Opasraportti

FTech - Courses in English for exchange students, Oulu Mining School (2020 - 2021)

University's new study guide for academic year 2020-2021 is published at https://opas.peppi.oulu.fi

The study guide includes information on degrees, curriculums, courses and course timetables. Course registrations are still done in Oodi.

If you have questions on information in the study guide, please contact the study field's Academic Affairs Service Team https://www.oulu.fi/forstudents/faculty-study-affairs

Courses in English for exchange students at the Oulu Mining School

This Course Catalogue lists the geosciences or mining engineering and mineral processing courses taught in English that are available for exchange students at the Faculty of Technology, Oulu Mining School during academic year 2020-21.

When **preparing a study plan** please use the information provided under the **Courses** tab in this catalogue. Read carefully the information of each course you wish to take (language of instruction, target group, course content, timing, preceding studies, additional information, etc.). The courses listed in this catalogue are available for exchange students hosted by Oulu Mining School and only if the student has the required previous knowledge. Check that from the course description. Work load should be 30 ECTS cr in total per one term, Autumn/Spring (= 15 cr per period, or 60 cr per academic year).

For information on the exchange application process please see www.oulu.fi/university/studentexchange. All exchange applicants must submit their exchange application through SoleMOVE by the deadline given: Proposed Study Plan (Learning Agreement) is attached to the on-line application.

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

Teaching periods for 2020-21

Autumn term 2020
Period 1: Sept 1 - Oct 25, 2020
Period 2: Oct 26 – Dec 18, 2020

Spring term 2021
Period 3: Jan 5 – March 14, 2021
Period 4: March 15 – May 9, 2021

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

Any questions on courses at Oulu Mining School should be addressed to:

M.Sc. Marita Puikkonen
Faculty Exchange Coordinator
for Student Exchange | Incoming & Outgoing Mobility
Faculty of Technology | Faculty of Science, University of Oulu, Finland
Email: Study.Technology@oulu.fi | Study.Science@oulu.fi

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

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

773633S: Advanced Course of Surficial Geology in Ore Exploration, 5 op
491686S: Advanced rock mechanics, 5 op
772699S: Bedrock geology of Fennoscandia, 5 op
900013Y: Beginners' Finnish Course 1, 3 op
900053Y: Beginners' Finnish Course 2, 5 op
900054Y: Conversational Skills in Finnish, 3 op
493608S: Development of benefication processes, 10 op
772691S: Exploration and mining - global to local perspectives, 5 op
492602S: Financial and Project valuation of mining, 5 op
774636S: Geochemistry of Mining Environment, 5 op
772694S: Geometallurgy and mineral processing, 5 op
772675S: Geophysics in economic geology, 5 op
772692S: Hydrothermal ore deposits, 5 op
900015Y: Intermediate Finnish Course 1, 5 op
900016Y: Intermediate Finnish Course 2, 5 op
772335A: Introduction to ore mineralogy, 5 op
774639S: Isotope geochemistry for economic geologists, 5 op
772695S: Magmatic ore deposits, 5 op
493606S: Mine Geology, 5 op
492600S: Mining Engineering, 10 op
492603S: Mining Project feasibility study, 5 op
493301A: Mining geophysics, 5 op
493609S: Mining, environment and society, 5 op
493605S: Ore benefication technologies, 5 op
494605S: Potential fields and airborne geophysics I, 5 op
494606S: Potential fields and airborne geophysics II, 5 op
491687S: Process modeling in mineral processing, 5 op
493607S: Quality requirements for concentrate, 5 op
772696S: Quantitative Evaluation of Minerals in Sediments and Rocks, 5 op
773630S: Quaternary geology of Fennoscandia, 5 op
772632S: Regional ore geology of Fennoscandia, 5 op
491688S: Rock Dynamics and applications, 5 op
492608S: Rock blasting, 5 op
492300A: Rock mechanics, 5 op
772693S: Sedimentary ore deposits, 5 op
773655S: Sedimentology, 5 op
494304A: Seismology, 5 op
772667S: Seminar in ore geology, 5 op
900027Y: Special Course in Finnish: Writing Skills, 3 op
492607S: Stress wave theory and applications, 5 op
900017Y: Survival Finnish, 2 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

773633S: Advanced Course of Surficial Geology in Ore Exploration, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Pertti Sarala
Opintokohteen kielet: English

ECTS Credits:
5 ECTS.
Language of instruction:
English or Finnish.
Timing:
4th or 5th year.
Learning outcomes:
Upon completion of the course, the student knows and understand:
Mode of the element occurrence in surficial sediments
Research methods of the element occurrences
Analytical techniques: chemical and mineralogical
Mineral fractions and different concentration techniques
Heavy minerals and indicator minerals in ore exploration
Advanced surficial geochemical and biogeochemical sampling and analysis methods
Contents:
To describe and explain broadly and analytically the modes of element occurrence in surficial sediments (mainly in glaciated terrain), their analysis methods and the use of indicator minerals and advanced surficial geochemical techniques in ore exploration with an emphasis of conventional and modern approach.
Mode of delivery:
Face to face teaching.
Learning activities and teaching methods:
The implementation methods of the course vary and will be agreed on together with the students for each course. There will be 24 hours of guided teaching and visits, and about 20 hours of teaching without guidance either privately or in groups.
Target group:
Students in the 4th or 5th (periods 1 or 2) year, international students.
Prerequisites and co-requisites:
The prerequisite is the completion of the following courses prior to enrolling for the course: Geologian peruskurssi II (771114P), Johdatus Suomen maaperägeologiaan ja maaperän raaka-ainevaroihin (771116P) and Maaperägeologinen malminetsintä (773322A) or similar knowledge.
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
McClenaghan, M., Bobrowsky, P.T., Hall, G.E.M. & Cook, S.J., (2001) Drift Exploration in Glaciated Terrain, Geological Society Special Publication N:o 185, 350 p., Other materials delivered during the course.
The availability of the textbooks can be checked via this link.

Assessment methods and criteria:

Participation in the lectures, activity in private or group works, final examination. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Noppa Study Portal. Read more about assessment criteria at the University of Oulu webpage.
Grading:
Grading 1-5/fail.
Person responsible:
Pertti Sarala
Working life cooperation:
The course could include visits to the companies or guest lectures of the course's subject.

