Wiley-Blackwell Publishing, 662 p.
 Barnes H.L. (1997) Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd ed., 992 p.
 Drever J. (1997) The Geochemistry of Natural Waters: Surface and Groundwater Environments. Prentice Hall, Indiana, 436 p.
 Hagemann S.G. & Brown P.E. (2000) Gold in 2000. Reviews in Economic Geology 13, SEG 559 p.
 Barrie C.T. & Hannington M.D. (1998) Volcanic-associated massive sulfide deposits: process and examples in modern and ancient settings. Reviews in Economic Geology 8, SEG 417 p.
 Richards J.P. & Larson P.B. (1998) Techniques in Hydrothermal Ore Deposits Geology. Reviews in Economic Geology 10, SEG 264 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination, lab exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772674S: Sedimentary ore deposits, 7 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tobias Weisenberger

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course the students should know the distribution and petrogenesis of the main sedimentary ore deposits.

Contents:

Global distribution and petrogenesis of sedimentary ore deposits, including Witwatersrand gold- placer-, BIF-, SEDEX-, SSC-, laterite-, MVT-, hydrocarbon-deposits.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 26 h, lab exercises (incl. hand specimen examination, microscopy practicals and modeling) 10 h.

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Sedimentary petrology (772344A), Ore geology (772385A), Igneous petrology (772341A), Metamorphic petrology (772345A), Introduction to ore mineralogy (772335S).

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Robb L. (2005) Introduction to Ore-Forming Processes. Wiley-Blackwell Publishing, 373 p.

Pohl W.L. (2011) Economic Geology: Principles and Practice. Wiley-Blackwell Publishing, 662 p.

Barnes H.L. (1997) Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd ed., 992 p.

Drever J. (1997) The Geochemistry of Natural Waters: Surface and Groundwater Environments. Prentice Hall, Indiana, 436 p.

Hagemann S.G. & Brown P.E. (2000) Gold in 2000. Reviews in Economic Geology 13, SEG 559 p.

Force E.R., Eidel J.J. & Maynard J.B. (1991) Sedimentary and diagenetic Mineral deposits: A Basin and analysis approach to exploration. Reviews in Economic Geology 5, SEG 214 p.

Leeder M. (2012) Sedimentology and Sedimentary Basins – From Turbulence to Tectonics. Wiley Blackwell, 768 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination, lab exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772675S: Geophysics in economic geology, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Elena Kozlovskaya

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

The students comprehend the main techniques used in exploration geophysics and have become familiar with a number of case studies. They should be able to interpret basic geophysical data and their importance in target evaluation.

Contents:

Geophysical methods in exploration and their use in exploration targeting.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures, data interpretation practicals.

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Bachelor's degree.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

- Reynolds, J.M. (2011) An Introduction to Applied and Environmental Geophysics, Wiley-Blackwell
 Everett M.E., 2013. Near-Surface Applied Geophysics. Cambridge University Press.
 Kearey, P., Brooks, M., Hill, I., 2002. An Introduction to Geophysical Exploration. Blackwell Science.
 Geophysical methods, in: Moon et al. (2009) Introduction to Mineral Exploration, Blackwell
 Reynolds, J.M. (2011) An Introduction to Applied and Environmental Geophysics, Wiley-Blackwell
 Everett M.E., 2013. Near-Surface Applied Geophysics. Cambridge University Press.
 Kearey, P., Brooks, M., Hill, I., 2002. An Introduction to Geophysical Exploration. Blackwell Science.
 Geophysical methods, in: Moon et al. (2009) Introduction to Mineral Exploration, Blackwell
 The availability of the literature can be checked from "[this link](#)".

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Elena Kozlovskaya

Working life cooperation:

No

Other information:

-

772682S: Applied Field Techniques in Economic Geology, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pertti Sarala

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Students will be able to describe and classify the different dispersion processes of the chemical elements in different glacigenic environments. They are able to choose the most appropriate sampling and analysis

methods to carry out an early ('greenfield') exploration program. They will learn to collect and handle different sample materials, to choose correct handling/assay methods, and appreciate the importance of diligent data collection, data entry and follow-up desktop work. Students will learn to synthesise and apply knowledge from discipline-based courses to identify and creatively solve problems that require decision making in the field. Learnt skills are easily adaptable to scientific field studies.

Contents:

This multidisciplinary course focus on (i) sampling and survey techniques commonly used in generative greenfield exploration campaigns in the glaciated terrains under cover and (ii) understanding of geochemistry and the use of surficial deposits in ore exploration. The importance of understanding the regional geological framework is a major theme during the course. The dispersion mechanisms of elements in different glaciated environments are described. The use of geophysical survey methods and the fine fraction and heavy minerals of surficial deposits are included in the course contents.

Mode of delivery:

Intensive face to face field course.

Learning activities and teaching methods:

40 h (lectures, group work), 10 h self-study. The exercises are completed as group work. The independent work is done before course by reading related key papers. Five hours of group work is done after course by compiling a short exploration report.

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Bachelor's degree. Recommended prior courses include completion of one or more of the following courses: 772385A Ore geology, 772632S Regional ore geology of Fennoscandia, 772671S Magmatic ore deposits, 772672S Hydrothermal ore deposits, 772674S Sedimentary ore deposits, 773303A Basics of glacial geology, 773322A Surficial geology in ore exploration.

Recommended or required reading:

Rose, Hawkes & Webb: Geochemistry in Mineral Exploration. Academic Press. G.J.S. Govett (Ed.): Handbook of Exploration Geochemistry, volumes 1-6. Elsevier.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Marko Holma, Pertti Sarala

Working life cooperation:

No

Other information:

To test student's capability to adapt for quick game rule changes, additional reading recommendations, such as few scientific papers, are given shortly prior the course.

772632S: Regional ore geology of Fennoscandia, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

After the course students should have an understanding of the occurrence and petrogenesis of the most important ore deposits in Fennoscandia, and their main analogues in a global context. Students will thus have gained an improved capability to contribute to mineral exploration in Finland.

Contents:

Factors that control temporal and spatial distribution of ores, with particular focus on Finnish and Fennoscandian ore deposits, including the Finnish VMS (Pyhäsalmi, Outokumpu), chromite (Kemi), PGE (Portimo, Penikat, Konttijärvi), vanadium (Mustavaara, Koitelainen), Fe (Kolari district, Otanmäki), gold (Suurikuusikko, Pahtavaara, Pampalo), and Ni deposits (Kevitsa, Talvivaara, Vammala-Kotalahti belt), the Swedish Kiruna and Skelefteå districts, the Pechenga deposit of Russia, and the Norwegian Fe-Ti deposits.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 30 h, handspecimen examination

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Ore Geology (772385A), Igneous Petrology (772341A), Metamorphic Petrology (772345A), Introduction to Ore Mineralogy (772335A).

Recommended optional programme components:

Other modules of the International Master programme.

Recommended or required reading:

Lehtinen et al., 2005, Precambrian Geology of Finland, Elsevier (Developments in Precambrian Geology).
 Vanecek, M. (ed.) Mineral Deposits of the world. Elsevier Science, 1994, 520 p. Hutchison, Ch.S.: Economic deposits and their tectonic setting. Wiley & Sons, Inc., New York, 1983, 365 p. Sawkins, F.J.: Metal deposits in relation to plate tectonics. 2nd ed., SpringerVerlag, 461 p., and other selected readings.

Eilu P (Ed.) (2012) Mineral deposits and metallogeny of Fennoscandia . Geological Survey of Finland, Special Paper 53. 401 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

N.N.

Working life cooperation:

No

772687S: Gold deposits, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

The students know the distribution of the major gold deposits, they comprehend the main models of ore formation, and can formulate criteria relevant in exploration for the various types of gold deposits.

Contents:

Distribution and petrogenesis of gold deposits globally.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 30h

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Ore geology (772385A), Igneous petrology (772341A), Metamorphic petrology (772345A), Optical mineralogy (772339A), Introduction to ore mineralogy (772335A).

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Pirajno F. (2009) Hydrothermal Processes and Mineral Systems. Springer, 1250 p.

Robb L. (2005) Introduction to Ore-Forming Processes. Wiley-Blackwell Publishing, 373 p.

Pohl W.L. (2011) Economic Geology: Principles and Practice. Wiley-Blackwell Publishing, 662 p.

Barnes H.L. (1997) Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd ed., 992 p.

Hagemann S.G. & Brown P.E. (2000) Gold in 2000. Reviews in Economic Geology 13, SEG 559 p.

Richards J.P. & Larson P.B. (1998) Techniques in Hydrothermal Ore Deposits Geology. Reviews in Economic Geology 10, SEG 264 p.

Pirajno F. (2009) Hydrothermal Processes and Mineral Systems. Springer, 1250 p.

Robb L. (2005) Introduction to Ore-Forming Processes. Wiley-Blackwell Publishing, 373 p.

Pohl W.L. (2011) Economic Geology: Principles and Practice. Wiley-Blackwell Publishing, 662 p.

Barnes H.L. (1997) Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd ed., 992 p.

Hagemann S.G. & Brown P.E. (2000) Gold in 2000. Reviews in Economic Geology 13, SEG 559 p.

Richards J.P. & Larson P.B. (1998) Techniques in Hydrothermal Ore Deposits Geology. Reviews in Economic Geology 10, SEG 264 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination, student presentation, project assignment.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772631S: Archean Geology, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Students will have gathered a thorough understanding of the geology and mineral deposits of Archean terranes in Fennoscandia and are able to draw comparisons to Archean terranes elsewhere in the world. Students understand the origins of life on the planet, and implications on geological processes.

Contents:

Evolution of the Earth's early crust, associated mineralisation processes, and emergence of life. Particular focus is placed on Fennoscandia, Kaapvaal, Yilgarn, Pilbara, Superior, and Greenland.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures, given by staff of Oulu University and selected invited speakers.

Target group:

Masters and PhD students in Geology.

Prerequisites and co-requisites:

Structural geology (772316A), Igneous Petrology (772341A), Metamorphic Petrology (772345S)
Sedimentary Petrology (772344A), Ore geology (772385A).

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Lehtinen et al., 2005, Precambrian Geology of Finland, Elsevier (Developments in Precambrian Geology).
Windley BF, 1995, The evolving continents, John Wiley and Sons.

"The availability of the literature can be checked from [this link](#) ."

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

N.N.

Working life cooperation:

No

772628S: Layered intrusions and their ore deposits, 5 op

Voimassaalo: 01.08.2009 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettaja: Shenghong Yang
Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

By the end of this course , students should have an understanding of the origin of igneous layering, the processes that control the generation and emplacement of the magmas, and the formation of the ore deposits associated with layered intrusions. Students will be able to compare layered igneous bodies to the world's main layered intrusions (notably Bushveld Complex, Great Dyke, Stillwater Complex, Skaergaard Monchegorsk and Panzhihua) in terms of stratigraphy, petrogenesis and mineralization potential. In particular, students will be able to assess the economic potential of Finnish layered intrusions.

Contents:

Layered intrusions in space and time, mineralogy, petrology, stratigraphy and ore-forming processes in layered intrusions. Examination of rock textures and mineralogy under the microscope and exploration modeling.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures, 12h practicals

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Igneous petrology (772341A), Ore geology (772385A)

Recommended optional programme components:

Other modules of International Master programme.

Recommended or required reading:

Cawthorn, R.G.: Layered Intrusions. Elsevier, 1996, 531 p., Parsons, I. (ed.): Origins of Igneous Layering. NATO ASI series, Series C, Mathematical and physical sciences; vol. 196. D. Reitels Publishing Company, Dordrecht, Holland, 1987.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Sheng-Hong Yang

Working life cooperation:

No

774637S: Isotope geochemistry for economic geologists, 6 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: English

ECTS Credits:

6 credits

Language of instruction:

Finnish/English

Timing:

4th or 5th year

Learning outcomes:

After completing the course, students can interpret and assess geological literature where isotopes have been utilized. They are able to calculate the ages of rocks using given isotope measurements of different isotopic systems and based on isotopic ratios, can make inferences on the origin of different rock types including ore deposits.

Contents:

Mechanisms of radioactive disintegration; mass spectrometry; different radiogenic and stable isotope systems (e.g., Rb-Sr, Sm-Nd, Re-Os, Lu-Hf, Sm-Nd and U-Pb and Pb-Pb; S and C isotopes); examples of the use of isotopes in the research of ore deposits.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

32 h lectures, 16 h computer exercises

Target group:

Advanced level geology and mineralogy students

Prerequisites and co-requisites:

Basic course in geochemistry 774301A

Recommended or required reading:

Faure, G.: Principles of Isotope Geology. 2nd ed., J. Wiley & Sons, New York, 1986, pp. 1-423. Dickin, A. P.: Radiogenic Isotope Geology, 2nd ed., Cambridge University Press, 2005, 492 p. Journal articles given during the course.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination on theory/essay and calculations as homework.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

E. Hanski

Working life cooperation:

No

772683S: Structural geology for economic geologists, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Upon completion the course, students should be able to carry out structural geological observation, to identify and describe different structural elements. In addition, they are able to use needed statistical methods and analyze structural data. They can exploit computer-aided methods in structural interpretation and are able to perform structural interpretation based on given source data.

Contents:

Methods of geometrical analysis, structural geological data and data management, projections and diagrams, practical strain analysis, fold shape analysis, petrographic identification of pervasive structural elements, regional fold and fault systems, structural geological maps and structural interpretation.

Mode of delivery:

Face to face teaching in the classroom and field.

Learning activities and teaching methods:

Lectures 8 h, field practicals 32 h, exercises 40 h and writing a report.

Target group:

Master students in geology and mineralogy.

Prerequisites and co-requisites:

Structural geology (772316A), Digital modelling and geological information systems in geosciences (771302A) or corresponding knowledge and intermediate studies for the Bachelor's degree.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

McClay: The Mapping of Geological Structures. 1991. Open University Press, Milton Keynes, 168 s.
 Rowland: Structural Analysis and Synthesis. 1986. Blackwell Sci. Publ. 208 s. Lisle: Geological Strain Analysis. 1985. Pergamon Press. 99 s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

N.N.

Working life cooperation:

No

Other information:

-

772667S: Seminar in ore geology, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 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. Students will be able to summarize the geology and petrogenesis of selected ore deposits and present these data to a specialist audience.

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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Independent literature studies, oral presentations by students, seminars c. 20 h

Target group:

Masters and PhD students.

Prerequisites and co-requisites:

Bachelor's degree.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Journal papers and Eilu P (Ed.) (2012) **Mineral deposits and metallogeny of Fennoscandia**. Geological Survey of Finland, Special Paper 53. 401 p

The availability of the literature can be checked from "[this link](#)".

Assessment methods and criteria:

Oral presentation and acting as an opponent.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772694S: Geometallurgy and mineral processing, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pertti Lamberg

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course students should be able to: 1) Describe the principles of different areas of geometallurgy (ore geology, process mineralogy, minerals processing, modeling and simulation) and how they are linked in a geometallurgical concept. 2) Use different research and analytical methods of importance for geometallurgy and interpret the results. 3) Evaluate, analyze and interpret the geometallurgical data in a quantitative way. 4) Design a geometallurgical sampling, analysis and research campaign. 5) Design a geometallurgical program.

Contents:

The course will give an introduction to main parts of the geometallurgy: 1) ore geology, 2) geostatistics, 3) process mineralogy, 4) minerals processing and 5) modeling and simulation. The main focus is put in process mineralogy, mineral processing and in assimilating the geometallurgical concept. Exercises, assignments and seminars concentrate on practical aspects of geometallurgy needed in mining industry.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures and PC classes with assignments (attending a serious game) 15 h, laboratory work 10 h, seminars 8 h.

Target group:

geology majors

Prerequisites and co-requisites:

Ore geology (772385A), Ore microscopy (772335A). Other modules in the International Master course.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Petruk, W., 2000. Applied Mineralogy in the Mining Industry, Elsevier Science B.V., Amsterdam.