491686S: Advanced rock mechanics, 5 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5 ECTS /133 hours of work
Language of instruction:
English
Timing:
Period 2 - end of October to middle of December (once per year)
Learning outcomes:
Upon completion of the course students should: (1) understand the methods and mechanism of rock excavation; (2) understanding tunnelling in rock mass; (3) be able to perform slope stability analysis; (4) understand the concept of rock support and its applications in Mines; (5) understand the challenges associated with deep Mining and how to address them.
Contents:
(1) Methods and mechanism of rock drilling; (2) mechanical rock excavation; (3) tunnelling or drifting; (4) rock bolting; (5) shotcrete and mesh; (6) rock support systems; (7) slope stability; (8) challenges in deep drilling and deep mining; (9) stability of underground excavation.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
Lectures, assignments, lab testing, written report, and presentation
Target group:
Students in mining engineering and mineral processing, geophysics, geology, and civil engineering
Prerequisites and co-requisites:
Bachelor’s degree in one of the following fields: mining, mineral processing, geology, other civil engineering
Recommended or required reading:
Recommended materials to read:
Brady, B.H. and Brown, E.T., 2013. Rock mechanics: for underground mining. Springer Science & Business Media.
Hoek, E., 2000. Practical rock engineering.
Hudson, J.A. and Harrison, J.P., 2000. Engineering rock mechanics: an introduction to the principles. Elsevier.
Wyllie, D.C. and Mah, C., 2014. Rock slope engineering. CRC Press.
Some journal papers
Assessment methods and criteria:
Assessment methods include assignments, written report, and presentation. The total points gained will determine the final grade of the course, and it is given on the scale 0-5.
• For grade 1, the student must know and understand the basic knowledge in this course.
• For grade 2, the student must be able to do a very good analysis to one of five topics— method and mechanism of rock drilling, rock excavation /
tunnelling, rock support, slope stability analysis, deep mining challenge.
• For grade 3 the student must be able to do a very good analysis to two of the above five topics.
• For grade 4, the student must be able to do a very good analysis to three of the above five topics.
• For grade 5, the student must be able to do a very good analysis to four of the above five topics.
Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale, zero stands for a fail.
Person responsible:
Adeyemi Aladejare

772699S: Bedrock geology of Fennoscandia, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS.
Language of instruction:
The language of instruction is English.
Timing:
The course is held in the autumn semester, during period II. It is recommended to complete the course at the 4th or 5th autumn semester.
Learning outcomes:
Upon completion of this course, the student will 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 of the Finnish bedrock.
Mode of delivery:
Face to face teaching.
Learning activities and teaching methods:
36 h lectures.
Target group:
All students in geosciences.
Prerequisites and co-requisites:
It is recommended that the student has completed studies equivalent to the Bachelor's degree in geology.
Recommended optional programme components:
The course in an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
Lehtinen, M., Nurmi, P. and Rämö, T. (2005) Precambrian Geology of Finland. 736 p. Elsevier. Additional material delivered during the course.
The availability of the textbooks can be checked via this link.
Assessment methods and criteria:
Written essay.
Grading:
In the theory exam grade and final grade, the course utilizes a numerical grading scale of 1-5. Zero stands for a fail.
Person responsible:
Prof. Kari Strand and prof. Shenghong Yang
Working life cooperation:
No

900013Y: Beginners' Finnish Course 1, 3 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Leikkaavuudet:

ay900013Y Beginners' Finnish Course 1 (OPEN UNI) 2.0 op

Proficiency level:
A1 (target level A1.2)
Status:
The course is intended for the international students in every faculty of Oulu University.
Required proficiency level:
A1.1, Completion of the Survival Finnish course (900017Y) or the equivalent language skills.
ECTS Credits:
3 ECTS credits
Language of instruction:
As much Finnish as possible; English will be used as a help language.
Timing:
-
Learning outcomes:
By the end of the course the student can understand and use some familiar and common everyday expressions relating to her/himself and everyday situations. S/he can interact in a simple way provided the other person talks slowly and clearly and is willing to help. The student is able to read short simple texts and messages dealing with familiar topics. S/he also deepens her/his understanding of the Finnish language and communication styles.
Contents:
This is lower elementary course which aims to help students to learn communication skills in ordinary everyday situations. During the course, students broaden their vocabulary and knowledge of grammar and principles of pronunciation. They also practise to understand easy Finnish talk about everyday subjects, and reading and writing short and simple texts/messages.

The topics and communicative situations covered in the course are: talking about oneself, one's family, studies and daily routines, as well as asking about these things from other person; expressing opinions; food, drink and transactions in the grocery; accommodation and describing it; colours and adjectives.

The structures studied are: verb types, basics of the change of the consonants k, p and t in verbs and nouns, basics of the partitive and genitive cases, possessive structure, some declension types for nouns (word types) and the basics of the local cases.
Mode of delivery:
Contact teaching and guided self study
Learning activities and teaching methods:
Lessons 2 times a week (26 h, including the final exam) and guided self study (55 h)
Target group:
International degree and post-graduate degree students, exchange students and the staff members of the University.
Prerequisites and co-requisites:
Completion of the Survival Finnish Course
Recommended optional programme components:
-
Recommended or required reading:
Kuparinen, K. & Tapaninen, T. Oma suomi 1 (chapter 2 - 5)
Assessment methods and criteria:
Regular and active participation in the weekly lessons (twice a week), homework assignments and written exam at the end of the course will be observed in assessment.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Grading scale is 1-5.
Person responsible:
Anne Koskela
Working life cooperation:
-
Other information:
Sign-up in WebOodi or Tuudo. The course will start right after the Survival Finnish course.

900053Y: Beginners' Finnish Course 2, 5 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay900053Y Beginners' Finnish Course 2 (OPEN UNI) 4.0 op

Proficiency level:
A1.3
Status:
International degree and post-graduate degree students, exchange students and the staff members of the University.
Students of the Oulu University of Applied Sciences (OAMK) students and OAMK's international and exchange students may also participate to this cross-institutional study. The quota principle is as follows: at least two OAMK students in a course and if there are more places, they are filled according to the queuing principle.
See more information for OAMK students https://www.oulu.fi/forstudents/crossinstitutionalstudy.
Required proficiency level:
A1.2, completion of the Beginners' Finnish course 1 (900013Y) or the equivalent language skills.
ECTS Credits:
5 ECTS credits
Language of instruction:
As much Finnish as possible; English will be used as a help language.
Timing:
-
Learning outcomes:
By the end of the course the student can understand and use some very common everyday expressions and sentences. S/he can communicate in easy and routine tasks requiring a simple and direct exchange of information on familiar everyday matters. The student understands different kinds of short texts. S/he can for example locate important information in them. In addition, s/he has acquired more detailed knowledge of the language and culture.
Contents:
This is a post-elementary course. During the course students learn more about communication in ordinary everyday situations in Finnish. They also extend their vocabulary and knowledge of grammar. Students practise understanding simple Finnish talk and short texts.

The topics and communicative situations covered in the course are: talking about weather, carrying out transactions in clothing stores and at the doctor's, asking about location, asking for help/favours, expressing how you are feeling, writing an invitation and email; talking about past, describing people and things; seasons, the names of the months, travelling, vehicles, body parts, adjectives, food, drink and parties.
The structures studied are: the local cases, more about the change of the consonants k, p and t, more declension types for nouns (word types), nominative plural (basic form plural), basics of the imperfect (past tense of verbs), basics of the object cases, some postposition structures, some sentence types (predicative and necessity sentences).