Will, B. & Napier-Munn, T., 2006. Wills' Mineral Processing Technology, Elsevier Science & Technology Books, ISBN: 0750644508.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Laboratory classes, participation of the game, geometallurgical investigations (for the seminar) and the seminars are compulsory. Laboratory reports, seminars, the investigation and the opposition are each awarded points based on the attained level. Assignments and reports must be delivered in time or there will be an automatic deduction of points. The total points production determines the grand grade of the course, and it is given on the scale Fail-1-5.

- For grade 1, the student must be able to describe different parts and procedures of geometallurgy and to conduct a routine geometallurgical analysis.
- For grade 2, the student must be able to collect geometallurgical data and perform an analysis with interpretation.
- For grade 3 the student must be able to evaluate and interpret geometallurgical data provided by different analytical and research techniques and to report the results.
- For grade 4, the student must be able to design geometallurgical campaign, interpret the result and establish a geometallurgical program.
- For grade 5, the student must be able to apply the acquired skills to a new geometallurgical case, interpret, report and present the results and to defend the conclusions.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Pertti Lamberg

Working life cooperation:

No

772608S: Mining geology, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay772608S Mining geology (OPEN UNI) 3.0 op

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Students learn practical aspects of the work of mining geologists. Students will be equipped to perform the basic tasks of mining geology.

Contents:

Lectures on various aspects of mining, underground and surface visits to mining operations and processing plant, excercises including logging and GIS applications. The course will be arranged with an industry partner. Previous partners include Pyhäsalmi Cu-Zn mine and Suurikuusikko gold mine.

Mode of delivery:

Face to face on a mine site.

Learning activities and teaching methods:

40 h lectures, mine visits and exercises.

Target group:

Master students in geology.

Prerequisites and co-requisites:

Hydrothermal Ore Deposits (772672S), Magmatic Ore Deposits (772671S). Recommended optional programme components: Other module in International Master course.

Recommended optional programme components:

Other courses in International Master course.

Recommended or required reading:

Will be given on site.

Assessment methods and criteria:

Report.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772640S: Excursion, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

The objective is to widen the student's field experience. Through exposure to novel geologic environments, students will have learnt to appreciate the diversity of geologic processes and environments on Earth.

Contents:

Introduction to Finnish or foreign geological field targets. Excursions typically last 1-2 weeks and consist of visits to field outcrops, as well as discussion of exposed structures and rocks. Past excursions went to Finland, Spain, South Africa, and Norway. Planned excursions include Germany-Poland, Scotland-Ireland, the Canary Islands, Cyprus, Italy, and Morocco.

Mode of delivery:

Face to face in field or mine.

Learning activities and teaching methods:

Pre-excursion seminar, field techniques, excursion.

Target group:

Master students and PhD students in geology.

Recommended optional programme components:

Other modules in International Master programme.

Recommended or required reading:

Reading will be informed separately depending on excursion destination.

Assessment methods and criteria:

Pre-excursion seminar, field protocol.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

774636S: Geochemistry of Mining Environment, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

28 h lectures

Target group:

Geology students interested in environmental issues. The course is also applicable to chemistry or process and environmental technology students.

Prerequisites and co-requisites:

Prerequisite for geology students Basic course in geochemistry (774301A). Also recommended Introduction to environmental geochemistry (774329A).

Recommended or required reading:

Jambor, J. L., Blawes, D. W., Ritchie, A. I. M. (Eds.) Environmental Aspects of Mine Wastes, Mineralogical Association of Canada, Short Course Series, Vol. 31, 2003, 430 s., Plumlee, G.S., Longsdon, M.J. (Eds.) The Environmental Geochemistry of Mineral Deposits. Reviews in Economic Geology, 1999, Vol. 6A.
The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

examination/essay

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

E. Hanski

Working life cooperation:

No

772613S: Bedrock geology of Finland, 6 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

ECTS Credits:

6 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

After the course student should have a good overview of the Finnish Precambrian bedrock and its evolution through time.

Contents:

The main geological units of the Finnish bedrock as part of the evolution of the Fennoscandian Shield. Magmatism, sedimentology and metamorphism and geochronology. Emphasis on Paleoproterozoic rocks (there is a separate course on Archean bedrock).

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 40 h

Target group:

Master's and PhD students in geology.

Prerequisites and co-requisites:

Studies equivalent to Bachelor's degree.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Lehtinen, M., Nurmi, P. ja Rämö, T., 2005. Precambrian Geology of Finland. Elsevier, 736 s
Additional material delivered during the course.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination/Essay

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

E. Hanski

Working life cooperation:

No

772658S: Special issues in geology and mineralogy, 1 - 9 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 credits.

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

The objective of the course is to provide the students with knowledge on the current developments in a special topic in geology and mineralogy. The students will have gained a deeper understanding of specific aspects of the subject.

Contents:

A course on a current topic given by a staff member or outside lecturer. Topics include economic geology, petrology, and mineralogy

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures and 10 h practical work consisting of examination of rock samples, maps or working with digital data.

Target group:

Masters and PhD students in geology

Prerequisites and co-requisites:

Bachelor in geology

Recommended or required reading:

Will be informed separately.

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

W. Maier

Working life cooperation:

No

772684S: GIS applications, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year, spring semester

Learning outcomes:

The student is able to utilize GIS systems in geological research and he/she can perform needed geoinformation analyses and modeling using 2D and 3D methods.

Contents:

Digital 2D modeling methods, GIS analysis, 3D modeling methods.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 8 h, demonstrations and exercises 32 h.

Target group:

Geology major students

Prerequisites and co-requisites:

A basic course in GIS applications

Recommended optional programme components:

-

Recommended or required reading:

Lecture material and literature that is informed separately

Assessment methods and criteria:

Skills test

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

-

773679S: Studies in other universities, 0 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

Varies depending on the original course

Contents:

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

Assessment methods and criteria:

Read more about [assessment criteria](#) at the University of Oulu webpage.

Person responsible:

Professor responsible of the subject in question

772614S: Workshop in bedrock mapping, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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, spring semester

Learning outcomes:

Upon completion of the course, students will be able to carry out geological bedrock mapping and produce geological maps using computer-aided methods. They are familiar with the map production methods used in Finnish research organizations.

Contents:

A two-week field work-dominated mapping project in cooperation with students from other universities and staff from the Geological Survey of Finland. Compilation of a geological map.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

12 h lectures, a field course with 68 h of demonstrations and a written report

Target group:

geology majors students

Prerequisites and co-requisites:

Most of the intermediate courses in geology

Recommended optional programme components:

-

Recommended or required reading:

Geological literature of the mapping area. Will be informed separately for each course.

Assessment methods and criteria:

Active participation in the field work and a written work report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass /fail

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

The main part of the course consists of a field work component organized by the Geological Survey of Finland.

772615S: Literature study, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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 writing of an essay on a given theme.

Mode of delivery:

Independent work and personal tuition

Learning activities and teaching methods:

see above

Recommended or required reading:

Will be informed separately.

Assessment methods and criteria:

a report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass /fail

Person responsible:

Eero Hanski, Wolfgang Maier

Working life cooperation:

No

773615S: Studia Generalia -lectures, 2 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

2 credits

Language of instruction:

Finnish/English

Timing:

4. or 5. year

Learning outcomes:

Students will acquire information on the current duties and special fields of geologists working in different sectors of the society and they will learn to gather the most essential points from lectures.

Contents:

Students attend lectures given by external visitors having different types of careers as geologists.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Attendance of at least four lectures.

Target group:

All intermediate- and advanced-level geology students

Recommended or required reading:

Material presented during lectures

Assessment methods and criteria:

circa 2-page reports on each lecture

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Seija Roman

Working life cooperation:

No

772666S: Master's thesis, 30 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

35 credits

Language of instruction:

finnish / english

Timing:

5th year

Learning outcomes:

Upon completing a Master's thesis, students will gain advanced understanding on a subject belonging to one of the four specializations: economic geology, Quaternary geology, geoenvironment, and mining and exploration. They will be able to use and apply pertinent research methods and theoretical knowledge of their research field, make independent inferences from their observations and measurements, and utilize effectively scientific literature.

Learning activities and teaching methods:

Students carry out a personal research project, which is normally based field and/or laboratory work, and they write a Master's thesis (pro gradu) on the results. The topic of the thesis is agreed with the supervisor from the department and with other potential internal or external supervisors. Personal guidance is given by the supervisor(s) during the research and writing stage. The official reviewers of the thesis are decided by the chair of the educational programme board of the department after the proposal of the professor of the discipline and the thesis is accepted and rated by the educational programme board.

Target group:

All advanced-level geology students

Prerequisites and co-requisites:

Sufficient amount of intermediate- and advanced-level courses to enable the student to start independent research work

Recommended or required reading:

Is decided separately in each case.

Assessment methods and criteria:

Thesis

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/Fail

Person responsible:

professors, lecturers

Working life cooperation:

Yes (commonly)

770690S: Maturity test, 0 op**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuuksikkö:** Oulu Mining School**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish**ECTS Credits:**

0 credits

Language of instruction:

English

Timing:

5th year

Learning outcomes:

The student can write an informative abstract on his/her M.Sc. thesis.

Contents:

The student describes and analyses the material, research methods, and results of his/her M.Sc. thesis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Independent work

Target group:

Compulsory for all M.Sc. students in geosciences.

Prerequisites and co-requisites:

Written after the completion of the M.Sc. thesis.

Recommended optional programme components:

No alternative course units.

Recommended or required reading:

No reading

Assessment methods and criteria:

Written abstract, which must fit on a single page. It is written on a separate form and is accepted by the study programme committee of the department.

Read more about [assessment criteria](#) at the University of Oulu webpage.**Grading:**

pass/fail

Person responsible:

Professors

Working life cooperation:

No

A325603: Geology and Mineralogy, advanced studies, 60 - 85 op**Opiskelumuoto:** Advanced Studies**Laji:** Study module**Vastuuuksikkö:** Oulu Mining School**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish**Voidaan suorittaa useasti:** Kyllä

Ei opintojaksokuvauksia.

engl/

772671S: Magmatic ore deposits, 7 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Shenghong Yang

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

After completion of the course students should have a knowledge of the occurrence of the most important magmatic ore deposits, including PGE- Ni-Cu, Cr, V-Ti, apatite, and diamond deposits. Students are familiar with the geology, and can comprehend the petrogenesis, of the main Finnish and global magmatic mineral deposits, including the deposits at Kemi (Cr), Portimo and Penikat (PGE), and Kevitsa (Ni-Cu-PGE), Mustavaara (Fe-Ti-V) and Otammäki (Fe-Ti-V) as well as global deposits including the Bushveld (PGE, Cr, V), Pechenga (Ni), Monchegorsk (PGE), Noril'sk (Ni-Cu-PGE), Sudbury (Ni), Kambalda (Ni), Jinhuan (Ni-Cu-PGE) and Panzhihua (Fe-Ti-V). Students will thus have gained an improved capability to contribute to exploration for magmatic ore deposits in Finland.

Contents:

Global distribution, geology and petrogenesis of magmatic ore deposits.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 30 h, handspecimen examination, microscopy sessions and exploration modeling.

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Igneous Petrology (772341A).

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Li C and Ripley EM (2011) Magmatic Ni-Cu and PGE deposits: geology, geochemistry, and genesis.

Reviews in Economic Geology, vol. 17, Society of Economic Geologists

Hedenquist JW et al. (2005) Economic Geology 100th Anniversary volume, Society of Economic Geologists, 1136 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Sheng-Hong Yang

Working life cooperation:

No

772672S: Hydrothermal ore deposits, 7 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tobias Weisenberger

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

: Hydrothermal ore deposits are ore deposits that are formed in the presence of fluids. Thereby, fluids play a significant role in ore formation, whether in its interaction with the metal source, as transport medium, and consequently during trapping of the metals. Thereby the physics and chemistry of fluids are relevant to the basic understanding of hydrothermal solutions, hydrothermal processes, and systems.

The aim of this course is to teach the fundamental physical and chemical aspects of hydrothermal processes, covering the aspects of metal source and leaching, transport, and trapping. Thereby, a basic knowledge in physics and chemistry is required.

Especially in fossil hydrothermal system the hydrothermal fluids are not any more present. Therefore, geoscientist use several methods to get information about the paleo-fluid from secondary phases, like fluid inclusion analysis, stable isotope geochemistry, and from modeling aqueous systems from solid phases. During the course we will get familiar with the basics of these significant techniques.

Different geotectonic and hydrological environments form different types of hydrothermal ore deposits. In the course, we will cover the fundamental characteristics and formation process of the major hydrothermal ore deposits, like VMS-, porphyry-, skarn-, MVT-, orogenic-gold- and epithermal deposits.

Contents:

Petrogenesis of hydrothermal ore deposits.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 26 h, lab exercises (incl. hand specimen examination, microscopy practicals and modeling) 10 h.

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Ore geology (772385A), Igneous Petrology (772341A), Metamorphic petrology (772345A), Introduction to ore mineralogy (772335A).

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Pirajno F. (2009) Hydrothermal Processes and Mineral Systems. Springer, 1250 p.

Robb L. (2005) Introduction to Ore-Forming Processes. Wiley-Blackwell Publishing, 373 p.

Pohl W.L. (2011) Economic Geology: Principles and Practice. Wiley-Blackwell Publishing, 662 p.

- Barnes H.L. (1997) Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd ed., 992 p.
- Drever J. (1997) The Geochemistry of Natural Waters: Surface and Groundwater Environments. Prentice Hall, Indiana, 436 p.
- Hagemann S.G. & Brown P.E. (2000) Gold in 2000. Reviews in Economic Geology 13, SEG 559 p.
- Barrie C.T. & Hannington M.D. (1998) Volcanic-associated massive sulfide deposits: process and examples in modern and ancient settings. Reviews in Economic Geology 8, SEG 417 p.
- Richards J.P. & Larson P.B. (1998) Techniques in Hydrothermal Ore Deposits Geology. Reviews in Economic Geology 10, SEG 264 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination, lab exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772674S: Sedimentary ore deposits, 7 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tobias Weisenberger

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course the students should know the distribution and petrogenesis of the main sedimentary ore deposits.

Contents:

Global distribution and petrogenesis of sedimentary ore deposits, including Witwatersrand gold- placer-, BIF-, SEDEX-, SSC-, laterite-, MVT-, hydrocarbon-deposits.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 26 h, lab exercises (incl. hand specimen examination, microscopy practicals and modeling) 10 h.

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Sedimentary petrology (772344A), Ore geology (772385A), Igneous petrology (772341A), Metamorphic petrology (772345A), Introduction to ore mineralogy (772335S).

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

- Robb L. (2005) Introduction to Ore-Forming Processes. Wiley-Blackwell Publishing, 373 p.
 Pohl W.L. (2011) Economic Geology: Principles and Practice. Wiley-Blackwell Publishing, 662 p.
 Barnes H.L. (1997) Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd ed., 992 p.
 Drever J. (1997) The Geochemistry of Natural Waters: Surface and Groundwater Environments. Prentice Hall, Indiana, 436 p.
 Hagemann S.G. & Brown P.E. (2000) Gold in 2000. Reviews in Economic Geology 13, SEG 559 p.
 Force E.R., Eidel J.J. & Maynard J.B. (1991) Sedimentary and diagenetic Mineral deposits: A Basin and analysis approach to exploration. Reviews in Economic Geology 5, SEG 214 p.
 Leeder M. (2012) Sedimentology and Sedimentary Basins – From Turbulence to Tectonics. Wiley Blackwell, 768 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination, lab exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772675S: Geophysics in economic geology, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Elena Kozlovskaya

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

The students comprehend the main techniques used in exploration geophysics and have become familiar with a number of case studies. They should be able to interpret basic geophysical data and their importance in target evaluation.

Contents:

Geophysical methods in exploration and their use in exploration targeting.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures, data interpretation practicals.

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Bachelor's degree.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Reynolds, J.M. (2011) An Introduction to Applied and Environmental Geophysics, Wiley-Blackwell
Everett M.E., 2013. Near-Surface Applied Geophysics. Cambridge University Press.

Kearey, P., Brooks, M., Hill, I., 2002. An Introduction to Geophysical Exploration. Blackwell Science.
Geophysical methods, in: Moon et al. (2009) Introduction to Mineral Exploration, Blackwell

Reynolds, J.M. (2011) An Introduction to Applied and Environmental Geophysics, Wiley-Blackwell
Everett M.E., 2013. Near-Surface Applied Geophysics. Cambridge University Press.

Kearey, P., Brooks, M., Hill, I., 2002. An Introduction to Geophysical Exploration. Blackwell Science.
Geophysical methods, in: Moon et al. (2009) Introduction to Mineral Exploration, Blackwell

The availability of the literature can be checked from "[this link](#)".

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Elena Kozlovskaya

Working life cooperation:

No

Other information:

-

772682S: Applied Field Techniques in Economic Geology, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pertti Sarala

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Students will be able to describe and classify the different dispersion processes of the chemical elements in different glaciogenic environments. They are able to choose the most appropriate sampling and analysis methods to carry out an early ('greenfield') exploration program. They will learn to collect and handle different sample materials, to choose correct handling/assay methods, and appreciate the importance of diligent data collection, data entry and follow-up desktop work. Students will learn to synthesise and apply knowledge from discipline-based courses to identify and creatively solve problems that require decision making in the field. Learnt skills are easily adaptable to scientific field studies.

Contents:

This multidisciplinary course focus on (i) sampling and survey techniques commonly used in generative greenfield exploration campaigns in the glaciated terrains under cover and (ii) understanding of geochemistry and the use of surficial deposits in ore exploration. The importance of understanding the regional geological framework is a major theme during the course. The dispersion mechanisms of elements in different glaciated environments are described. The use of geophysical survey methods and the fine fraction and heavy minerals of surficial deposits are included in the course contents.

Mode of delivery:

Intensive face to face field course.

Learning activities and teaching methods:

40 h (lectures, group work), 10 h self-study. The exercises are completed as group work. The independent work is done before course by reading related key papers. Five hours of group work is done after course by compiling a short exploration report.

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Bachelor's degree. Recommended prior courses include completion of one or more of the following courses: 772385A Ore geology, 772632S Regional ore geology of Fennoscandia, 772671S Magmatic ore deposits, 772672S Hydrothermal ore deposits, 772674S Sedimentary ore deposits, 773303A Basics of glacial geology, 773322A Surficial geology in ore exploration.

Recommended or required reading:

Rose, Hawkes & Webb: Geochemistry in Mineral Exploration. Academic Press. G.J.S. Govett (Ed.): Handbook of Exploration Geochemistry, volumes 1-6. Elsevier.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Marko Holma, Pertti Sarala

Working life cooperation:

No

Other information:

To test student's capability to adapt for quick game rule changes, additional reading recommendations, such as few scientific papers, are given shortly prior the course.

772632S: Regional ore geology of Fennoscandia, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

After the course students should have an understanding of the occurrence and petrogenesis of the most important ore deposits in Fennoscandia, and their main analogues in a global context. Students will thus have gained an improved capability to contribute to mineral exploration in Finland.

Contents:

Factors that control temporal and spatial distribution of ores, with particular focus on Finnish and Fennoscandian ore deposits, including the Finnish VMS (Pyhäsalmi, Outokumpu), chromite (Kemi), PGE (Portimo, Penikat, Kontijärvi), vanadium (Mustavaara, Koitelainen), Fe (Kolari district, Otanmäki), gold (Suurikuusikko, Pahtavaara, Pampalo), and Ni deposits (Kevitsa, Talvivaara, Vammala-Kotalahti belt), the Swedish Kiruna and Skelefteå districts, the Pechenga deposit of Russia, and the Norwegian Fe-Ti deposits.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 30 h, hand specimen examination

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Ore Geology (772385A), Igneous Petrology (772341A), Metamorphic Petrology (772345A), Introduction to Ore Mineralogy (772335A).

Recommended optional programme components:

Other modules of the International Master programme.

Recommended or required reading:

Lehtinen et al., 2005, Precambrian Geology of Finland, Elsevier (Developments in Precambrian Geology). Vanecek, M. (ed.) Mineral Deposits of the world. Elsevier Science, 1994, 520 p. Hutchison, Ch.S.: Economic deposits and their tectonic setting. Wiley & Sons, Inc., New York, 1983, 365 p. Sawkins, F.J.: Metal deposits in relation to plate tectonics. 2nd ed., SpringerVerlag, 461 p., and other selected readings.

Eilu P (Ed.) (2012) Mineral deposits and metallogeny of Fennoscandia . Geological Survey of Finland, Special Paper 53. 401 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

N.N.

Working life cooperation:

No

772687S: Gold deposits, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

The students know the distribution of the major gold deposits, they comprehend the main models of ore formation, and can formulate criteria relevant in exploration for the various types of gold deposits.

Contents:

Distribution and petrogenesis of gold deposits globally.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 30h

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Ore geology (772385A), Igneous petrology (772341A), Metamorphic petrology (772345A), Optical mineralogy (772339A), Introduction to ore mineralogy (772335A).

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Pirajno F. (2009) Hydrothermal Processes and Mineral Systems. Springer, 1250 p.

Robb L. (2005) Introduction to Ore-Forming Processes. Wiley-Blackwell Publishing, 373 p.

Pohl W.L. (2011) Economic Geology: Principles and Practice. Wiley-Blackwell Publishing, 662 p.

Barnes H.L. (1997) Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd ed., 992 p.

Hagemann S.G. & Brown P.E. (2000) Gold in 2000. Reviews in Economic Geology 13, SEG 559 p.

Richards J.P. & Larson P.B. (1998) Techniques in Hydrothermal Ore Deposits Geology. Reviews in Economic Geology 10, SEG 264 p.

Pirajno F. (2009) Hydrothermal Processes and Mineral Systems. Springer, 1250 p.

Robb L. (2005) Introduction to Ore-Forming Processes. Wiley-Blackwell Publishing, 373 p.

Pohl W.L. (2011) Economic Geology: Principles and Practice. Wiley-Blackwell Publishing, 662 p.

Barnes H.L. (1997) Geochemistry of Hydrothermal Ore Deposits. John Wiley & Sons, Inc., New York, 3rd ed., 992 p.

Hagemann S.G. & Brown P.E. (2000) Gold in 2000. Reviews in Economic Geology 13, SEG 559 p.

Richards J.P. & Larson P.B. (1998) Techniques in Hydrothermal Ore Deposits Geology. Reviews in Economic Geology 10, SEG 264 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination, student presentation, project assignment.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772631S: Archean Geology, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Students will have gathered a thorough understanding of the geology and mineral deposits of Archean terranes in Fennoscandia and are able to draw comparisons to Archean terranes elsewhere in the world. Students understand the origins of life on the planet, and implications on geological processes.

Contents:

Evolution of the Earth's early crust, associated mineralisation processes, and emergence of life. Particular focus is placed on Fennoscandia, Kaapvaal, Yilgarn, Pilbara, Superior, and Greenland.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures, given by staff of Oulu University and selected invited speakers.

Target group:

Masters and PhD students in Geology.

Prerequisites and co-requisites:

Structural geology (772316A), Igneous Petrology (772341A), Metamorphic Petrology (772345S)
Sedimentary Petrology (772344A), Ore geology (772385A).

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Lehtinen et al., 2005, Precambrian Geology of Finland, Elsevier (Developments in Precambrian Geology).
Windley BF, 1995, The evolving continents, John Wiley and Sons.

"The availability of the literature can be checked from [this link](#) ."

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

N.N.

Working life cooperation:

No

772628S: Layered intrusions and their ore deposits, 5 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Shenghong Yang

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

By the end of this course , students should have an understanding of the origin of igneous layering, the processes that control the generation and emplacement of the magmas, and the formation of the ore deposits associated with layered intrusions. Students will be able to compare layered igneous bodies to the world's main layered intrusions (notably Bushveld Complex, Great Dyke, Stillwater Complex, Skaergaard Monchegorsk and Panzhihua) in terms of stratigraphy, petrogenesis and mineralization potential. In particular, students will be able to assess the economic potential of Finnish layered intrusions.

Contents:

Layered intrusions in space and time, mineralogy, petrology, stratigraphy and ore-forming processes in layered intrusions. Examination of rock textures and mineralogy under the microscope and exploration modeling.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures, 12h practicals

Target group:

Masters students and PhD students in geology.

Prerequisites and co-requisites:

Igneous petrology (772341A), Ore geology (772385A)

Recommended optional programme components:

Other modules of International Master programme.

Recommended or required reading:

Cawthorn, R.G.: Layered Intrusions. Elsevier, 1996, 531 p., Parsons, I. (ed.): Origins of Igneous Layering. NATO ASI series, Series C, Mathematical and physical sciences; vol. 196. D. Reitels Publishing Company, Dordrecht, Holland, 1987.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Sheng-Hong Yang

Working life cooperation:

No

774637S: Isotope geochemistry for economic geologists, 6 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: English

ECTS Credits:

6 credits

Language of instruction:

Finnish/English

Timing:

4th or 5th year

Learning outcomes:

After completing the course, students can interpret and assess geological literature where isotopes have been utilized. They are able to calculate the ages of rocks using given isotope measurements of different isotopic systems and based on isotopic ratios, can make inferences on the origin of different rock types including ore deposits.

Contents:

Mechanisms of radioactive disintegration; mass spectrometry; different radiogenic and stable isotope systems (e.g., Rb-Sr, Sm-Nd, Re-Os, Lu-Hf, Sm-Nd and U-Pb and Pb-Pb; S and C isotopes); examples of the use of isotopes in the research of ore deposits.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

32 h lectures, 16 h computer exercises

Target group:

Advanced level geology and mineralogy students

Prerequisites and co-requisites:

Basic course in geochemistry 774301A

Recommended or required reading:

Faure, G.: Principles of Isotope Geology. 2nd ed., J. Wiley & Sons, New York, 1986, pp. 1-423. Dickin, A. P.: Radiogenic Isotope Geology, 2nd ed., Cambridge University Press, 2005, 492 p. Journal articles given during the course.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination on theory/essay and calculations as homework.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

E. Hanski

Working life cooperation:

No

772683S: Structural geology for economic geologists, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

7 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Upon completion the course, students should be able to carry out structural geological observation, to identify and describe different structural elements. In addition, they are able to use needed statistical methods and analyze structural data. They can exploit computer-aided methods in structural interpretation and are able to perform structural interpretation based on given source data.

Contents:

Methods of geometrical analysis, structural geological data and data management, projections and diagrams, practical strain analysis, fold shape analysis, petrographic identification of pervasive structural elements, regional fold and fault systems, structural geological maps and structural interpretation.

Mode of delivery:

Face to face teaching in the classroom and field.

Learning activities and teaching methods:

Lectures 8 h, field practicals 32 h, exercises 40 h and writing a report.

Target group:

Master students in geology and mineralogy.

Prerequisites and co-requisites:

Structural geology (772316A), Digital modelling and geological information systems in geosciences (771302A) or corresponding knowledge and intermediate studies for the Bachelor's degree.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

McClay: The Mapping of Geological Structures. 1991. Open University Press, Milton Keynes, 168 s.
 Rowland: Structural Analysis and Synthesis. 1986. Blackwell Sci. Publ. 208 s. Lisle: Geological Strain Analysis. 1985. Pergamon Press. 99 s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

N.N.

Working life cooperation:

No

Other information:

-

772667S: Seminar in ore geology, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 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. Students will be able to summarize the geology and petrogenesis of selected ore deposits and present these data to a specialist audience.

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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Independent literature studies, oral presentations by students, seminars c. 20 h

Target group:

Masters and PhD students.

Prerequisites and co-requisites:

Bachelor's degree.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Journal papers and **Eilu P (Ed.) (2012) Mineral deposits and metallogeny of Fennoscandia**. Geological Survey of Finland, Special Paper 53. 401 p

The availability of the literature can be checked from "[this link](#)".

Assessment methods and criteria:

Oral presentation and acting as an opponent.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772694S: Geometallurgy and mineral processing, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pertti Lamberg

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course students should be able to: 1) Describe the principles of different areas of geometallurgy (ore geology, process mineralogy, minerals processing, modeling and simulation) and how they are linked in a geometallurgical concept. 2) Use different research and analytical methods of importance for geometallurgy and interpret the results. 3) Evaluate, analyze and interpret the geometallurgical data in a quantitative way. 4) Design a geometallurgical sampling, analysis and research campaign. 5) Design a geometallurgical program.

Contents:

The course will give an introduction to main parts of the geometallurgy: 1) ore geology, 2) geostatistics, 3) process mineralogy, 4) minerals processing and 5) modeling and simulation. The main focus is put in process mineralogy, mineral processing and in assimilating the geometallurgical concept. Exercises, assignments and seminars concentrate on practical aspects of geometallurgy needed in mining industry.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures and PC classes with assignments (attending a serious game) 15 h, laboratory work 10 h, seminars 8 h.

Target group:

geology majors

Prerequisites and co-requisites:

Ore geology (772385A), Ore microscopy (772335A). Other modules in the International Master course.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Petruk, W., 2000. Applied Mineralogy in the Mining Industry, Elsevier Science B.V., Amsterdam.

Will, B. & Napier-Munn, T., 2006. Wills' Mineral Processing Technology, Elsevier Science & Technology Books, ISBN: 0750644508.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Laboratory classes, participation of the game, geometallurgical investigations (for the seminar) and the seminars are compulsory. Laboratory reports, seminars, the investigation and the opposition are each awarded points based on the attained level. Assignments and reports must be delivered in time or there will be an automatic deduction of points. The total points production determines the grand grade of the course, and it is given on the scale Fail-1-5.

- For grade 1, the student must be able to describe different parts and procedures of geometallurgy and to conduct a routine geometallurgical analysis.
- For grade 2, the student must be able to collect geometallurgical data and perform an analysis with interpretation.
- For grade 3 the student must be able to evaluate and interpret geometallurgical data provided by different analytical and research techniques and to report the results.
- For grade 4, the student must be able to design geometallurgical campaing, interpret the result and establish a geometallurgical program.
- For grade 5, the student must be able to apply the acquired skills to a new geometallurgical case, interpret, report and present the results and to defend the conclusions.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Pertti Lamberg

Working life cooperation:

No

772608S: Mining geology, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay772608S Mining geology (OPEN UNI) 3.0 op

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Students learn practical aspects of the work of mining geologists. Students will be equipped to perform the basic tasks of mining geology.

Contents:

Lectures on various aspects of mining, underground and surface visits to mining operations and processing plant, exercises including logging and GIS applications. The course will be arranged with an industry partner. Previous partners include Pyhäsalmi Cu-Zn mine and Suurikuusikko gold mine.

Mode of delivery:

Face to face on a mine site.

Learning activities and teaching methods:

40 h lectures, mine visits and exercises.

Target group:

Master students in geology.

Prerequisites and co-requisites:

Hydrothermal Ore Deposits (772672S), Magmatic Ore Deposits (772671S). Recommended optional programme components: Other module in International Master course.

Recommended optional programme components:

Other courses in International Master course.

Recommended or required reading:

Will be given on site.

Assessment methods and criteria:

Report.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

772640S: Excursion, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

The objective is to widen the student's field experience. Through exposure to novel geologic environments, students will have learnt to appreciate the diversity of geologic processes and environments on Earth.

Contents:

Introduction to Finnish or foreign geological field targets. Excursions typically last 1-2 weeks and consist of visits to field outcrops, as well as discussion of exposed structures and rocks. Past excursions went to Finland, Spain, South Africa, and Norway. Planned excursions include Germany-Poland, Scotland-Ireland, the Canary Islands, Cyprus, Italy, and Morocco.

Mode of delivery:

Face to face in field or mine.

Learning activities and teaching methods:

Pre-excursion seminar, field techniques, excursion.

Target group:

Master students and PhD students in geology.

Recommended optional programme components:

Other modules in International Master programme.

Recommended or required reading:

Reading will be informed separately depending on excursion destination.

Assessment methods and criteria:

Pre-excursion seminar, field protocol.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

774636S: Geochemistry of Mining Environment, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

28 h lectures

Target group:

Geology students interested in environmental issues. The course is also applicable to chemistry or process and environmental technology students.

Prerequisites and co-requisites:

Prerequisite for geology students Basic course in geochemistry (774301A). Also recommended Introduction to environmental geochemistry (774329A).