Mode of delivery:
Contact teaching and quided self study
Learning activities and teaching methods:
Lessons 2 times a week (52 h, including the tests) and guided self study (83 h)
Target group:
International degree and post-graduate degree students, exchange students and the staff members of the University.
Students of the Oulu University of Applied Sciences (OAMK) students and OAMK's international and exchange students may also participate to this cross-institutional study. The quota principle is as follows: at least two OAMK students in a course and if there are more places, they are filled according to the queuing principle.
See more information for OAMK students https://www.oulu.fi/forstudents/crossinstitutionalstudy.
Prerequisites and co-requisites:
Completion of the Beginners' Finnish Course 1 or the equivalent language skills.
Recommended optional programme components:
-

Recommended or required reading:
Kuparinen, K. & Tapaninen, T. Oma suomi 1 (chapters 6 - 10)
Assessment methods and criteria:
Regular and active participation in the weekly lessons (twice a week), homework assignments and tests will be taken into consideration in the assessment.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Grading scale is 1-5.
Person responsible:
Arja Haapakoski
Working life cooperation:
-
Other information:
Sign-up in WebOodi or Tuudo. Staff members in staff training portal.

900054Y: Conversational Skills in Finnish, 3 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Proficiency level:
B1/B2 , according to the Common European Framework.
Status:
The course is intended for the international students in every faculty at the University of Oulu. Students of the Oulu University of Applied Sciences (OAMK) may also participate to this cross-institutional study. See courses, student quota and applying for OAMK students https://www.oulu.fi/forstudents/crossinstitutionalstudy.
Required proficiency level:
A2.2
Completion of Intermediate Finnish 2 (900016Y) or the equivalent language skills.
ECTS Credits:
3 ECTS credits
Language of instruction:
Finnish
Timing:
-
Learning outcomes:
By the end of the course the student can interact with a degree of fluency (and spontaneity) that makes regular interaction with native speakers quite possible. S/he can describe and explain (clearly and in detail) on a wide range of objects, experiences and events, dreams, hopes and ambitions. The student can bring out opinions, give reasons and explanations for them and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options. S/he is also able to give a (clear) prepared presentation and answer the questions posed by the audience.
Contents:
During the course students strengthen their communication skills in formal and informal situations. The goal is to activate the student's Finnish skills and encourage him/her to use them in different situations. There will be various types of situational dialogue, conversation and listening exercises in the course. In addition, students will conduct a short survey which will also be reported to other students in the class.
Mode of delivery:
Contact teaching and guided self study
Learning activities and teaching methods:
Lessons twice a week (28-30 h), group work (15 h) and guided self study (36 h)
Target group:
International degree and post-graduate degree students, exchange students and the staff members of the University. Students of the Oulu University of Applied Sciences (OAMK) may also participate to this cross-institutional study. See courses, student quota and applying for OAMK students https://www.oulu.fi/forstudents/crossinstitutionalstudy.
Prerequisites and co-requisites:

Completion of Intermediate Finnish 2 (900016Y) or equivalent skills
Recommended optional programme components:
-
Recommended or required reading:
Will be provided during the course.
Assessment methods and criteria:
To pass the course, students must attend class on a regular basis and complete group work tasks and homework assignments.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Grading is on a pass/fail basis.
Person responsible:
Anne Koskela
Working life cooperation:
-
Other information:
Sign-up in WebOodi or Tuudo. Staff members in in staff training portal.

493608S: Development of benefication processes, 10 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
10 ECTS cr / 266 hours of work
Language of instruction:
English
Timing:
Periods 3-4
Learning outcomes:
Upon completion of the course student is able to

- Describe the development of the mineral processing chain starting from mineralogy and laboratory scale tests, proceeding to pilot and industrial scale process
- Select the correct lab tests for the selected ore
- Describe the essential parameters from process development and optimization points of view.
- Analyze the reasons for the selection of processes based on raw material properties
- Select the appropriate combination of methods for a particular application
- Design the flowsheet and develop a process for the selected raw material
- Integrate various processing techniques to elaborate a complete flowsheet to recover of valuable mineral and metal from a particular ore
- Design and size equipment appropriate to the flow rate of the material to be treated
- Evaluate and report the results obtained from the experimental and field work
- Use specialized software for modelling and simulation applied to process design

Contents:
Lectures:

- Module 1 Mineral liberation case study
- Module 2 Ore Characterization for comminution circuit design
- Module 3 Process Circuit Design
- Module 4 Comminution Circuit Design
- Module 5 Batch And Locked cycle tests for the design of flotation circuits
- Module 6 Flotation Circuit Design and Scale-up (HSC)
- Module 7 Rules for selection of operation and processes
- Module 8 Pulp potential and other components in flotation in control and design
- Module 9 Design of beneficiation circuits (BFD or BFS, PFD, P&ID and symbols of the circuit
- Module 10 Mass balance using HSC and scale up from batch kinetic tests
- Module 11 Mass balance using HSC and scale up from continuous batch flotation
- Module 12 Design and start-up of mine water treatment plants

Laboratory practice

- Practice 1 Optical microscopy and MLA (trial mineral characterization)
- Practice 2 Bond test
- Practice 3 Kinetic Test to optimize parameter
- Practice 4 Continuous cycle test one component
- Practice 5 continuous cycle test for two minerals (optimization)
- Practice 6 Analysis and scale-up to pilot test
- Practice 7 Pilot test
- Practice 8 Visit to an industrial plant and report

Mode of delivery:
Lectures, exercises, modelling and simulation with HSC (use of laptops and software), laboratory practice and practical work in groups
Learning activities and teaching methods:
Simulation exercises supported by the contact-education, which consists of simulation exercises (32 hours of guided work + 16 hours of individual work = total 48 hours). The rest (approximately 87 hours) is individual work outside the lectures.
Target group:
Master's of Mining Engineering and Mineral Processing / Mineral Processing study option
Prerequisites and co-requisites:
Courses 493605S Ore benefication technologies and 491687S Process modeling in mineral processing
Recommended or required reading:

- Gupta, A., Yan, D.S. (2006). Mineral Processing Design and Operation and Introduction
- Mular, Habe, Barrat; (2002) Mineral processing plant design, practice and control, Vol. 1 and 2, SME ProceedingsMalhorta, D (2009)
- Recent Advances in Mineral Processing Plant Design, 592 pages
- Fuerstenau M., Han K, (eds., 2003), Principles of Mineral Processing. SME
- Lynch Alban (ed, 2015) Comminution handbook, AusIMM,
- Material distributed during lectures and articles and references given during the course

Assessment methods and criteria:
Due to continuous assessment used in this course, it is highly recommended that students are present in all lectures
Continuous assessment during lectures, exercises, practical work, seminar, reports. Major students participate in a seminar peer review as the assessment method. Intended learning outcomes will be assessed in a way as that the student being able to demonstrate the application of the learned skills. Also, problems discussion, but also through student's performance during lab sessions and especially through final report presentation. The final report aims to present the results in detail and on that basis to elaborate and defend the choice of a realistic flowsheet with mass and recovery balancing of the metal of interest. The choice should be based on literature review, practical work and the discussion should be based on proposing alternative options. Therefore, it is foreseeable that the competences acquired during the course will be illustrated in a quite convincing manner.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Maria Sinche Gonzalez

772691S: Exploration and mining - global to local perspectives, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr
Language of instruction:
English
Timing:
4th or 5th year
Learning outcomes:

Upon completion of the course the students should know the structure of the mining and exploration industry. This includes the major players in a variety of commodity spaces, such as copper, gold, iron ore, base metals, etc., the concepts of value chain and variable business models. In particular, the differences between resources and reserves and economic drivers of the industry (demand and supply, changes in applications, commodity speculation) will be discussed. Furthermore, strategies and methods for exploration suitable for certain ore deposits types will be reviewed.

Contents:
Based on global and regional scale examples and developments an understanding will be developed for the dynamics of the business cycle in the raw materials industry.

Mode of delivery:
Face to face

Learning activities and teaching methods:
Lectures 30 h, hand-specimen examination, home work on reserve and resource calculations, and ore values. Also, group assignment and presentations on a subject such as mining company profiles, exploration methodologies etc.

Target group:
Masters students and PhD students in geoscience or related fields. Course is also suitable for interested geography or economics students with a background/interest in geosciences and natural resources.

Prerequisites and co-requisites:
Ore geology and society (Intermediate level course: 772386A)

Recommended optional programme components:
493301A Mining geophysics
774636S Geochemistry of mining environment
772632S Regional Ore Geology of Fennoscandia
774637S Isotope geochemistry for economic geologists
772694S Geometallurgy and mineral processing

Recommended or required reading:
Crowson, P. (2008) Mining unearthed. Aspermont, 423 p.
Wellmer, F.W., Dalheimer, M., Wagner, M. (2008) Economic valuations in exploration. Springer 174 p.
Eilu P (Ed.) (2012) Mineral deposits and metallogeny of Fennoscandia. Geological Survey of Finland, Special Paper 53, 401 p.,
Maier, W., O'Brien, H., Lahtinen, R. (Eds.) (2015) Ore Deposits of Finland. Elsevier, 792 p.
The availability of the literature can be checked from this link.

Assessment methods and criteria:
Examination

Grading:
5-1/fail

Person responsible:
Prof. Shenghong Yang

492602S: Financial and Project valuation of mining, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5 ECTS /133 hours of work

Language of instruction:
English

Timing:
End of October to middle of December (once per year)

Learning outcomes:
Upon completion of the course students should: (1) be able to analyse inflation and taxation and their influences on decision making; (2) make decision on capital investment; (3) determine the best possible method for financing projects under prevailing economic conditions; (4) understand how to prepare financial statements for mining industries and others; (5) perform risk assessments of mining projects.

Contents:

(1) Introduction to financial and project valuation; (2) time value of money; (3) inflation; (4) behaviour of costs; (5) capital investment decisions; (6) financing of projects; (7) depreciation and equipment replacement; (8) taxation; (9) analysis of financial statement, (10) risk assessment in project valuation.

Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
Lectures, and assignments.
Target group:
Students in mining engineering and mineral processing, geophysics, geology, and other engineering

Prerequisites and co-requisites:
Bachelor's degree in one of the following fields: mining engineering, mineral processing, geology, other engineering
Recommended or required reading:
Recommended materials to read:
Gocht WR, Zantop H, Eggert RG. International mineral economics: mineral exploration, mine valuation, mineral markets, international mineral policies. Springer Science & Business Media; 2012 Dec 6.
Rudenno, Victor. The mining valuation handbook: mining and energy valuation for investors and management. John Wiley & Sons, 2012.
Svetlana B. Valuation of metals and mining companies. collaboration with the University of Zürich, Swiss Banking Institute and Prof. Dr. T. Hens. 2010.
Assessment methods and criteria:
Assessment methods include basically assignments. The total points gained from the above determine the final grade of the course, and it is given on the scale 0-5.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Adeyemi Aladejare

774636S: Geochemistry of Mining Environment, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr
Language of instruction:
The language of instructions is Finnish or English, depending on the participants.
Timing:
The course is held in the spring semester, during period 4. It is recommended to complete the course at the 4th or 5th spring semester.
Learning outcomes:
Upon completion of this course, the student will:

- can describe and assess environmental problems associated with metal mining,
- is familiar with the chemical and mineralogical phenomena related to acid mine drainage, and
- know how to test the acid-producing or acid-neutralizing capacity of rock types.

Contents:
Oxidation of sulphidic ores, formation of secondary minerals, water chemistry in mining environment, acid neutralisation capacity of rocks waste and its determination, factors involved in acid mining drainage (AMD) and its mitigation.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
28 h lectures
Target group:
All students in geosciences
Prerequisites and co-requisites:

Completion of 774301A Basic Course in Geochemistry and other studies equivalent to Bachelor's degree are recommended

Recommended optional programme components:

The course in an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Articles (informed separately) from the following books: Jambor, J. L., Blowes, D. W., Ritchie, A. I. M. (Eds.) (2003) Environmental Aspects of Mine Wastes, Mineralogical Association of Canada, Short Course Series, Vol. 31, 430 s., Plumlee, G.S., Logsdon, M.J. (Eds.) (1999) The Environmental Geochemistry of Mineral Deposits. Reviews in Economic Geology, Vol. 6A., Blowes et al. (2014) The Geochemistry of Acid Mine Drainage, Treatise in Geochemistry, Vol. 9.

Assessment methods and criteria:

Written essay

Grading:

In the theory exam grade and final grade, the course utilizes a numerical grading scale of 1-5. Zero stands for a fail.

Person responsible:

Prof. Kari Strand, prof. Pertti Sarala

772694S: Geometallurgy and mineral processing, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: 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 introduce main parts of the Geometallurgy: 1) ore geology, 2) process mineralogy and 3) minerals processing. The focus is 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 33 h.

Target group:

geology majors, minor subject students. Prerequisites and co-requisites: Ore geology (772385A), Introduction to Ore mineralogy (772335A).

Prerequisites and co-requisites:

Ore geology (772385A), Ore microscopy (772335A).

Recommended optional programme components:

ü Petruk, W. (2000) Applied Mineralogy in the Mining Industry, Elsevier Science B.V., Amsterdam.

ü Wills, B. & Napier-Munn, T. (2006) Wills' Mineral Processing Technology, Elsevier Science & Technology Books, ISBN: 0750644508.

ü Becker et al. (2016) Process Mineralogy, JKMRC Monograph Series in Mining and Mineral Processing: No. 6, ISBN: 978-1-74272-171-2

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, Geometallurgical investigations (for the seminar) and the seminars are compulsory. 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.

Grading:

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

Person responsible:

Jussi Liipo

Working life cooperation:

No

772675S: Geophysics in economic geology, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: 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 casa 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 exercises.

Target group:

Master's students and PhD students in geology.

Prerequisites and co-requisites:

Bachelor's degree.