Recommended or required reading:

Jambor, J. L., Blawes, D. W., Ritchie, A. I. M. (Eds.) Environmental Aspects of Mine Wastes, Mineralogical Association of Canada, Short Course Series, Vol. 31, 2003, 430 s., Plumlee, G.S., Longsdon, M.J. (Eds.) The Environmental Geochemistry of Mineral Deposits. Reviews in Economic Geology, 1999, Vol. 6A.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

examination/essay

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

E. Hanski

Working life cooperation:

No

772613S: Bedrock geology of Finland, 6 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

ECTS Credits:

6 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

After the course student should have a good overview of the Finnish Precambrian bedrock and its evolution through time.

Contents:

The main geological units of the Finnish bedrock as part of the evolution of the Fennoscandian Shield. Magmatism, sedimentology and metamorphism and geochronology. Emphasis on Paleoproterozoic rocks (there is a separate course on Archean bedrock).

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 40 h

Target group:

Master's and PhD students in geology.

Prerequisites and co-requisites:

Studies equivalent to Bachelor's degree.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Lehtinen, M., Nurmi, P. ja Rämö, T., 2005. Precambrian Geology of Finland. Elsevier, 736 s
Additional material delivered during the course.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination/Essay

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

E. Hanski

Working life cooperation:

No

772658S: Special issues in geology and mineralogy, 1 - 9 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 credits.

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

The objective of the course is to provide the students with knowledge on the current developments in a special topic in geology and mineralogy. The students will have gained a deeper understanding of specific aspects of the subject.

Contents:

A course on a current topic given by a staff member or outside lecturer. Topics include economic geology, petrology, and mineralogy

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures and 10 h practical work consisting of examination of rock samples, maps or working with digital data.

Target group:

Masters and PhD students in geology

Prerequisites and co-requisites:

Bachelor in geology

Recommended or required reading:

Will be informed separately.

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

W. Maier

Working life cooperation:

No

772684S: GIS applications, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year, spring semester

Learning outcomes:

The student is able to utilize GIS systems in geological research and he/she can perform needed geoinformation analyses and modeling using 2D and 3D methods.

Contents:

Digital 2D modeling methods, GIS analysis, 3D modeling methods.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 8 h, demonstrations and exercises 32 h.

Target group:

Geology major students

Prerequisites and co-requisites:

A basic course in GIS applications

Recommended optional programme components:

-

Recommended or required reading:

Lecture material and literature that is informed separately

Assessment methods and criteria:

Skills test

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

-

773679S: Studies in other universities, 0 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

Varies depending on the original course

Contents:

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

Assessment methods and criteria:

Read more about [assessment criteria](#) at the University of Oulu webpage.

Person responsible:

Professor responsible of the subject in question

772614S: Workshop in bedrock mapping, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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, spring semester

Learning outcomes:

Upon completion of the course, students will be able to carry out geological bedrock mapping and produce geological maps using computer-aided methods. They are familiar with the map production methods used in Finnish research organizations.

Contents:

A two-week field work-dominated mapping project in cooperation with students from other universities and staff from the Geological Survey of Finland. Compilation of a geological map.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

12 h lectures, a field course with 68 h of demonstrations and a written report

Target group:

geology majors students

Prerequisites and co-requisites:

Most of the intermediate courses in geology

Recommended optional programme components:

-

Recommended or required reading:

Geological literature of the mapping area. Will be informed separately for each course.

Assessment methods and criteria:

Active participation in the field work and a written work report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass /fail

Person responsible:

A. Kärki

Working life cooperation:

No

Other information:

The main part of the course consists of a field work component organized by the Geological Survey of Finland.

772615S: Literature study, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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 writing of an essay on a given theme.

Mode of delivery:

Independent work and personal tuition

Learning activities and teaching methods:

see above

Recommended or required reading:

Will be informed separately.

Assessment methods and criteria:

a report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass /fail

Person responsible:

Eero Hanski, Wolfgang Maier

Working life cooperation:

No

773615S: Studia Generalia -lectures, 2 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

2 credits

Language of instruction:

Finnish/English

Timing:

4. or 5. year

Learning outcomes:

Students will acquire information on the current duties and special fields of geologists working in different sectors of the society and they will learn to gather the most essential points from lectures.

Contents:

Students attend lectures given by external visitors having different types of careers as geologists.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Attendance of at least four lectures.

Target group:

All intermediate- and advanced-level geology students

Recommended or required reading:

Material presented during lectures

Assessment methods and criteria:

circa 2-page reports on each lecture

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Seija Roman

Working life cooperation:

No

772666S: Master's thesis, 30 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

35 credits

Language of instruction:

finnish / english

Timing:

5th year

Learning outcomes:

Upon completing a Master's thesis, students will gain advanced understanding on a subject belonging to one of the four specializations: economic geology, Quaternary geology, geoenvironment, and mining and exploration. They will be able to use and apply pertinent research methods and theoretical knowledge of their research field, make independent inferences from their observations and measurements, and utilize effectively scientific literature.

Learning activities and teaching methods:

Students carry out a personal research project, which is normally based field and/or laboratory work, and they write a Master's thesis (pro gradu) on the results. The topic of the thesis is agreed with the supervisor from the department and with other potential internal or external supervisors. Personal guidance is given by the supervisor(s) during the research and writing stage. The official reviewers of the thesis are decided by the chair of the educational programme board of the department after the proposal of the professor of the discipline and the thesis is accepted and rated by the educational programme board.

Target group:

All advanced-level geology students

Prerequisites and co-requisites:

Sufficient amount of intermediate- and advanced-level courses to enable the student to start independent research work

Recommended or required reading:

Is decided separately in each case.

Assessment methods and criteria:

Thesis

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/Fail

Person responsible:

professors, lecturers

Working life cooperation:

Yes (commonly)

770690S: Maturity test, 0 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

0 credits

Language of instruction:

English

Timing:

5th year

Learning outcomes:

The student can write an informative abstract on his/her M.Sc. thesis.

Contents:

The student describes and analyses the material, research methods, and results of his/her M.Sc. thesis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Independent work

Target group:

Compulsory for all M.Sc. students in geosciences.

Prerequisites and co-requisites:

Written after the completion of the M.Sc. thesis.

Recommended optional programme components:

No alternative course units.

Recommended or required reading:

No reading

Assessment methods and criteria:

Written abstract, which must fit on a single page. It is written on a separate form and is accepted by the study programme committee of the department.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Professors

Working life cooperation:

No

031010P: Calculus I, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Lusikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031010P Calculus I (OPEN UNI) 5.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-3.

Learning outcomes:

After completing the course the student identifies concepts of vector algebra and can use vector algebra for solving problems of analytic geometry. The student can also explain basic characteristics of elementary functions and is able to analyse the limit and the continuity of real valued functions of one variable. Furthermore, the student can solve problems associated with differential and integral calculus of real valued functions of one variable.

Contents:

Vector algebra and analytic geometry. Limit, continuity, differential and integral calculus and applications of real valued functions of one variable. Complex numbers.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 55 h / Group work 22 h.

Target group:**Prerequisites and co-requisites:****Recommended optional programme components:****Recommended or required reading:**

Grossmann, S.I.: Calculus of One Variable; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations (partly); Adams, R.A.: A Complete Course Calculus (partly).

Assessment methods and criteria:

Intermediate exams or a final exam.

Read more about [assessment criteria](#) at the University of Oulu webpage.**Grading:**

Numerical grading scale 1-5.

Person responsible:

Ilkka Lusikka

Working life cooperation:**Other information:**

-

H327031: Studies in Process and environmental engineering, 15 - 100 op**Voimassaolo:** 01.08.2012 -**Opiskelumuoto:** Basic Studies**Laji:** Study module**Vastuuysikkö:** Oulu Mining School**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish

Ei opintojaksojauksia.

*E8***488012A: Environmental Legislation, 5 op****Voimassaolo:** 01.01.2011 - 31.07.2017**Opiskelumuoto:** Intermediate Studies**Laji:** Course**Vastuuysikkö:** Field of Process and Environmental Engineering**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** English**Leikkaavuudet:**

488101A Environmental Legislation 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during periods 4-5

Learning outcomes:

Upon completion of the course, the student will be able to explain the main component of Finnish environmental legislation and knows the structure of environmental administration in governmental and municipal level; authorities, jurisdiction and duties. The student will be able to understand differences between EIA and environmental permits. Having completed the course, the student knows what permits and acts must be considered in different cases relating to mining, water and energy initiatives.

Contents:

Environmental Legislation of Finland

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 11 h, seimar 9 h and self-study 115 h. Totally 135 h.

Target group:

Students in bachelor program of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

-

Recommended or required reading:

Ympäristöoikeuden pääpiirteet (Ekroos, Kumpula 2010, ISBN: 9789510361283), lecture notes

Assessment methods and criteria:

Group work (50% of the final grade of the course) and seminar (50%). Seminar includes presentation and discussion.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Lecturer A-K Ronkanen

Working life cooperation:

No

Other information:

-

477011P: Introduction to Process and Environmental Engineering I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa, Sanna Taskila

Opintokohteen kielet: Finnish

Leikkaavuudet:

470219A Introduction to Process Engineering 3.5 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation during periods 1-3

Learning outcomes:

Objective: To give insight to the whole perspective of process and environmental engineering and to familiarise the students with the terminology involved. The objective is also to outline the connections between process and environmental engineering and other fields closely related to them.

Learning outcomes: After the course, the student can analyse the process and environmental engineering aspects of an industrial process. He/She can, for example, divide the process into unit processes, analyse the process or a chain of processes based on the material balances, identify and evaluate the significance of essential mechanical, chemical and transport phenomena, analyse the control and process design aspects of a process etc. He/She can also evaluate the significance of different aspects of process and environmental engineering to the overall production system when these aspects are further examined in forthcoming courses.

Contents:

The course divides into eight separate themes: 1. Unit processes and material balances. 2. Environmental impacts and their classification. 3. Mechanical phenomena. 4. Momentum, heat and mass transfer phenomena. 5. Chemical reactions and reactors. 6. The possibilities of biological process engineering. 7. Process dynamics and control. 8. Process measurements and measurability.

Mode of delivery:

Contact lectures

Learning activities and teaching methods:

Assignments (8 altogether) carried out in small groups and contact lectures supporting them (16 hours).

Target group:

Bachelor's degree students in the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

None

Recommended optional programme components:

The course serves as an introduction to the studies in process and environmental engineering.

Recommended or required reading:

The material is provided during the contact lectures and through the course webpages. It is expected also that the students seek the material for completing the assignments independently.

Assessment methods and criteria:

The assignments (8 altogether) covering the course themes carried out in small groups.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course utilises a numerical grading scale 1-5 and fail.

Person responsible:

M.Sc. (eng) Aki Sorsa

Working life cooperation:

No.

Other information:

The assessment method utilised requires the attendance in contact lectures from the beginning of the course.

477101A: Particle Technology, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ari Ämmälä

Opintokohteen kielet: Finnish

Leikkaavuudet:

477121A Particle Technology 5.0 op

470101A Mechanical Process Engineering I 5.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish

Timing:

Implementation in period 4.

Learning outcomes:

Upon completion of the course, a student should be able to identify the mainline mechanical processes enhancing the degree of upgrading, as well as recovery operations related to those mechanical main processes. The student is able to identify the equipments related to the mechanical processes and can explain their purpose of use and their operational principles.

Contents:

Granular material and sampling, particle size and particle size distribution, specific surface area, basics in grinding, crushing, sieving and mineral concentration, froth flotation, mineral concentration methods based on density difference, magnetic concentration and other concentration methods, granulation, separation from suspensions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises.

Target group:

Bachelor students in process and environmental engineering

Prerequisites and co-requisites:

Introduction to Process Engineering 477011P

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

Exam.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

0-5

Person responsible:

Education coordinator

Working life cooperation:

No

Other information:

Literature exam possible for foreign students.

031010P: Calculus I, 5 op**Opiskelumuoto:** Basic Studies**Laji:** Course**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Ilkka Lusikka**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

ay031010P Calculus I (OPEN UNI) 5.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-3.

Learning outcomes:

After completing the course the student identifies concepts of vector algebra and can use vector algebra for solving problems of analytic geometry. The student can also explain basic characteristics of elementary functions and is able to analyse the limit and the continuity of real valued functions of one variable. Furthermore, the student can solve problems associated with differential and integral calculus of real valued functions of one variable.

Contents:

Vector algebra and analytic geometry. Limit, continuity, differential and integral calculus and applications of real valued functions of one variable. Complex numbers.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 55 h / Group work 22 h.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Grossmann, S.I.: Calculus of One Variable; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations (partly); Adams, R.A.: A Complete Course Calculus (partly).

Assessment methods and criteria:

Intermediate exams or a final exam.

Read more about [assessment criteria](#) at the University of Oulu webpage.**Grading:**

Numerical grading scale 1-5.

Person responsible:

Ilkka Lusikka

Working life cooperation:

-

Other information:

-

488010P: Introduction to Process and Environmental Engineering II, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Fabritius, Timo Matti Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

488011P Introduction to Environmental Engineering 5.0 op

477012P Introduction to Automation Engineering 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation in 4th to 6th periods.

Learning outcomes:

Students can examine industrial processes using the methods and perspectives of process and environmental engineering (e.g. environmental load of processes, use of land and water resources, control and design of processes...) and they recognize the role of different areas of the process and environmental engineering, when these areas are considered in the forthcoming courses.

Contents:

1. Environmental thinking and industrial ecology. 2. Materials in production processes. 3. Water resources and land use. 4. Municipal and industrial water supply. 5. PI diagrams. 6. Process design. 7. Control and operation of processes.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Group exercises and contact-education that supports these exercises. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

None

Recommended optional programme components:

This course is an introduction to the other courses of process and environmental engineering.

Recommended or required reading:

Material will be distributed during lectures and exercises.

Assessment methods and criteria:

Group-exercises. Please note that the course is not organised for the English speaking students.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Failed, 1, 2, 3, 4 and 5.

Person responsible:

professor Timo Fabritius

Working life cooperation:

No.

Other information:

It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

488103A: Environmental Impact Assessment, 4 - 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Björn Klöve

Opintokohteen kielet: English

Leikkaavuudet:

488133A Environmental Impact Assessment 5.0 op

ay488103A Environmental Impact Assessment (OPEN UNI) 5.0 op

480170S Environmental Impact Assesment and Diminishing Harmful Effects in Water Resource Management 5.0 op

ECTS Credits:

4 or 8 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-4

Learning outcomes:

The student will acquire a broad and multidisciplinary and sustainable approach to environmental impact assessment (EIA). The student will know the all steps in EIA process and the different methods used in environmental impact assessment. During the course students develop their working life skills (e.g. writing, communication and presentation skills) and the ability to review environmental problems. They also learn how to resolve extensive environmental projects related problems, causes and consequences.

Contents:

EIA process and legislation, environmental change, principles and assessment methods in ecology, hydrology, economics and social sciences.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The whole course contains lectures 18 or 32 h, independent works (assignments and learning diaries, 90 or 175 h and seminars 0 or 9 h. Totally 108 h or 216 h

Target group:

Master students in the Environmental Engineering study program

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course or to have corresponding knowledge prior to enrolling for the course unit: 488011P Introduction to Environmental Engineering

Recommended optional programme components:

-

Recommended or required reading:

Environmental Impact Assessment: Cutting Edge for the Twenty-First Century (Gilpin A, 1995, ISBN 0-521-42967-6). Lecture hand-outs and other materials delivered in lectures.

Assessment methods and criteria:

The course includes 5 modules, which are evaluated separately (with the scale 1-5). The first module is 4 ECTS credits and it is requisite for next modules. Other modules are 4 ECTS credits including seminar.

The final grade of the course is weighted average of modules. Credit points of the modules are used as a weighted factor. Assessment methods of modules vary including learning diaries and different kind of assignments. More information about assessment methods of each module is given during the course. Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Björn Klöve

Working life cooperation:

No

Other information:

The course is arranged in alternate years (even autumn semesters). The course is organised in a co-operation with faculty of Technology, the company Pöyry Finland Oy, and the Thule institute.