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
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:
-

772692S: Hydrothermal ore deposits, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5 cr
Language of instruction:
English

Timing:
4th or 5th year

Learning outcomes:
At the end of the course, students should have knowledge of the formation of the main hydrothermal and magmatic-hydrothermal ore deposit types, their characteristics and global distribution. Different principles covering evolution of hydrothermal, and magmatic-hydrothermal fluids, importance of different fluid reservoirs, interaction of hydrothermal fluids with host-rocks and the mechanism leading to the precipitation of metals and gangue minerals. Case studies from the representative type deposits will be presented.
Contents:
Global distribution and ore formation processes of hydrothermal ore deposits.

Mode of delivery:
Face to face
Learning activities and teaching methods:
Video lectures, assignments, face to face teaching

Target group:
Master's students and PhD students in geology

Prerequisites and co-requisites:
Ore Geology and society (Malmigeologia ja yhteiskunta) or other introductory ore geology course

Recommended optional programme components:
Other courses in the international Master's degree programme MRSM Geosciences
Recommended or required reading:
Piranjo, F. 2009. Hydrothermal Processes and Mineral Systems
Robb, 2005. Introduction to ore-forming processes

Deposit related research/review papers (e.g. Hedenquist JW et al., 2005. Economic Geoogy 100th Anniversary volume, Society of Economic Geologists, 1136 p.)

Assessment methods and criteria:
Examination

Grading:
5–1/fail

Person responsible:
Jukka-Pekka Ranta
Working life cooperation:
No

900015Y: Intermediate Finnish Course 1, 5 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay900015Y Intermediate Finnish Course 1 (OPEN UNI) 4.0 op

Proficiency level:
A2.1
Status:
The course is intended for the international students in every faculty at the University of Oulu.
Required proficiency level:
A1.3, Completion of the Beginners' Finnish course 2 (900053Y) or the equivalent language skills.
ECTS Credits:
5 ECTS credits
Language of instruction:
Mainly Finnish
Timing:
-
Learning outcomes:
By the end of the course the student can communicate in ordinary everyday situations when the topics are familiar or connected with everyday matters. S/he can search for and locate key informational content in different kinds of texts. The student can also identify the topic and some details of the discussion around her/him. S/he can describe activities and personal experiences both orally and in writing and s/he also knows the difference between spoken/colloquial and written/standard language. The student knows how things can be expressed with different degrees of politeness and can apply that information in her/his own communication.
Contents:
The course is a lower intermediate course. During the course students strengthen their communication skills in ordinary everyday situations and acquire a wider vocabulary and more thorough knowledge of grammar. In addition, students practise understanding and producing Finnish talk and reading newspaper articles.

The topics and communicative situations covered in the course are: requesting different kinds of requests, expressing politeness, making appointments with friends, giving directions, doing the shopping, talking about the past and talking about his/her future plans, hobbies, transactions e.g. in the doctor's and post office.

The structures studied are: more about the imperative, the verb rections, the deverbal noun (-minen), passive present tense, part of the plural declension of nouns, the third infinitive (ma-infinitive), more about sentence types, perfect tense, more about object cases.
Mode of delivery:
Contact teaching and guided self-study.
Learning activities and teaching methods:

Lessons 2 times a week (52 h, including the tests) and guided self-study (83 h)
Target group:
International degree and post-graduate degree students, exchange students and the staff members of the University
Prerequisites and co-requisites:
Completion of the Beginners' Finnish Course 2
Recommended optional programme components:
-
Recommended or required reading:
Gehring, S. & Heinzmann, S.: **Suomen mestari 2,** (chapters 1 - 5)
Assessment methods and criteria:
Regular and active participation in the weekly lessons (twice a week), homework assignments and the tests will be taken into consideration in the assessment.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Grading scale is 1-5.
Person responsible:
Anne Koskela
Working life cooperation:
-
Other information:
Sign-up in WebOodi or Tuudo.

900016Y: Intermediate Finnish Course 2, 5 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Proficiency level:
A2.2
Status:
The course is intended for the international students in every faculty at the University of Oulu.
Also students of the Oulu University of Applied Sciences (OAMK) may also participate to this cross-institutional study. See courses, student quota and applying for OAMK students https://www.oulu.fi/forstudents/crossinstitutionalstudy.
Required proficiency level:
A2.1, Completion of the Intermediate Finnish course 1 (900015Y) or the equivalent language skills.
ECTS Credits:
5 ECTS credits
Language of instruction:
Finnish
Timing:
-
Learning outcomes:
By the end of the course the student can communicate in various informal situations in Finnish. The student understands the main points of messages and talk around her/him. S/he can produce simple connected text on topics which are familiar or of personal interest and describe experiences and also report heard content to others.
Contents:
The course is an upper intermediate course. During the course students learn the necessary written and oral skills to be able to cope in informal situations arising during everyday life, work and study. In the course, students practise understanding more Finnish talk and written texts, and finding information and talking about it to other people. In the classes the main stress is on oral exercises and group work.
The topics and communicative situations covered in the course are: transactions e.g. in clothes shops and on the phone, Finnish small talk, reacting in different situations, information and facts about Finnish celebrations and features of colloquial/spoken language.

The structures studied are: the perfect and pluperfect, revision of all the verb tenses, comparison of adjectives, conditional, more about the plural declension of nouns (particularly the plural partitive case), more about object and predicative cases, the passive imperfect.
Mode of delivery:
Contact teaching and guided self-study
Learning activities and teaching methods:
Lessons (52 h, including the tests) and guided self-study (83 h).
Target group:
International degree and post-graduate degree students, exchange students and the staff members of the University.
Students of the Oulu University of Applied Sciences (OAMK) students and OAMK's international and exchange students may also participate to this cross-institutional study. The quota principle is as follows: at least two OAMK students in a course and if there are more places, they are filled according to the queuing principle.
See more information https://www.oulu.fi/forstudents/crossinstitutionalstudy.
Prerequisites and co-requisites:
Completion of the Intermediate Finnish Course 1 or equivalent skills
Recommended optional programme components:
-
Recommended or required reading:
Gehring, S. & Heinzmann, S.: **Suomen mestari 2 (chapters 6 - 8).**
Assessment methods and criteria:
Regular and active participation in the weekly lessons (twice a week), homework assignments and the tests will be taken into consideration in the assessment.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Grading scale is 1-5.
Person responsible:
Anne Koskela
Working life cooperation:
-
Other information:
Sign-up in WebOodi or Tuudo.