A325606: Exploration and Mining Studies, 30 - 100 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Study module

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

E6

477703A: Surface Chemistry Principles of Minerals, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jaakko Rämö

Opintokohteen kielet: Finnish

Leikkaavuudet:

477716A Surface Chemistry Principles and Applications in Mineral and Mining Technology 5.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish/English

Timing:

In period 3. It is recommendable the student to take this course on the first year of the Master's degree phase of his/her studies i.e. the fourth year of all.

Learning outcomes:

After completing the course, student can describe mineral engineering processes and unit operations on the basis of physical chemistry. The course introduces students to surface phenomena of physical chemistry.

Contents:

Thermodynamic basic equations; chemical interactions, especially those of boundary surfaces; zeta potential, total surface charges; bubbles; surface reagents, etc.

Mode of delivery:

Implemented as face-to-face teaching or by electrical connection.

Learning activities and teaching methods:

Lectures, exercises.

Target group:

The students of the Mineral Processing study option in the study programmes Process Engineering or Environmental Engineering.

Prerequisites and co-requisites:

The Bachelor level studies of process or environmental engineering study programmes or respective knowledge, and the preceding Master level studies or respective knowledge.

Recommended optional programme components:

The other courses of the Master's phase curriculum.

Recommended or required reading:

Materials delivered at the lectures or electrically.

Assessment methods and criteria:

Scored excercises. Final examination.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Jaakko Rämö (Thule Institute, University of Oulu)

Working life cooperation:

No

Other information:

The course is performed for the LTU students by an electronic connection.

477704A: Principles of Mineral Processing, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Hannu Kuopanportti

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

In period 5. It is recommedable the student to take this course on the first year of the Master's degree phase of his/her studies i.e. the fourth year of all.

Learning outcomes:

After the course the student knows the principles of mineral processing and can explain the basic processes therein. Additionally the student has acquired the skill to recognize the essential equipment used in mineral processing and their operation. Further, the student can explain the basics of the economics of mineral processing.

Contents:

Grinding methods, separation methods, process control; practical examples of mineral processing; unit processes related to optimal mineral processing.

Mode of delivery:

Implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures and practical exercises, final examination.

Target group:

The students of the Mineral Processing study option in the study programmes Process Engineering or Environmental Engineering.

Prerequisites and co-requisites:

The Bachelor level studies of process or environmental engineering study programmes or respective knowledge, and the preceding Master level studies or respective knowledge.

Recommended optional programme components:

The other courses of the Master's phase curriculum.

Recommended or required reading:

Materials delivered at the lectures, practicals and/or in Optima.

Assessment methods and criteria:

Final examination.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Hannu Kuopanportti

Working life cooperation:

No

Other information:

-

762302A: Geophysical research methods of rock and soil, 6 - 8 op

Voimassaolo: 01.03.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

6 - 8 credits

Language of instruction:

Finnish

Timing:

2nd year in the spring term

Learning outcomes:

After passing the course the student can explain on which the use of geophysical methods in studying rock and soil is based. The student can describe theoretical basics and the measuring techniques of the methods and is able to apply the methods in various important economical and civil tasks.

Contents:

The aim of the course is to learn the principles of applying different geophysical methods for various economical and civil tasks. Geophysical subjects in sediments and bedrock and basics for their exploration. Basics of petrophysical properties. Gravity methods, magnetic methods, resistivity methods, IP method,

electromagnetic methods, radiometric methods and seismic methods: the physical principles, devices and the most important ways of using them in practice. Aerogeophysical methods. Borehole measurements. Geothermal research.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 50 h, practical exercises 20 h, field exercises 30 h (compulsory), self-study 113 h. NB: The 6 cp course does not contain field exercises.

Target group:

Compulsory for students of geophysics in the B.Sc. degree. The course is suitable and useful also, e.g. for the students of the Department of Geosciences. The 6 cp course is designed for the 4th year students of Mining Industry of Production Technology in Process Engineering.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

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

Recommended or required reading:

Lecture notes and lecture material. Peltoniemi, M. 1988: Maa- ja kallioperän geofysikaaliset tutkimusmenetelmät. Selected parts of the following: Milsom, J. 1989: Field geophysics. Telford, W. M., Geldart, T. M. & Sheriff, R. E., 1990: Applied geophysics. Kearey, P., Brooks, M. & Hill, I., 2002: An introduction to geophysical exploration (3rd ed.); Parasnis, T. S., 1997: Principles of applied geophysics. (5th ed.); Reynolds, J. M., 2011: An introduction to applied and environmental geophysics (2nd ed.); Sharma, P. V., 1997: Environmental and engineering geophysics. Course material availability can be checked [here](#).

Assessment methods and criteria:

Two midterm exams or final examination and the compulsory participating in field exercises for passing the 8 cp course.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Markku Pirttijärvi

Working life cooperation:

No work placement period

Other information:

<https://wiki.oulu.fi/display/762102P/>

488110S: Water and Wastewater Treatment, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisangela Heiderscheidt

Opintokohteen kielet: English

Leikkaavuudet:

480151S Water and Wastewater Treatment 7.0 op

480208S Industrial Water and Wastewater Treatment 3.5 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-2

Learning outcomes:

Upon completion of the course, the student will be able to explain basic processes of water and wastewater treatment and can do the selection of needed process units and can dimensioning those.

Contents:

Characters of raw water, tap water and wastewater; used process units in water and waste water treatment; selection of process units; dimensioning treatment units and unit processes.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

lectures (50 h), exercises (40 h), self-study (45 h)

Target group:

Students in master program of environmental engineering

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course or to have corresponding knowledge prior to enrolling for the course unit: 488011P Introduction to Environmental Engineering

Recommended optional programme components:

-

Recommended or required reading:

Lecture hand-outs & Kemira, About water treatment. Optional: RIL 124-2, Vesihuolto II; Metcalf & Eddy, Wastewater Engineering: Treatment and Reuse; AWWA, Water quality & treatment; AWWA, Water treatment plant design.

Assessment methods and criteria:

Course can be completed A) by book examination (Kemira), the lecture examination and to do 2 exercises OR B) by the final examination and to do 2 exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Laboratory Engineer Jarmo Sallanko

Working life cooperation:

No

Other information:

-

488205S: Environmental Load of Process Industry, 4 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niina Koivikko

Opintokohteen kielet: English

Leikkaavuudet:

ay488215S Industry and Environment (OPEN UNI) 5.0 op

488215S	Industry and Environment	5.0 op
488221S	Environmental Load of Industry	5.0 op
480314S	Control of Environmental Load from Processes of Pulp and Paper Industry	2.5 op
480315S	Control of Environmental Load from Processes of Metallurgical Industry	2.5 op

ECTS Credits:

4 cr

Language of instruction:

English

Timing:Implementation in spring semester during 6th period.**Learning outcomes:**

The student is able to identify the essential features of the environmental load in different types of (chemical, wood, metallurgical,...) industry. He/she is able to explain the type, quality, quantity and sources of the emissions. The student is able to apply the main emission control systems and techniques in different industrial sectors. He/she has the skills to apply BAT-techniques in emission control. The student can explain the environmental management system of an industrial plant and is able to apply it to an industrial plant.

Contents:

Effluents: types, quality, quantity, sources. Unit operations in managing effluents, comprehensive effluent treatment. Environmental management systems, environmental licences, environmental reporting and BAT.

Mode of delivery:

Lectures.

Learning activities and teaching methods:

Lectures 30 h.

Target group:

Master's degree students of the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

The courses 477011P Introduction to Process Engineering, 488011P Introduction to Environmental Engineering, 488204S Air Pollution Control Engineering and 488110S Water and Wastewater Treatment recommended before-hand.

Recommended optional programme components:

-

Recommended or required reading:

Material represented in lectures and in the Optima environment.

Assessment methods and criteria:

Written final exam

Read more about [assessment criteria](#) at the University of Oulu webpage.**Grading:**

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University researcher Satu Ojala

Working life cooperation:

No

Other information:

-

477725S: Mine Automation, 7,5 op**Opiskelumuoto:** Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Ei opintojaksokuvauksia.

477709S: Financial and Project Valuation of Mining Project, 3 op

Voimassaolo: 01.01.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lindborg, Timo Albert

Opintokohteen kielet: English

ECTS Credits:

3 cr

Language of instruction:

English

Timing:

In period 5. It is recommendedable the student to take this course on the first year of the Master's degree phase of his/her studies, i.e. the fourth year of all.

Learning outcomes:

After completion of the course the student is able to understand how to finance a mining project; he/she will be able to describe the requirements of venture capital financing and other type of financing, the sources of mining financing and how to seek financing; the sources of financing and he/she understands the importance of cash flow, NPV and IRR calculations. The student will understand the parameters impacting the value of a mining project. The student will be able to prepare a simple valuation model of exploration properties and companies.

Contents:

Different tools for analyzing financial information, problems in analyzing financial information, and the use of financial and mineral resource information in project valuation.

Mode of delivery:

Implemented as face-to-face teaching and distance teaching.

Learning activities and teaching methods:

Lectures and exercises.

Target group:

The students of the Mineral Processing study option in the study programmes Process Engineering or Environmental Engineering, etc.; and the students of Luleå University of Technology (LTU) within the Nordic Mining School (NMS) agreement between LTU and the University of Oulu.

Prerequisites and co-requisites:

The Bachelor level studies of process or environmental engineering study programmes or respective knowledge, and the preceding Master level studies or respective knowledge.

Recommended optional programme components:

The other courses of the Master's phase curriculum.

Recommended or required reading:

Course materials and literature list will be delivered at the lectures.

Assessment methods and criteria:

Exercises and final exam, or participation to the lectures plus exercises and literature summary.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Timo Lindborg (Nordic Mining School, University of Oulu), Nordic Mining School Coordinator Jaakko Rämö (Thule Institute, University of Oulu).

Working life cooperation:

No

Other information:

This course is organized within the Nordic Mining School (NMS) agreement between Luleå University of Technology, Sweden and the University of Oulu.

774636S: Geochemistry of Mining Environment, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

28 h lectures

Target group:

Geology students interested in environmental issues. The course is also applicable to chemistry or process and environmental technology students.

Prerequisites and co-requisites:

Prerequisite for geology students Basic course in geochemistry (774301A). Also recommended Introduction to environmental geochemistry (774329A).

Recommended or required reading:

Jambor, J. L., Blowes, D. W., Ritchie, A. I. M. (Eds.) Environmental Aspects of Mine Wastes, Mineralogical Association of Canada, Short Course Series, Vol. 31, 2003, 430 s., Plumlee, G.S., Longsdon, M.J. (Eds.) The Environmental Geochemistry of Mineral Deposits. Reviews in Economic Geology, 1999, Vol. 6A.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

examination/essay

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

E. Hanski

Working life cooperation:

No

774304A: Analytical methods in geochemistry, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures and visit to a laboratory

Target group:

Bachelor or Master level geology students

Prerequisites and co-requisites:

Basic course in geochemistry (774301A)

Recommended or required reading:

Gill, Robin (ed.): Modern analytical geochemistry: an introduction to quantitative chemical analysis for earth, environmental and materials scientists, Harlow, Longman, 1997, 329 p. and Sawyer, C.N., McCarty, P.L., Parkin, G.F.: Chemistry for Environmental Engineering and Science, Boston, McGraw-Hill, 2003, p. 410-451.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

E. Hanski

Working life cooperation:

No

773322A: Surficial geology in ore exploration, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Upon completion of the course, students should have a basic knowledge of the dispersal of ore boulders and how boulders and till geochemistry are utilized 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

2nd or 3rd year geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P, Surficial geology in Finland 773306A, Basics of glacial geology 773303A

Recommended or required reading:

Kujansuu, R. ja Saarnisto, M. (eds.): Glacial Indicator Tracing, A.A. Balkema, 1990, 252 p

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course, students have gained knowledge of the mode of occurrence of elements in surficial deposits, research methods of heavy minerals and their use 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

Advanced-level geoscience students

Prerequisites and co-requisites:

Surficial geology in ore exploration 73322A

Recommended or required reading:

McClenaghan, M., Bobrowsky, P.T., Hall, G.E.M. & Cook, S.J., Drift Exploration in Glaciated Terrain, Geological Society Special Publication n:o 185, 2001, 350 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course students have 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 their use in ore exploration.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

Advanced-level geoscience students

Prerequisites and co-requisites:

Advanced course of surficial geology in ore exploration I 773641S

Recommended or required reading:

Selected articles

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

772608S: Mining geology, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay772608S Mining geology (OPEN UNI) 3.0 op

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Students learn practical aspects of the work of mining geologists. Students will be equipped to perform the basic tasks of mining geology.

Contents:

Lectures on various aspects of mining, underground and surface visits to mining operations and processing plant, exercises including logging and GIS applications. The course will be arranged with an industry partner. Previous partners include Pyhäsalmi Cu-Zn mine and Suurikuusikko gold mine.

Mode of delivery:

Face to face on a mine site.

Learning activities and teaching methods:

40 h lectures, mine visits and exercises.

Target group:

Master students in geology.

Prerequisites and co-requisites:

Hydrothermal Ore Deposits (772672S), Magmatic Ore Deposits (772671S). Recommended optional programme components: Other module in International Master course.

Recommended optional programme components:

Other courses in International Master course.

Recommended or required reading:

Will be given on site.

Assessment methods and criteria:

Report.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Tobias Björn Weisenberger

Working life cooperation:

No

477711S: Rock and Mining Engineering, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikael Rinne

Opintokohteen kielet: Finnish

Leikkaavuudet:

477702A Rock Engineering 5.0 op

477707A Mining Engineering 5.0 op

Ei opintojaksokuvauksia.

772694S: Geometallurgy and mineral processing, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pertti Lamberg

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course students should be able to: 1) Describe the principles of different areas of geometallurgy (ore geology, process mineralogy, minerals processing, modeling and simulation) and how they are linked in a geometallurgical concept. 2) Use different research and analytical methods of importance for geometallurgy and interpret the results. 3) Evaluate, analyze and interpret the geometallurgical data in a quantitative way. 4) Design a geometallurgical sampling, analysis and research campaign. 5) Design a geometallurgical program.

Contents:

The course will give an introduction to main parts of the geometallurgy: 1) ore geology, 2) geostatistics, 3) process mineralogy, 4) minerals processing and 5) modeling and simulation. The main focus is put in process mineralogy, mineral processing and in assimilating the geometallurgical concept. Exercises, assignments and seminars concentrate on practical aspects of geometallurgy needed in mining industry.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures and PC classes with assignments (attending a serious game) 15 h, laboratory work 10 h, seminars 8 h.

Target group:

geology majors

Prerequisites and co-requisites:

Ore geology (772385A), Ore microscopy (772335A). Other modules in the International Master course.

Recommended optional programme components:

Other courses of the International Master programme.

Recommended or required reading:

Petruk, W., 2000. Applied Mineralogy in the Mining Industry, Elsevier Science B.V., Amsterdam.

Will, B. & Napier-Munn, T., 2006. Wills' Mineral Processing Technology, Elsevier Science & Technology Books, ISBN: 0750644508.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Laboratory classes, participation of the game, geometallurgical investigations (for the seminar) and the seminars are compulsory. Laboratory reports, seminars, the investigation and the opposition are each awarded points based on the attained level. Assignments and reports must be delivered in time or there will be an automatic deduction of points. The total points production determines the grand grade of the course, and it is given on the scale Fail-1-5.

- For grade 1, the student must be able to describe different parts and procedures of geometallurgy and to conduct a routine geometallurgical analysis.
- For grade 2, the student must be able to collect geometallurgical data and perform an analysis with interpretation.
- For grade 3 the student must be able to evaluate and interpret geometallurgical data provided by different analytical and research techniques and to report the results.
- For grade 4, the student must be able to design geometallurgical campaing, interpret the result and establish a geometallurgical program.
- For grade 5, the student must be able to apply the acquired skills to a new geometallurgical case, interpret, report and present the results and to defend the conclusions.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

Pertti Lamberg

Working life cooperation:

No

477715S: Environmental and Social Responsibility in Mining, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jaakko Rämö

Opintokohteen kielet: English

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

In periods 1-3. It is recommendable the student to take this course on the first year, or on the second year autumn term, of the Master's degree phase of his/her studies, i.e. the fourth year / fifth year autumn of all.