772335A: Introduction to ore mineralogy, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Eero Hanski

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS
Language of instruction:
The language of instruction is English.
Timing:
The course is held in the autumn semester, during period I. It is recommended to complete the course at the 2nd or 3rd autumn semester.
Learning outcomes:
Upon completion of this course, the student will:
obtain basic knowledge on ore minerals and their mode of occurrence
learn to recognise 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 teaching.
Learning activities and teaching methods:

14 h lectures, 21 h exercises.
Target group:
All students in geosciences and mining engineering and mineral processing.
Prerequisites and co-requisites:
The recommended prerequisite is the completion of the following courses prior to enrolling for the course: 771102P Basic mineralogy, 772339A Optical mineralogy.
Recommended optional programme components:
The course in an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
Textbook: Craig, J.P. & Vaughan, D.J. (1994) Ore Microscopy and Ore Petrography. Wiley & Sons, 2nd ed. 434 p. Other handbook-type literature supporting the microscope excercises: Wiley & Sons, 2nd ed. 434 p. Ramdohr, P. (1980) The Ore Minerals and their Intergrowths, vol. 1 and 2. Pergamon Press, 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 ed. 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 textbooks can be checked via this link.
Assessment methods and criteria:
Examinations in both theory and calculations.
Grading:
In the theory exam grade and final grade, the course utilizes a numerical grading scale of 1-5. Zero stands for a fail. In the microscope exam, the course utilizes verbal grading pass/fail.
Person responsible:
Shenghong Yang
Working life cooperation:
No.

774639S: Isotope geochemistry for economic geologists, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr
Language of instruction:
English
Timing:
The course is held in the spring semester, during periods 3-4. It is recommended to complete the course at the 4th or 5th spring semester.
Learning outcomes:
Upon completion of this course, the student can interpret and assess geological literature where isotopes have been utilizedis able to calculate ages of rocks using given isotope measurements of different isotopic systems,can make inferences on the origin of different rocks types, including ore deposits, based on measured isotope ratios.
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:
All students in geosciences
Prerequisites and co-requisites:
It is recommended that the student has completed studies equivalent to the Bachelor's degree in geology
Recommended optional programme components:
The course in an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:
White, W.M. (2015) Isotope Geochemistry. Wiley-Blackwell, 496 p. or Dickin, A.P. (2005) Radiogenic Isotope Geology, 2nd edition, Cambridge University Press, 492 p. Journal articles given during the course.
Assessment methods and criteria:
Theory exam, and excel calculations as home study tasks.
Grading:
In the theory exam grade and final grade, the course utilizes a numerical grading scale of 1-5. Zero stands for a fail. Calculations are graded as pass/fail.
Person responsible:
Prof. Shenghong Yang

772695S: Magmatic ore deposits, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: 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:
After completion of the course students should have knowledge of the occurrence and ore-formation processes of magmatic ore deposits, and will thus gain an improved capability to contribute to exploration for magmatic ore deposits.
Contents:
The most important magmatic ore deposit types:
Layered intrusions related PGE, Cr, V-Ti,
Cu-Ni sulfide mineralization in mafic-ultramafic igneous rocks,
Massif anorthosite related Ti,
Kimberlite related diamond,
Alkaline and carbonatite related REE,
Pegmatite related Li, Cs, Ta,
Kiruna type iron oxide apatite,
Podiform type chromitite in ophiolite
Typical examples of these types of magmatic mineral deposits will be introduced. In the practical part, typical rock and ore samples and thin section will be observed. The exploration methods for specific deposit types will also be discussed.
Mode of delivery:
Face to face
Learning activities and teaching methods:
Lectures 30 h, hand-specimen examination, microscopy sessions, exploration modelling.
Target group:
Masters students and PhD students in geology.
Prerequisites and co-requisites:
Igneous Petrology (772341A).
Recommended optional programme components:
Other courses in the International Master’s course.
Recommended or required reading:
Hedenquist JW et al. (2005) Economic Geology 100 th Anniversary volume, Society of Economic Geologists, 1136 p. Other review papers regarding different types of ore deposits will be provided during the course.
Assessment methods and criteria:
Examination
Grading:
5-1/fail

Person responsible:
Shenghong Yang
Working life cooperation:
No

493606S: Mine Geology, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5 ECTS /133 hours of work
Language of instruction:
English
Timing:
Period 1, once a year
Learning outcomes:
Upon completion of the course the students should gain the basic knowledge in the geology related to mining engineering, mineral processing and applied geophysics. The students should be able to apply their knowledge to mining engineering, mineral processing, and other rock-related engineering fields. Lectures and exercises (e.g. drill core logging).
The course objective is to give an overview of the mine geologists work in a mining environment, and the course content covers the most common topics encountered in the daily work of a mine geologist. The focus in this course is on operations in metal mines, but are in most part applicable for other commodity type operations.
Contents:
The course includes workflow in mine geology and mine planning, drill core logging, sampling, QAQC, database, mineral resource estimation, conversion from resources to reserves, mine mapping, grade control and reconciliation, relation between mine geology and mining method, applications in mineral processing, and a practical example—mine geology in one underground mine.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
Lectures, assignments, core logging and report
Target group:
Masters students in the Mining Engineering and Mineral Processing Master's programme (compulsory course) and Masters students in Geosciences (optional course to fulfill the obligation of 10 ECTS cr of advanced level courses in mining engineering and mineral processing)
Prerequisites and co-requisites:
Introduction to geology I and II; Basic Course in Mineralogy; Principles of Mineral Processing, Rock Mechanics (BSc level courses) or completed BSc degree or respective knowlegde
Recommended or required reading:
All information required in the exam is covered in the lecture material.
Abzalov, M. (2016) Applied Mining Geology, Springer, Modern approaches in solid Earth sciences 12, 448 p
Assessment methods and criteria:
Assessment methods include assignments, written report, and written exam. The total points gained from the above determine the final grade of the course. Exam 75% and Presentation 25%.
Grading:
The course unit utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail, and 5 does for top grade, i.e., outstanding.
Person responsible:
Prof. Shenghong Yang, Guest lecturer: Jyri Meriläinen

492600S: Mining Engineering, 10 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Zongxian Zhang
Opintokohteen kielet: English

ECTS Credits:
10 ECTS /266 hours of work
Language of instruction:
English
Timing:
Spring term of the 4th academic year
Learning outcomes:
Upon completion of the course students should be able to: 1) use the knowledge of rock mechanics, rock drilling and blasting to make mining planning and mine designs; 2) perform better operations or improve current operations in drilling, blasting, extraction, tunnelling, and comminution; 3) understand the effect of ore recovery on mining economy and resource recovery; 4) gain knowledge on how to improve recovery; 5) gain the knowledge of reducing the damage to the environment due to mining activities.
Contents:
The course will first give a compact introduction to basic rock mechanics, rock drilling, rock blasting and ventilation, and then introduce basic principles for mining planning and operation design such as development and different excavations. After these, the course will introduce each mining method in detail, including mass mining methods such as sublevel caving and block caving and other common mining methods such as cut-and-fill, room-and-pillar, shrinkage, open stope, etc. In the last part of the course, mining economy related to mining operation and mining technology will be discussed, optimum fragmentation aiming to save energy will be described, and then vibration control will be introduced.
Mode of delivery:
Face to face
Learning activities and teaching methods:
Lectures, seminars, written reports, and assignments (mine visit if available).
Target group:
Students from mining and mineral processing, geophysics and geology
Prerequisites and co-requisites:
Bachelor degree in mining or mineral processing or geology or other civil engineering.
Recommended or required reading:
Recommended materials to read:
Zhang ZX. Mining Science and Technology. Compendium for course Mining Technology, University of Oulu, 2017.
Hamrin H. Underground mining methods and applications. In: Underground mining methods—engineering fundamentals and international case studies, eds. By WA Hustrulid and RL Bullock. Littleton (Colorado): Society for mining, metallurgy, and exploration, Inc, (SME), 2001, p.3-14.
Hustrulid WA, Bullock RL. Underground mining methods—engineering fundamentals and international case studies. Littleton (Colorado): Society for mining, metallurgy, and exploration, Inc, (SME), 2001.
Vergne J. Hard Rock Miner's Handbook, Edition 5. Edmonton: Stantec Consulting Ltd, 2008.
Zhang ZX. Rock fracture and blasting: theory and applications. Oxford: Elsevier, 2016 (Chapters 1, 3-7, 10, 17-19, 21-24).
Assessment methods and criteria:
Assessment methods include oral presentations, written reports, seminars, assignments and written examination. The total points gained from the above determine the final grade of the course, and it is given on the scale Fail-1-5.
• For grade 1, the student must be able to know and understand the basic knowledge in this course.
• For grade 2, the student must know how to make a preliminary plan for mining and rock support by using the knowledge in rock mechanics and mining science.
• For grade 3 the student must be able to make a plan for mining and rock support and evaluate such a plan
• For grade 4, the student must be able to make a plan for mining and rock support and evaluate such a plan. In addition, the student should be able to improve any current plan for mining and rock support by using his/her knowledge in mining science.
• For grade 5, the student must be able to apply the acquired knowledge to make a very good plan for mining and rock support. He or she must do an outstanding design in at least one aspect, e.g. he/she can find a problem in one operation or one design and know how to solve the problem or how to make improvement.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:
Prof. Zongxian Zhang, Adeyemi Aladejare

492603S: Mining Project feasibility study, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Saija Luukkanen

Opintokohteen kielet: English

ECTS Credits:
5 ECTS cr /133 hours of work
Language of instruction:
English
Timing:
1st year in Master's degree, 4th period
Learning outcomes:
After completion of the course the student should be able to understand the content of feasibility study, calculate economical conditions and profitability for mining project, describe and explain differences in feasibility studies of different project stages. The student also understands and is 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 modelling. 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:
Lectures and exercises
Target group:
Students in the MEMP Mineral Processing study option
Prerequisites and co-requisites:
Courses on economy and mining engineering are suggested
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
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Prof. Saija Luukkanen, together with lecturers

493301A: Mining geophysics, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Elena Kozlovskaya

Opintokohteen kielet: English

ECTS Credits:
5 ECTS /133 hours of work
Language of instruction:
English
Timing:
In first period
Learning outcomes:
The students got familiar with geophysical methods and instrumentation used to solve practical problems arising at al
stages of mine life circle.
Contents:
The course is intended for geophysicists, geologist and mining and rock mechanics engineers working at mines. The basic techniques of applied geophysics are introduced and explained with application to problems of exploration, development, planning, operation, closure and reclamation of open and underground mines. For each method, principles, instrumentation, field procedures, interpretation and case histories are discussed. The students get familiar with the geophysical instrumentation used in specific mining environment. A part of the course is introduction to mining seismology and the modern methods and techniques used to monitor and study seismicity and rock bursts in underground mines.
Target group:
geophysics, geology, mining engineering students
Assessment methods and criteria:
continuous assessment (home work), final exam
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Elena Kozlovskaya
Working life cooperation:
No

493609S: Mining, environment and society, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5 ECTS /133 hours of work
Language of instruction:
English
Timing:
During period 3
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.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Jukka-Pekka Ranta/Ninna Immonen. Lecturer Rauno Sairinen (University of Eastern Finland).
Working life cooperation:
No

493605S: Ore benefication technologies, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English, Finnish

ECTS Credits:
5 ECTS cr /133 hours of work
Language of instruction:
English
Timing:
Autumn semester, period 1. It is recommended to complete the course at the 1st autumn semester of the Master's studies.
Learning outcomes:
Upon completion of the course students should be able to:

- Describe the principles and applications of the main beneficiation technologies
- Recognize the variables affecting the selection of the process techniques
- Understand the characteristics of the feed material and behaviour during physical and chemical beneficiation processes (comminution, flotation, gravity separation and sedimentation processes) and characteristics of the products and waste
- Understand of optimization methods applied in beneficiation plants
- Apply knowledge in practical exercises, carrying out calculation of sample size, efficiencies, balances and basic design of the unit operations that are used in ore processing

Contents:
Module 1: Introduction to Mineral Processing Technology
Module 2: Mineral Characterization Techniques
Module 3: Comminution - Size reduction
Module 4: Beneficiation Technologies - Physical Separation Techniques
Module 5: Physic-chemical separation techniques
Module 6: Solid-Liquid Separation
Module 7: Cu, Fe, Phosphate beneficiation and Optimization in separation processes
Module 8: Seminar (technic, method or process reviewed)
Additionally, it is included Practices in sampling, comminution, flotation, mass balances, lab test calculation (in laboratory or on-line according to the situation)
Mode of delivery:
Classroom education and on-line, practice in laboratory
Learning activities and teaching methods:
Lectures 24h / Practice 16h / Group work 12h / Self-study includes exercises and assignments 75h
Target group:
Students in the study option MEMP Mineral processing, minor subject and other students of the Oulu Mining School and Faculty of Technology
Prerequisites and co-requisites:
493300A Principles in Mineral Processing, 493302A Chemical Phenomena in Mineral processing for Finnish students
Previous courses in Mineral Processing for international students
Recommended optional programme components:

The course is an independent entity and does not require additional studies out at the same time. Review of the material and reding is recommended.
Recommended or required reading:
Wills & Napier-Munn: Mineral processing technology; Elsevier Science & Technology Books, ISBN: 0750644508
Gupta, A., Yan, D.S. (2006). Mineral Processing Design and Operation and Introduction
Material, articles and references given during the course.
Assessment methods and criteria:
Continuous assessment during lectures, exercises (participation), reports, papers review, questionary self-learning, quizzes
The final assessment method: Seminar peer review and Assignment
Due to continuous assessment used in this course, it is highly recommended that the students are present already in the first lecture and attendance is very important
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Maria Sinche Gonzalez

494605S: Potential fields and airborne geophysics I, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Moisio, Kari Juhani

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits
Language of instruction:
Finnish/English
Timing:
Autumn semester every other year (odd years), period 1. Recommended at 1st or 2nd year of the Master's studies.