Learning outcomes:

After completion of this course the student is able to develop, apply and assess the targets, practices and methods of environmentally and socially responsible mining in practice.

Mode of delivery:

Implemented as distance learning.

Learning activities and teaching methods:

Lectures and exercises by distance learning & learning diaries.

Target group:

The students of the Mineral Processing study option in the study programmes Process Engineering or Environmental Engineering, etc. and the students of Luleå University of Technology (LTU) within the Nordic Mining School (NMS) agreement between LTU and the University of Oulu.

Prerequisites and co-requisites:

The Bachelor level studies of the process or environmental engineering study programmes or respective knowledge, and the preceding Master level studies or respective knowledge.

Recommended optional programme components:

The other courses of the Master's phase curriculum.

Recommended or required reading:

Lectures + articles delivered during lectures

Assessment methods and criteria:

Participation to the lectures & learning diary.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Rauno Sairinen (University of Eastern Finland), Nordic Mining School Coordinator Jaakko Rämö (Thule Institute, University of Oulu).

Working life cooperation:

No

Other information:

This course is organized within the Nordic Mining School (NMS) agreement between Luleå University of Technology, Sweden and the University of Oulu.

477708S: Mining Project Feasibility Study, 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

4 cr

Language of instruction:

English

Timing:

In period 3. It is recommended the student to take this course on the first year, or on the second year autumn term, of the Master's degree phase of his/her studies, i.e. the fourth year / fifth year autumn of all.

Learning outcomes:

After completion of the course the student is able to describe the content of mining project feasibility study, calculate economical conditions and profitability for the project, describe and explain differences in feasibility studies of different mining project stages. The student will also understand and be able to evaluate the quality of feasibility studies. This involves addressing the underlying technical principles, applying these to mineral projects and demonstrating how these influence the financial modeling. The student will be able prepare an economical calculation for feasibility study of the mining project and calculate free cash flow to it.

Contents:

Role of different feasibility studies; Guidelines and criteria for resource and reserve classification. Sources of technical information for feasibility study industry-level information; Quality requirements of technical and economical information; Pre-production planning and optimization of the rate of mining in relation to the size of the resource; Mining methods; Importance of dilution, waste rock ratio, recovery and net smelter return; Estimation of operating and capital costs.

Mode of delivery:

Implemented as face-to-face teaching and distance teaching.

Learning activities and teaching methods:

Lectures and exercises, final examination.

Target group:

The students of the Mineral Processing study option in the study programmes Process Engineering or Environmental Engineering, etc.; and the students of Luleå University of Technology (LTU) within the Nordic Mining School (NMS) agreement between LTU and the University of Oulu.

Prerequisites and co-requisites:

The Bachelor level studies of process or environmental engineering study programmes or respective knowledge, and the preceding Master level studies or respective knowledge.

Recommended optional programme components:

The other courses of the Master's phase curriculum.

Recommended or required reading:

Course materials and literature list will be delivered at the lectures.

Assessment methods and criteria:

Exercises and final exam, or participation to the lectures plus exercises and literature summary.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Timo Lindborg (Nordic Mining School, University of Oulu), Nordic Mining School Coordinator Jaakko Rämö (Thule Institute, University of Oulu).

Working life cooperation:

No

Other information:

This course is organized within the Nordic Mining School (NMS) agreement between Luleå University of Technology, Sweden and the University of Oulu.

477712S: Phenomena in Mineral Processing, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Hannu Kuopanportti

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

In period 4. It is recommendedable the student to take this course on the first year of the Master's degree phase of his/her studies i.e. the fourth year of all.

Learning outcomes:

After the course the student is able to explain and understand the physical and chemical phenomena that effect on the operation of an enrichment method. By understanding the phenomena the student can explain the reasons for the process changes, and can explain how the process device works and can optimize the process conditions and the equipment parameters.

Contents:

Basic methods and equipment of crushing and grinding. Enrichment based on sorting. Grinding-conditioning of flotation, flotation concentration. Beneficiation methods and equipment based on density differences. Magnetic and electrostatic enrichment. Beneficiation methods based on leaching.

Mode of delivery:

Implemented as face-to-face teaching

Learning activities and teaching methods:

Lectures, final examination.

Target group:

The students of the Mineral Processing study option in the study programmes Process Engineering or Environmental Engineering.

Prerequisites and co-requisites:

The Bachelor level studies of process or environmental engineering study programmes or respective knowledge, and the preceding Master level studies or respective knowledge.

Recommended optional programme components:

The other courses of the Master's phase curriculum.

Recommended or required reading:

Lecture materials delivered in the lectures and/or in Optima.

Assessment methods and criteria:

Final examination for the lectures.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Hannu Kuopanportti

Working life cooperation:

No

Other information:

-

477713S: Automation in Mineral Processing, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Leiviskä, Kauko Johannes

Opintokohteen kielet: Finnish

Leikkaavuudet:

477510S Automation in Mineral Processing 5.0 op

477724S Numerical Mine Modelling 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course is arranged in period 6. It is recommendable the student to take this course on the first year of the Master's degree phase of his/her studies i.e. the fourth year of all.

Learning outcomes:

The aim of this study module is to familiarize the student to the modelling of mineral processes and to the usage of these models in monitoring and control of the process.

Contents:

The principles of the modelling of mineral processes (for example crushing, grinding, flotation, magnetic and gravity separation) and the usage of the models.

Mode of delivery:

Teaching will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures during one period. Practices include guided familiarization of modelling software, practical work done in small group and written report of practical work.

Target group:

The students of the Mineral Processing study option in the study programmes Process Engineering or Environmental Engineering.

Prerequisites and co-requisites:

The Bachelor level studies of process or environmental engineering study programmes or respective knowledge, and the preceding Master level studies or respective knowledge.

Recommended optional programme components:

The other courses of the Master's phase curriculum.

Recommended or required reading:

Lecture material in English.

Assessment methods and criteria:

Final exam (lectures and practices).

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5 or fail.

Person responsible:

Prof. Kauko Leiviskä

Working life cooperation:

No

Other information:

-

477721S: Mineral Processing, 7,5 op

Voimassaolo: - 31.07.2011

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Ei opintojaksokuvauksia.

477723S: Mining Economy and Risk Evaluation, 7,5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Ei opintojaksokuvauksia.

A326103: Surficial Geology, advanced studies, 60 op

Opiskelumuoto: Advanced Studies

Laji: Study module

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

engl/

773601S: Glacial Geology II, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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:

Upon completion of the course the student will be able to explain the 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 paleoice-sheets.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

26 h lectures

Target group:

Geology students

Prerequisites and co-requisites:

B.Sc.-degree

Recommended optional programme components:

No

Recommended or required reading:

Glaciers & Glaciation. Benn, D. I. & Evans, D. J. A. Arnold. 1998.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

No

773616S: Aerial photo interpretation in surficial geology, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course, students should be able to identify and interpret basic landforms from air photographs.

Contents:

Basics of air photograph interpretation; identification of landforms from air photographs and topographical maps; mapping based on air photograph interpretation and the necessary field research. Students compile a map of a small area.

Mode of delivery:

Face to face

Learning activities and teaching methods:

20 h lectures, 30 h practicals

Target group:

Advanced-level geoscience students

Prerequisites and co-requisites:

Quaternary geology of Finland 773306A, Basics of glacial geology 773303A

Assessment methods and criteria:

Excercises and an examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyskikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course, students have gained knowledge of the mode of occurrence of elements in surficial deposits, research methods of heavy minerals and their use 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

Advanced-level geoscience students

Prerequisites and co-requisites:

Surficial geology in ore exploration 73322A

Recommended or required reading:

McClenaghan, M., Bobrowsky, P.T., Hall, G.E.M. & Cook, S.J., Drift Exploration in Glaciated Terrain, Geological Society Special Publication n:o 185, 2001, 350 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course students have 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 their use in ore exploration.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

Advanced-level geoscience students

Prerequisites and co-requisites:

Advanced course of surficial geology in ore exploration I 773641S

Recommended or required reading:

Selected articles

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773621S: Global environmental and climate change during the Cenozoic, 4 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuksikkö: Oulu Mining School

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:

Upon completion of the course the student will be able to explain 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 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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures

Target group:

Geology students

Prerequisites and co-requisites:

No

Recommended optional programme components:

No

Recommended or required reading:

Lunkka, J. P. 2008. Maapallon ilmastoehistoria. Gaudeamus - Helsinki University Press. 286 s. and other selected readings.

The availability of the literature from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

No

773646S: Advanced field techniques, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuuyksikkö: Oulu Mining School

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:

Upon completion of the course the student will be able to use a range of field techniques required in Quaternary Geology research projects (e.g. aerial image, sedimentological, drilling, ground penetrating techniques).

Contents:

Field course comprises planning and implementation of geological methods to collect geological data (sedimentological, geomorphological and geophysical data) from a preselected field area.

Mode of delivery:

Face to face teaching in the field

Learning activities and teaching methods:

40 h lectures

Target group:

Geology students

Prerequisites and co-requisites:

B.Sc.-degree

Recommended optional programme components:

No

Recommended or required reading:

No

Assessment methods and criteria:

Participation in the field course

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi or J. P. Lunkka

Working life cooperation:

No

Other information:

No

773648S: Sedimentary Structures, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Pekka Lunkka

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

Finnish (in English if required)

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course, the student is able to identify various sedimentary structures and facies associations and use them for palaeoenvironmental reconstructions.

Contents:

The course introduces the sedimentary structures, the physical background of their genesis and the occurrence of these structures in different sedimentary environments. The course also includes exercises to identify different sedimentary structures.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures, 15 h exercises

Target group:

Geology students

Prerequisites and co-requisites:

B.Sc.-degree

Recommended optional programme components:

No

Recommended or required reading:

Reineck, H-E. & Singh, I. B. Depositional Sedimentary Environments. 1980. Springer-Verlag. Pages 1-176.
The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

No

773647S: Sedimentology, 6 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Pekka Lunkka

Opintokohteen kielet: Finnish

ECTS Credits:

6 credits

Language of instruction:

Finnish (in English if required)

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course, the student will be able to explain how different sediment beds and sediment associations are related to different sedimentary environments. The student will also be able link individual observations to various sedimentary processes and their products and explain the fundamental concepts used in sequence stratigraphy.

Contents:

The topics that are introduced in the course are: sedimentary environments their processes and products, basin analysis and sequence stratigraphy.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures

Target group:

Geology students

Prerequisites and co-requisites:

B.Sc.-degree

Recommended optional programme components:

No

Recommended or required reading:

Reading, H. G. 1996. Sedimentary Environments. Blackwell Science Ltd. 688 pp. And Coe, A. L. 2005.

The Sedimentary Record of Sea-level Change. Cambridge University Press. 287 pp. Lecture notes.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

Ei

Other information:

No

773613S: Literature essay, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Student searches literature on the given topic and writes an essay.

Contents:

Professor gives to a student a geological topic and he/she writes an essay on it.

Mode of delivery:

Independent working

Learning activities and teaching methods:

A report

Target group:

Advanced-level geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P, Basics of glacial geology 773303A, Quaternary geology of Finland 773306A

Assessment methods and criteria:

Writing an essay

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773607S: Literature study, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: 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.

Mode of delivery:

Independent working

Learning activities and teaching methods:

see above

Target group:

Advanced-level students in Quaternary geology

Prerequisites and co-requisites:

Exogenic processes 771112P, Basics of glacial geology 773303A, Quaternary geology of Finland 773306A

Recommended or required reading:

Will be informed separately

Assessment methods and criteria:

A report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773608S: Special questions in Quaternary geology, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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:

Upon completion of the course, the student will be able to critically asses and analyze recent research results of the chosen topic lectured.

Contents:

Guest lecture course on recent advances in Quaternary Geology.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures

Target group:

Geology students

Prerequisites and co-requisites:

B.Sc.-degree

Recommended optional programme components:

No

Recommended or required reading:

Will be informed separately

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

N. N.

Working life cooperation:

No

Other information:

No

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

3-6 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

After the field trip, students are able to recognize typical Quaternary formations occurring in different areas.

Contents:

A several-day domestic or foreign field trip, during which students are introduced to typical Quaternary deposits and their stratigraphic sections in different areas.

Mode of delivery:

Face to face in the field

Learning activities and teaching methods:

Teaching in the field

Target group:

Quaternary geology students

Prerequisites and co-requisites:

Exogenic processes 771112P, Quaternary geology of Finland 773306A, Basics in glacial geology 773303A

Recommended or required reading:

Selected separately for each excursion

Assessment methods and criteria:

Written report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773619S: Quaternary geology seminar II, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Seminar

Prerequisites and co-requisites:

Exogenic processes 771112P, Quaternary geology of Finland 773306A, Basics in glacial geology

Recommended or required reading:

Will be informed separately

Assessment methods and criteria:

Oral presentation and acting as an opponent

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi or J.P. Lunkka

Working life cooperation:

No

773673S: Environmental geology and geophysicfield course, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

After conducted the course student can well-founded choose and specify which kind geophysical measurements must be used in different surficial environments.

Contents:

Course gives basic knowledge and skills for studying Quaternary landforms, their consistency, ground water questions and environmental issues with geological and geophysical methods.

Mode of delivery:

Face to face in the field

Learning activities and teaching methods:

8 h lectures, 32 h exercises in the field

Target group:

Students majoring in Quaternary geology

Prerequisites and co-requisites:

Exogenic processes 771112P, Quaternary geology of Finland 773306A, Basics in glacial geology 773303A

Assessment methods and criteria:

Active participation and report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773679S: Studies in other universities, 0 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

Varies depending on the original course

Contents:

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

Assessment methods and criteria:

Read more about [assessment criteria](#) at the University of Oulu webpage.

Person responsible:

Professor responsible of the subject in question

773657S: Pro gradu thesis, 30 op**Opiskelumuoto:** Advanced Studies**Laji:** Diploma thesis**Vastuuysikkö:** Oulu Mining School**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish**ECTS Credits:**

35 credits

Language of instruction:

Finnish/ English

Timing:

5th year

Learning outcomes:

Upon completing their Master's thesis, students will gain advanced understanding on a subject belonging to two of the four specializations: Quaternary geology and geoenvironment. They will be able to use and apply pertinent research methods and theoretical knowledge of their research field, make independent inferences from their observations and measurements, and utilize effectively scientific literature.

Contents:

Independent research and literature study and production of scientific text

Mode of delivery:

Personal supervision

Learning activities and teaching methods:

Students carry out a personal research project, which is normally based field and/or laboratory work, and they write a Master's thesis (pro gradu) on the results. The topic of the thesis is agreed with the supervisor from the department and with other potential internal or external supervisors. Personal guidance is given by the supervisor(s) during the research and writing stage. The official reviewers of the thesis are decided by the chair of the educational programme board of the department after the proposal of the professor of the discipline and the thesis is accepted and rated by the educational programme board.

Target group:

All advanced-level geology students

Prerequisites and co-requisites:

A sufficient amount of intermediate- and advanced-level courses has to be done to enable the student to start independent research work

Recommended or required reading:

Is decided separately in each case

Assessment methods and criteria:

Thesis

Read more about [assessment criteria](#) at the University of Oulu webpage.**Grading:**

1-5/fail

Person responsible:

Professors

Working life cooperation:

Yes (commonly)

770690S: Maturity test, 0 op**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuysikkö:** Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

0 credits

Language of instruction:

English

Timing:

5th year

Learning outcomes:

The student can write an informative abstract on his/her M.Sc. thesis.

Contents:

The student describes and analyses the material, research methods, and results of his/her M.Sc. thesis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Independent work

Target group:

Compulsory for all M.Sc. students in geosciences.

Prerequisites and co-requisites:

Written after the completion of the M.Sc. thesis.

Recommended optional programme components:

No alternative course units.

Recommended or required reading:

No reading

Assessment methods and criteria:

Written abstract, which must fit on a single page. It is written on a separate form and is accepted by the study programme committee of the department.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Professors

Working life cooperation:

No

H327032: Advanced studies in Geoenvironment, 20 - 100 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Study module

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvaauksia.

E9

774636S: Geochemistry of Mining Environment, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

28 h lectures

Target group:

Geology students interested in environmental issues. The course is also applicable to chemistry or process and environmental technology students.

Prerequisites and co-requisites:

Prerequisite for geology students Basic course in geochemistry (774301A). Also recommended Introduction to environmental geochemistry (774329A).

Recommended or required reading:

Jambor, J. L., Blowes, D. W., Ritchie, A. I. M. (Eds.) Environmental Aspects of Mine Wastes, Mineralogical Association of Canada, Short Course Series, Vol. 31, 2003, 430 s., Plumlee, G.S., Longsdon, M.J. (Eds.) The Environmental Geochemistry of Mineral Deposits. Reviews in Economic Geology, 1999, Vol. 6A. The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

examination/essay

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

E. Hanski

Working life cooperation:

No

488121S: Fundamentals of Civil Engineering, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Kauko Kujala

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester, during periods 1-2

Learning outcomes:

The student knows how to calculate stability and settlement of municipal earth structures, design the structures against frost depth and frost heave and evaluate the needs for soil improvement. The student can also design geotechnical structures of industrial and domestic landfills. The student knows risks of the excavations and slopes and can design those using mathematical theories.

Contents:

Norms and instructions, basis of geotechnical design, earth and road structures, properties of soil material and industrial by-products, slope stability, settlement calculations, soil improvement, excavations, frost depth and frost heave calculation, thaw settlement, dams and tailings, landfill bottom

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (35 h) and design and calculation exercises (40 h) also self-study (60 h)

Target group:

Students in Master program of Water and Geoenvironmental Engineering

Prerequisites and co-requisites:

488115A Geomechanics

Recommended optional programme components:

-

Recommended or required reading:

Handout and other materials delivered in lectures

Assessment methods and criteria:

Examination and homeworks

Read more about [assessment criteria](#) at the University of Oulu webpage.**Grading:**

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Kauko Kujala

Working life cooperation:

No

Other information:

-

488111S: Modelling in Geoenvironmental Engineering, 5 op**Voimassaolo:** 01.08.2005 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuysikkö:** Field of Process and Environmental Engineering**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

485305S Modelling in Geoenvironmental Engineering 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during periods 5-6

Learning outcomes:

After the course the student can apply the numerical calculation methods in design and dimensioning of earth and geoenvironmental structures. The student can evaluate the influence of boundary conditions and material parameters in calculation results.

Contents:

Contaminant transport. Design and dimensioning of waste containment systems, liner systems for landfills and surface impoundment, tailings and dams, Settlement calculation due to different load types, Calculating the earth pressure of Retaining walls, Freezing and thawing of earth structures.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (20 h), design (18 h) and modelling assignments (97 h).

Target group:

Students in Master program of Water and Geoenvironmental Engineering

Prerequisites and co-requisites:

488115A Geomechanics

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout and other materials delivered in lectures

Assessment methods and criteria:

To solve given assignments and to write reports about them

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Kauko Kujala

Working life cooperation:

No

Other information:

-

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

After conducted the course student can well-founded choose and specify which kind geophysical measurements must be used in different surficial environments.

Contents:

Course gives basic knowledge and skills for studying Quaternary landforms, their consistency, ground water questions and environmental issues with geological and geophysical methods.

Mode of delivery:

Face to face in the field

Learning activities and teaching methods:

8 h lectures, 32 h exercises in the field

Target group:

Students majoring in Quaternary geology

Prerequisites and co-requisites:

Exogenic processes 771112P, Quaternary geology of Finland 773306A, Basics in glacial geology 773303A

Assessment methods and criteria:

Active participation and report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

488115S: Geomechanics, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyskikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Kauko Kujala

Opintokohteen kielet: Finnish

Leikkaavuudet:

480211A Advanced Course in Environmental Geotechnics 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester, during periods 3-4

Learning outcomes:

Have a clear understanding of mechanical behaviour of soil structures in loading and environmental conditions. Understand design and dimensioning principles and can explain environmental aspects of soil behaviour.

Contents:

Origins and composition of soils, classification of soils, stress and strains in soils, mechanical properties of soils, stability of slopes, bearing capacity of foundation, seepage analyses, freezing and thawing of soils, site investigations and in situ testing.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures, calculation and design exercises

Target group:

Students in Master program of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

488121S Introduction to Civil Engineering

Recommended or required reading:

Lecture handout and other materials delivered in lectures

Assessment methods and criteria:

Examination and homeworks

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Kauko Kujala

Working life cooperation:

No

477715S: Environmental and Social Responsibility in Mining, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jaakko Rämö

Opintokohteen kielet: English

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

In periods 1-3. It is recommendable the student to take this course on the first year, or on the second year autumn term, of the Master's degree phase of his/her studies, i.e. the fourth year / fifth year autumn of all.

Learning outcomes:

After completion of this course the student is able to develop, apply and assess the targets, practices and methods of environmentally and socially responsible mining in practice.

Mode of delivery:

Implemented as distance learning.

Learning activities and teaching methods:

Lectures and exercises by distance learning & learning diaries.

Target group:

The students of the Mineral Processing study option in the study programmes Process Engineering or Environmental Engineering, etc. and the students of Luleå University of Technology (LTU) within the Nordic Mining School (NMS) agreement between LTU and the University of Oulu.

Prerequisites and co-requisites:

The Bachelor level studies of the process or environmental engineering study programmes or respective knowledge, and the preceding Master level studies or respective knowledge.

Recommended optional programme components:

The other courses of the Master's phase curriculum.

Recommended or required reading:

Lectures + articles delivered during lectures

Assessment methods and criteria:

Participation to the lectures & learning diary.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Rauno Sairinen (University of Eastern Finland), Nordic Mining School Coordinator Jaakko Rämö (Thule Institute, University of Oulu).

Working life cooperation:

No

Other information:

This course is organized within the Nordic Mining School (NMS) agreement between Luleå University of Technology, Sweden and the University of Oulu.

488205S: Environmental Load of Process Industry, 4 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niina Koivikko

Opintokohteen kielet: English

Leikkaavuudet:

ay488215S Industry and Environment (OPEN UNI) 5.0 op

488215S Industry and Environment 5.0 op

488221S Environmental Load of Industry 5.0 op

480314S Control of Environmental Load from Processes of Pulp and Paper Industry 2.5 op

480315S Control of Environmental Load from Processes of Metallurgical Industry 2.5 op

ECTS Credits:

4 cr

Language of instruction:

English

Timing:

Implementation in spring semester during 6th period.

Learning outcomes:

The student is able to identify the essential features of the environmental load in different types of (chemical, wood, metallurgical,...) industry. He/she is able to explain the type, quality, quantity and sources of the emissions. The student is able to apply the main emission control systems and techniques in

different industrial sectors. He/she has the skills to apply BAT-techniques in emission control. The student can explain the environmental management system of an industrial plant and is able to apply it to an industrial plant.

Contents:

Effluents: types, quality, quantity, sources. Unit operations in managing effluents, comprehensive effluent treatment. Environmental management systems, environmental licences, environmental reporting and BAT.

Mode of delivery:

Lectures.

Learning activities and teaching methods:

Lectures 30 h.

Target group:

Master's degree students of the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

The courses 477011P Introduction to Process Engineering, 488011P Introduction to Environmental Engineering, 488204S Air Pollution Control Engineering and 488110S Water and Wastewater Treatment recommended before-hand.

Recommended optional programme components:

-

Recommended or required reading:

Material represented in lectures and in the Optima environment.

Assessment methods and criteria:

Written final exam

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University researcher Satu Ojala

Working life cooperation:

No

Other information:

-

488103A: Environmental Impact Assessment, 4 - 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Björn Klöve

Opintokohteen kielet: English

Leikkaavuudet:

488133A Environmental Impact Assessment 5.0 op

ay488103A Environmental Impact Assessment (OPEN UNI) 5.0 op

480170S Environmental Impact Assessment and Diminishing Harmful Effects in Water Resource Management 5.0 op

ECTS Credits:

4 or 8 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-4

Learning outcomes:

The student will acquire a broad and multidisciplinary and sustainable approach to environmental impact assessment (EIA). The student will know the all steps in EIA process and the different methods used in environmental impact assessment. During the course students develop their working life skills (e.g. writing, communication and presentation skills) and the ability to review environmental problems. They also learn how to resolve extensive environmental projects related problems, causes and consequences.

Contents:

EIA process and legislation, environmental change, principles and assessment methods in ecology, hydrology, economics and social sciences.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The whole course contains lectures 18 or 32 h, independent works (assignments and learning diaries, 90 or 175 h and seminars 0 or 9 h. Totally 108 h or 216 h

Target group:

Master students in the Environmental Engineering study program

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course or to have corresponding knowledge prior to enrolling for the course unit: 488011P Introduction to Environmental Engineering

Recommended optional programme components:

-

Recommended or required reading:

Environmental Impact Assessment: Cutting Edge for the Twenty-First Century (Gilpin A, 1995, ISBN 0-521-42967-6). Lecture hand-outs and other materials delivered in lectures.

Assessment methods and criteria:

The course includes 5 modules, which are evaluated separately (with the scale 1-5). The first module is 4 ECTS credits and it is requisite for next modules. Other modules are 4 ECTS credits including seminar. The final grade of the course is weighted average of modules. Credit points of the modules are used as a weighted factor. Assessment methods of modules vary including learning diaries and different kind of assignments. More information about assessment methods of each module is given during the course. Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Björn Klöve

Working life cooperation:

No

Other information:

The course is arranged in alternate years (even autumn semesters). The course is organised in a co-operation with faculty of Technology, the company Pöyry Finland Oy, and the Thule institute.

488110S: Water and Wastewater Treatment, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisangela Heiderscheidt

Opintokohteen kielet: English

Leikkaavuudet:

480151S	Water and Wastewater Treatment	7.0 op
480208S	Industrial Water and Wastewater Treatment	3.5 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-2

Learning outcomes:

Upon completion of the course, the student will be able to explain basic processes of water and wastewater treatment and can do the selection of needed process units and can dimensioning those.

Contents:

Characters of raw water, tap water and wastewater; used process units in water and waste water treatment; selection of process units; dimensioning treatment units and unit processes.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

lectures (50 h), exercises (40 h), self-study (45 h)

Target group:

Students in master program of environmental engineering

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course or to have corresponding knowledge prior to enrolling for the course unit: 488011P Introduction to Environmental Engineering

Recommended optional programme components:

-

Recommended or required reading:

Lecture hand-outs & Kemira, About water treatment. Optional: RIL 124-2, Vesihuolto II; Metcalf & Eddy, Wastewater Engineering: Treatment and Reuse; AWWA, Water quality & treatment; AWWA, Water treatment plant design.

Assessment methods and criteria:

Course can be completed A) by book examination (Kemira), the lecture examination and to do 2 exercises OR B) by the final examination and to do 2 exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Laboratory Engineer Jarmo Sallanko

Working life cooperation:

No

Other information:

-

A326103: Surficial Geology, advanced studies, 60 op

Opiskelumuoto: Advanced Studies

Laji: Study module

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

engl/

773601S: Glacial Geology II, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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:

Upon completion of the course the student will be able to explain the 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 paleoice-sheets.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

26 h lectures

Target group:

Geology students

Prerequisites and co-requisites:

B.Sc.-degree

Recommended optional programme components:

No

Recommended or required reading:

Glaciers & Glaciation. Benn, D. I. & Evans, D. J. A. Arnold. 1998.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

No

773616S: Aerial photo interpretation in surficial geology, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course, students should be able to identify and interpret basic landforms from air photographs.

Contents:

Basics of air photograph interpretation; identification of landforms from air photographs and topographical maps; mapping based on air photograph interpretation and the necessary field research. Students compile a map of a small area.

Mode of delivery:

Face to face

Learning activities and teaching methods:

20 h lectures, 30 h practicals

Target group:

Advanced-level geoscience students

Prerequisites and co-requisites:

Quaternary geology of Finland 773306A, Basics of glacial geology 773303A

Assessment methods and criteria:

Excercises and an examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course, students have gained knowledge of the mode of occurrence of elements in surficial deposits, research methods of heavy minerals and their use 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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

Advanced-level geoscience students

Prerequisites and co-requisites:

Surficial geology in ore exploration 73322A

Recommended or required reading:

McClennaghan, M., Bobrowsky, P.T., Hall, G.E.M. & Cook, S.J., Drift Exploration in Glaciated Terrain, Geological Society Special Publication n:o 185, 2001, 350 p.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course students have 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 their use in ore exploration.

Mode of delivery:

Face to face

Learning activities and teaching methods:

30 h lectures

Target group:

Advanced-level geoscience students

Prerequisites and co-requisites:

Advanced course of surficial geology in ore exploration I 773641S

Recommended or required reading:

Selected articles

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773621S: Global environmental and climate change during the Cenozoic, 4 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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:

Upon completion of the course the student will be able to explain 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 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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures

Target group:

Geology students

Prerequisites and co-requisites:

No

Recommended optional programme components:

No

Recommended or required reading:

Lunkka, J. P. 2008. Maapallon ilmastoehistoria. Gaudeamus - Helsinki University Press. 286 s. and other selected readings.

The availability of the literature from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

No

773646S: Advanced field techniques, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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:

Upon completion of the course the student will be able to use a range of field techniques required in Quaternary Geology research projects (e.g. aerial image, sedimentological, drilling, ground penetrating techniques).

Contents:

Field course comprises planning and implementation of geological methods to collect geological data (sedimentological, geomorphological and geophysical data) from a preselected field area.

Mode of delivery:

Face to face teaching in the field

Learning activities and teaching methods:

40 h lectures

Target group:

Geology students

Prerequisites and co-requisites:

B.Sc.-degree

Recommended optional programme components:

No

Recommended or required reading:

No

Assessment methods and criteria:

Participation in the field course

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi or J. P. Lunkka

Working life cooperation:

No

Other information:

No

773648S: Sedimentary Structures, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Pekka Lunkka

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

Finnish (in English if required)

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course, the student is able to identify various sedimentary structures and facies associations and use them for palaeoenvironmental reconstructions.

Contents:

The course introduces the sedimentary structures, the physical background of their genesis and the occurrence of these structures in different sedimentary environments. The course also includes exercises to identify different sedimentary structures.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures, 15 h exercises

Target group:

Geology students

Prerequisites and co-requisites:

B.Sc.-degree

Recommended optional programme components:

No

Recommended or required reading:

Reineck, H-E. & Singh, I. B. Depositional Sedimentary Environments. 1980. Springer-Verlag. Pages 1-176.
The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

No

Other information:

No

773647S: Sedimentology, 6 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Pekka Lunkka

Opintokohteen kielet: Finnish

ECTS Credits:

6 credits

Language of instruction:

Finnish (in English if required)

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course, the student will be able to explain how different sediment beds and sediment associations are related to different sedimentary environments. The student will also be able link individual observations to various sedimentary processes and their products and explain the fundamental concepts used in sequence stratigraphy.

Contents:

The topics that are introduced in the course are: sedimentary environments their processes and products, basin analysis and sequence stratigraphy.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures

Target group:

Geology students

Prerequisites and co-requisites:

B.Sc.-degree

Recommended optional programme components:

No

Recommended or required reading:

Reading, H. G. 1996. Sedimentary Environments. Blackwell Science Ltd. 688 pp. And Coe, A. L. 2005. The Sedimentary Record of Sea-level Change. Cambridge University Press. 287 pp. Lecture notes. The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

Ei

Other information:

No

773613S: Literature essay, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Student searches literature on the given topic and writes an essay.

Contents:

Professor gives to a student a geological topic and he/she writes an essay on it.

Mode of delivery:

Independent working

Learning activities and teaching methods:

A report

Target group:

Advanced-level geoscience students

Prerequisites and co-requisites:

Exogenic processes 771112P, Basics of glacial geology 773303A, Quaternary geology of Finland 773306A

Assessment methods and criteria:

Writing an essay

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773607S: Literature study, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: 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.

Mode of delivery:

Independent working

Learning activities and teaching methods:

see above

Target group:

Advanced-level students in Quaternary geology

Prerequisites and co-requisites:

Exogenic processes 771112P, Basics of glacial geology 773303A, Quaternary geology of Finland 773306A

Recommended or required reading:

Will be informed separately

Assessment methods and criteria:

A report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773608S: Special questions in Quaternary geology, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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:

Upon completion of the course, the student will be able to critically assess and analyze recent research results of the chosen topic lectured.

Contents:

Guest lecture course on recent advances in Quaternary Geology.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures

Target group:

Geology students

Prerequisites and co-requisites:

B.Sc.-degree

Recommended optional programme components:

No

Recommended or required reading:

Will be informed separately

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

N. N.

Working life cooperation:

No

Other information:

No

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

3-6 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

After the field trip, students are able to recognize typical Quaternary formations occurring in different areas.

Contents:

A several-day domestic or foreign field trip, during which students are introduced to typical Quaternary deposits and their stratigraphic sections in different areas.

Mode of delivery:

Face to face in the field

Learning activities and teaching methods:

Teaching in the field

Target group:

Quaternary geology students

Prerequisites and co-requisites:

Exogenic processes 771112P, Quaternary geology of Finland 773306A, Basics in glacial geology 773303A

Recommended or required reading:

Selected separately for each excursion

Assessment methods and criteria:

Written report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773619S: Quaternary geology seminar II, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

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.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Seminar

Prerequisites and co-requisites:

Exogenic processes 771112P, Quaternary geology of Finland 773306A, Basics in glacial geology

Recommended or required reading:

Will be informed separately

Assessment methods and criteria:

Oral presentation and acting as an opponent

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi or J.P. Lunkka

Working life cooperation:

No

773673S: Environmental geology and geophysicfield course, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

After conducted the course student can well-founded choose and specify which kind geophysical measurements must be used in different surficial environments.

Contents:

Course gives basic knowledge and skills for studying Quaternary landforms, their consistency, ground water questions and environmental issues with geological and geophysical methods.

Mode of delivery:

Face to face in the field

Learning activities and teaching methods:

8 h lectures, 32 h exercises in the field

Target group:

Students majoring in Quaternary geology

Prerequisites and co-requisites:

Exogenic processes 771112P, Quaternary geology of Finland 773306A, Basics in glacial geology 773303A

Assessment methods and criteria:

Active participation and report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

V. Peuraniemi

Working life cooperation:

No

773679S: Studies in other universities, 0 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

Varies depending on the original course

Contents:

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

Assessment methods and criteria:

Read more about [assessment criteria](#) at the University of Oulu webpage.

Person responsible:

Professor responsible of the subject in question

773657S: Pro gradu thesis, 30 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

35 credits

Language of instruction:

Finnish/ English

Timing:

5th year

Learning outcomes:

Upon completing their Master's thesis, students will gain advanced understanding on a subject belonging to two of the four specializations: Quaternary geology and geoenvironment. They will be able to use and apply pertinent research methods and theoretical knowledge of their research field, make independent inferences from their observations and measurements, and utilize effectively scientific literature.

Contents:

Independent research and literature study and production of scientific text

Mode of delivery:

Personal supervision

Learning activities and teaching methods:

Students carry out a personal research project, which is normally based field and/or laboratory work, and they write a Master's thesis (pro gradu) on the results. The topic of the thesis is agreed with the supervisor from the department and with other potential internal or external supervisors. Personal guidance is given by the supervisor(s) during the research and writing stage. The official reviewers of the thesis are decided by the chair of the educational programme board of the department after the proposal of the professor of the discipline and the thesis is accepted and rated by the educational programme board.

Target group:

All advanced-level geology students

Prerequisites and co-requisites:

A sufficient amount of intermediate- and advanced-level courses has to be done to enable the student to start independent research work

Recommended or required reading:

Is decided separately in each case

Assessment methods and criteria:

Thesis

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

Professors

Working life cooperation:

Yes (commonly)

770690S: Maturity test, 0 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

0 credits

Language of instruction:

English

Timing:

5th year

Learning outcomes:

The student can write an informative abstract on his/her M.Sc. thesis.

Contents:

The student describes and analyses the material, research methods, and results of his/her M.Sc. thesis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Independent work

Target group:

Compulsory for all M.Sc. students in geosciences.

Prerequisites and co-requisites:

Written after the completion of the M.Sc. thesis.

Recommended optional programme components:

No alternative course units.

Recommended or required reading:

No reading

Assessment methods and criteria:

Written abstract, which must fit on a single page. It is written on a separate form and is accepted by the study programme committee of the department.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Professors

Working life cooperation:

No

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

488132S: Cold Climate Engineering, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuuksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Kauko Kujala

Opintokohteen kielet: English

Leikkaavuudet:

485307S Cold Climate Engineering 5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course is held in 4th and 5th period

Learning outcomes:

By completing the course, students will be able to describe and understand cold climate requirements in geotechnical engineering. Students have the skills to design and dimension earth structures in cold climate and arctic conditions.

Contents:

Snow and ice engineering, snow precipitation and snowmelt, bearing capacity of ice, frost action and frozen soils, thaw weakening, building foundations and infrastructure in permafrost.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures, group work and seminar presentation

Target group:

Master students in the water and civil engineering orientation of the Environmental Engineering program

Prerequisites and co-requisites:

The required prerequisite is the completion of the following courses prior to enrolling for the course unit: 488115A Geomechanics, 488121S Introduction to Civil Engineering

Recommended optional programme components:

-

Recommended or required reading:

Material represented in lectures and in the Optima environment

Assessment methods and criteria:

Written exam and seminar presentations

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Kauko Kujala

Working life cooperation:

No

Other information:

The course is arranged in alternate years (even spring semesters)

488131S: Geoenvironmental Engineering, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuuksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Kauko Kujala

Opintokohteen kielet: Finnish

Leikkaavuudet:

485306S Geoenvironmental Engineering 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester during periods 1-2

Learning outcomes:

The student knows norms and instruction which are related to contaminated sites. The students can choose the suitable remediation of contaminated soil. The student can calculate contaminant transport in soils. The student can also design geotechnical structures of industrial and domestic landfills and evaluate the needs for remediation of contaminated soils. Student know how to used by-products from industry in different applications.

Contents:

Norms and instructions, there will be a project work where student will be discover a contaminated soil and a proposal remediation technique, Properties of soil material and industrial by-products, basis of geotechnical design to landfill environment, challenges of mining

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (20 h), group work (60 h) and independent work (55 h)

Target group:

Students in Master program of Water and Geoenvironmental Engineering

Prerequisites and co-requisites:

488115A Geomechanics

Recommended optional programme components:

-
Recommended or required reading:

Handout and other materials delivered in lectures

Assessment methods and criteria:

-
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Kauko Kujala

Working life cooperation:

No

Other information:

-

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course, students are familiar with the occurrence, composition and genesis of alkaline rocks, carbonatites and kimberlites and can assess their economic potential.

Contents:

Occurrence of alkaline rocks, carbonatites and kimberlites and their mineralogy, petrography, geochemistry, petrogenesis and economic geology.

Mode of delivery:

Face to face

Learning activities and teaching methods:

24 h lectures

Target group:

Master's and PhD students in geology.

Prerequisites and co-requisites:

Igneous petrology (772341A), Ore geology (772385A).

Recommended optional programme components:

Other courses in the International Master programme.

Recommended or required reading:

Lehtinen, M., Nurmi, P. & T. Rämö (ed.), Precambrian Geology of Finland - Key to the evolution of the Fennoscandian Shield. Elsevier, Amsterdam. Mitchell, R.H. 1986: Kimberlites; Mineralogy, Geochemistry and Petrology, 442 s.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5/fail

Person responsible:

Hugh O'Brien

Working life cooperation:

No

488108S: Groundwater Engineering, 5 op

Voimassaolo: - 31.07.2017

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuuksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Björn Klöve

Opintokohteen kielet: English

Leikkaavuudet:

480122A Groundwater Technology 5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-2

Learning outcomes:

Upon completion of the course, the student will have knowledge on water retention and flow in soils, basic theories about hydraulics of groundwater systems, groundwater quality, groundwater use and modelling. Students learn to define hydraulic characteristics of soil and aquifers. After the course students are able to estimate key factors influencing on discharge and water quality of groundwater and to use general methods to calculate groundwater flow. They also know how to plan, manage, and protect groundwater resources in a sustainable way.

Contents:

Soil and groundwater, water balance, hydraulic properties of soils, formation of groundwater, flow equations and solutions, pumping tests and methods, groundwater quality and modelling.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 10 h, calculus exercises 9 h, MODFLOW modelling exercises 16 h, modelling report 40 h, and self-study 60 h.

Target group:

Master students in the water engineering orientation of the Environmental Engineering program

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course prior to enrolling for the course unit: 488102A Hydrological Processes

Recommended optional programme components:

Recommended or required reading:

Lecture hand-outs, Physical and Chemical Hydrogeology (Domenico PA, Schwartz FW, 2nd edition, 1998, ISBN 0-471-59762-7). Maanalaiset vedet - pohjavesigeologian perusteet (Korkka-Niemi K, Salonen V-P, 1996, ISBN 951-29-0825-5). Pohjavesi ja pohjaveden ympäristö (Mälkki E, 1999, ISBN 951-26-4515-7).

Assessment methods and criteria:

Modelling assignment (40 % of the grade) and exam (60 % of the grade).

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Björn Klöve and Researcher Pekka Rossi

Working life cooperation:

No

Other information:

The course is arranged in alternate years (odd autumn semesters).

774629S: Literature essay, 4 - 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

4th or 5th year

Learning outcomes:

Students will be able to search for geochemical data from the literature, related a particular geological or geochemical problem, and write a logical synthesis on the subject.

Contents:

Independent literature search and writing of an essay on a given topic.

Mode of delivery:

Personal tuition

Learning activities and teaching methods:

Independent work

Target group:

Master geosciences students. Suitable also for chemistry students

Prerequisites and co-requisites:

Geoscience students need to have passed the Basic course in geochemistry (774301A) at least one intermediate- or advanced-level geochemistry course.

Recommended or required reading:

Will be informed separately

Assessment methods and criteria:

Essay

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

E. Hanski

Working life cooperation:

No

772689S: Nickel deposits of the Fennoscandian Shield, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

5 credits

Language of instruction:

English

Timing:

4th or 5th year

Learning outcomes:

Upon completion of the course , students should know the geology, petrogenesis, and geophysical signatures of the major Ni deposits in Finland and Fennoscandia. Major deposits covered include the Finnish Ni belt, Kevitsa, Pechenga, Mochegorsk, Outokumpu and Talvivaara. Students will be able to compare the Fennoscandian deposits to Ni deposits elsewhere in the world, and to compile key targeting criteria for exploration.

Contents:

Geology and petrogenesis of Ni deposits of the Fennoscandian Shield.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 30 h, microscopy practicals 12 h.

Target group:

Masters and PhD students in geology.

Prerequisites and co-requisites:

Igneous petrology (772341A), Ore geology (772385A).

Recommended optional programme components:

Other courses in the International Master programme.

Recommended or required reading:

Li C and Ripley EM (2011) Magmatic Ni-Cu and PGE deposits: geology, geochemistry, and genesis. Reviews in Economic Geology, vol. 17, Society of Economic Geologists

Hedenquist JW et al. (2005) Economic Geology 100th Anniversary volume, Society of Economic Geologists, 1136 p.

Eilu P (Ed.) (2012) Mineral deposits and metallogeny of Fennoscandia. Geological Survey of Finland, Special Paper 53. 401 p.

"The availability of the literature can be checked from [this link](#)."

Assessment methods and criteria:

Examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

5-1/fail

Person responsible:

N.N.

Working life cooperation:

No

477412S: Phenomena-based modelling in extractive metallurgy, 10 op

Voimassaolo: 01.08.2011 - 31.07.2017

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuuksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eetu-Pekka Heikkinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

477421S Thermodynamics in Metallurgy 6.0 op

ECTS Credits:

10 cr

Language of instruction:

Finnish

Timing:

Implementation in 1st to 3rd periods.

Learning outcomes:

Students passing the course are familiar with the most important computational methods used to investigate the most essential phenomena in the research and development of metallurgical processes. Students can e.g. calculate thermodynamic equilibria, read and construct phase stability diagrams as well as other diagrams used in the investigation of pyrometallurgical and electrochemical reactions, describe the role of inclusions in metal production, describe the structure of metallurgical slags, etc. It should however be noted that these are only examples since the contents of the course are under continuous development and therefore more detailed learning outcomes are given each year at the beginning of each course.

Contents:

Models and methods that are used to investigate the most essential chemical and physical phenomena in the research and development of metallurgical processes.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Group exercises and contact-education that supports these exercises.

Target group:

Students of process metallurgy

Prerequisites and co-requisites:

Knowledge and skills corresponding the knowledge and skills that are obtained from the Bachelor-level-studies in the programme of process or environmental engineering are required as prerequisites. In order to get credits from this course, bachelor thesis must be completed.

Recommended optional programme components:

The module of process metallurgy consists of courses 477412S, 477413S and 477414S.

Recommended or required reading:

Material will be distributed during lectures and exercises.

Assessment methods and criteria:

Group-exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Failed, 1, 2, 3, 4 and 5.

Person responsible:

University teacher Eetu-Pekka Heikkinen.

Working life cooperation:

No

Other information:

It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

477414S: Process Simulation in Extractive Metallurgy, 10 op

Voimassaolo: 01.08.2011 - 31.07.2017

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuuksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Fabritius, Timo Matti Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

477422A Metallurgical Processes 6.0 op

ECTS Credits:

10 cr

Language of instruction:

Finnish

Timing:

Implementation in 1st to 3rd periods.

Learning outcomes:

Students passing the course are familiar with the metal production processes and metallurgical unit operations used in Finland and they can create process simulations describing these processes. Additionally, students can identify the boundary conditions of the process simulations created by e.g. availability of the data and possibilities to model the phenomena involved in these processes. It should also be noted that the contents of the course are under continuous development and therefore more detailed learning outcomes are given each year at the beginning of each course.

Contents:

The most important metal production processes and metallurgical unit operations used in Finland as well as modelling and simulation of these processes.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Group exercises and contact-education that supports these exercises.

Target group:

Students of process metallurgy

Prerequisites and co-requisites:

Knowledge and skills corresponding the knowledge and skills that are obtained from the Bachelor-level-studies in the programme of process or environmental engineering are required as prerequisites. In order to get credits from this course, bachelor thesis must be completed.

Recommended optional programme components:

The module of process metallurgy consists of courses 477412S, 477413S and 477414S.

Recommended or required reading:

Material will be distributed during lectures and exercises.

Assessment methods and criteria:

Group-exercises.

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Failed, 1, 2, 3, 4 and 5.

Person responsible:

Professor Timo Fabritius.

Working life cooperation:

No

Other information:

It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

773343A: Quaternary Geology Seminar I, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

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:

Upon completion of the course, the student will be able to construct an essay on given scientific topic and give a scientific presentation on a subject of their field.

Contents:

The student prepares an essay and gives an oral presentation (about 30 minutes) on a subject that has required independent work. The student also acts once as an opponent. Active class participation required.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Seminar work (oral presentation and acting as an opponent) and independent preparation of an essay.

Target group:

Middle level geology students

Prerequisites and co-requisites:

The required pre-requisite is the completion of the following courses prior to enrolling for the course unit: Basic courses in Geology, Physical Sedimentologia 773317A and the Basics of Glacial Geology 773303A.

Recommended optional programme components:

No

Recommended or required reading:

Selected case by case

Assessment methods and criteria:

The quality of essay and the oral presentation

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

J. P. Lunkka

Working life cooperation:

Ei

Other information:

Seminar has to be passed before the preparation of B.Sc.-thesis

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

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuuksikkö: Oulu Mining School

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' ability to construct and give a scientific presentation on a subject of their field has increased and their skills to write scientific text have improved.

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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

see above.

Target group:

All geology students

Recommended or required reading:

Reading material depends on the chosen subjects and is informed upon starting the course/ or students are given the task to search for proper sources from the literature.

Assessment methods and criteria:

oral presentation and acting as an opponent

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

E. Hanski

Working life cooperation:

No