Learning outcomes:
Upon completion of the courses tudent identifies the special characteristics of airborne geophysical measurements and knows how to process and interpret airborne geophysical data. In addition student can explain the major physical properties of rocks and rock forming minerals and their mutual dependence.
Contents:
The course provides basic knowledge on airborne geophysical investigation methods and also on the petrophysical properties of rocks and minerals. Course focuses on the airborne geophysical mapping made by the Geological Survey of Finland including magnetic, electromagnetic and radiometric measurements, and their characteristics. On behalf of petrophysics the physical properties of rocks and minerals including density, magnetic, elastic, electric, thermal and radiometric properties are considered.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures and exercises 40 h, independent work and self study.
Target group:
Students of the Oulu Mining School and those interested in airborne geophysics and petrophysics.
Prerequisites and co-requisites:
No specific prerequisites
Recommended optional programme components:
The course is an independent entity, does not require additional studies carried out at the same time.
Recommended or required reading:
Lecture materials
Assessment methods and criteria:
Variable grading and evaluation methods

Grading:

1-5/fail
Person responsible:
Kari Moisio

Working life cooperation:
No working life cooperation
Other information:
-

494606S: Potential fields and airborne geophysics II, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Elena Kozlovskaya
Opintokohteen kielet: English

ECTS Credits:
5 cr
Language of instruction:
English
Timing:
Period 2
Learning outcomes:
The students understand the background of application of airborne gravity and electromagnetic methods (frequency and time domain) in exploration and other stages of mine life circle.
Contents:
The course is continuation of the course Potential Fields and Airborne Geophysics, Part I. It consideres airborne gravity and electromagnetic methods and their application in exploration and mining
Mode of delivery:
Lectures, practicals, digital learning
Learning activities and teaching methods:
Lectures, practical exersises, independent work
Target group:
Master's students in Mining Enginereering and Mineral Processing, especially the Applied Geophysics study option
Prerequisites and co-requisites:
Potential Fields and Airborne Geophysics, Part I
Assessment methods and criteria:
Exam
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Elena Kozlvskaya
Working life cooperation:
No

491687S: Process modeling in mineral processing, 5 op

Voimassaolo: 01.08.2018 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

ECTS Credits:

5 ECTS cr
Language of instruction:
English
Timing:
Period 2
Learning outcomes:
Students passing the course can use computational methods. They can use commercial the process simulation software (i.e. HSC Sim -software) to model metallurgical and mineral processes. This means that the student will know how to 1) model flowsheets for various processes, 2) apply simulation in practical problems in mineral processing and 3) run calculation and analyse the results.
Contents:
The course focuses on general information and exercises in HSC-Sim (Flowsheet simulation -module): HSC-Sim structure and user interface, toolbar, drawing a flowsheets with HSC Sim, data necessary for building up a simulation in mineral processing, structure of HSC Sim Distribution mode, simulation of metallurgical balance. Additionally, it will include general information about HSC Geo and mineral data browser.
Mode of delivery:
Classroom education, demonstration exercises using HSC software, face to face teachingd
Learning activities and teaching methods:
Simulation exercises supported by the contact-education, which consists of simulation exercises (32 hours of guided work. The rest is individual work outside the lectures
Target group:
Students of mineral processing, process metallurgy and process chemistry
Prerequisites and co-requisites:
493605S Ore beneficiation technologies or respective. Knowledge and skills obtained from the Bachelor-level-studies in engineering or science programmes, computation is required as prerequisites.
Recommended optional programme components:
This course is part of the M.Sc. level studies in Oulu Mining School
Recommended or required reading:
HSC manual
Assessment methods and criteria:
Continuous assessment consisting of simulation exercises and reports based on the exercises. Final Assignment. Due to continuous assessment used in this course, it is highly recommended that the students are present in all sessions.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Maria Sinche Gonzalez
Working life cooperation:
Invited lecturers

493607S: Quality requirements for concentrate, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Saija Luukkanen

Opintokohteen kielet: English

ECTS Credits:
5 ECTS /133 hours of work
Language of instruction:
English
Timing:
1st year in Master's degree 3rd period
Learning outcomes:
After finishing this course student understands the main quality requirements of the final mineral processing concentrate which effect on further processing in each selected case. The student knows the main economic and technical factors and limitations related to the successful process.
Contents:

Quality requirements for selected concentrates, Distribution of penalty elements in final concentrates, Calculation of Net Smelter Return, Price variation, Typical pricing clauses, Exercises
Learning activities and teaching methods:
Lectures and exercises
Target group:
Mineral processing majors, minor subject students
Prerequisites and co-requisites:
Principles of mineral processing
Recommended optional programme components:
Ore beneficiation technologies
Assessment methods and criteria:
Continuous evaluation based on the course lectures and exercises participation
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Saija Luukkanen, Maria Sinche Gonzalez
Working life cooperation:
No

772696S: Quantitative Evaluation of Minerals in Sediments and Rocks, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr
Language of instruction:
English
Timing:
4th or 5th study year
Learning outcomes:
Upon completion of the course, the student will be able to do quantitative mineral evaluations for sediments and rocks. Optical microscopy, electron microprobe (EMPA), scanning electron microscopy (SEM) and QEMSCAN studies of specific samples are learned to identify useful minerals e.g. ore indicator minerals and quantify their relative abundances especially when looking for base metals or critical metals and minerals. Automated mineralogy systems are introduced to let you obtain data about your samples, such as mineralogical composition, mineral grain`s composition, rock minerals distribution, minerals elements distribution and includes in minerals.
Contents:
The topics that are introduced in the course are: what is a quantitive mineral evaluation, what materials can be studies and for what purposes, analytical equipments needed, examples of research results and own learning exercise.
Mode of delivery:
Face to face
Learning activities and teaching methods:
24 h lectures and exercise
Target group:
Advance level geoscience students
Prerequisites and co-requisites:
Bachelor of Science degree
Recommended or required reading:
Announced separately
Assessment methods and criteria:
Attending lectures and written examination
Grading:
5-1/fail
Person responsible:
Kari Strand

Working life cooperation:
No

773630S: Quaternary geology of Fennoscandia, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
5 cr
Language of instruction:
English or Finnish
Timing:
4th (periods 3 or 4) or 5th year
Learning outcomes:
Upon completion of the course, the student knows and understand:

- Main glacial-interglacial phases during Quaternary in Fennoscandia
- Key stratigraphy sections in Nordic countries
- Main marginal deposits and their regional existence
- Main glaciogenic morphology areas and their indication to glaciers' development
- Age and stages of the last deglaciation
- The development of Baltic Sea and Holocene sedimentary deposits

Contents:
After the course students can describe and explain Quaternary history of Fennoscandia including main glacial phases and Late Pleistocene glacial-interglacial cycles, main marginal and morphological deposition areas, key sites of the Quaternary stratigraphy, development of the Baltic Sea and marine coastlines and Holocene sedimentary deposits.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
24 hours of guided teaching, and about 20 hours of teaching without guidance either privately or in groups.
Target group:
Students in the 4th or 5th year, international and PhD students in geology
Prerequisites and co-requisites:
The prerequisite is the completion of the following courses prior to enrolling for the course: Kvartääristratigrafia (773300A) and Glasiaaligeologian perusteet (773344A) or similar knowledge.
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
Required reading:
Donner, J. (1995) The Quaternary History of Scandinavia. World and Regional Geology 7. Cambridge University Press, 200 pp.; Ehlers et al. (2011) Developments in Quaternary Science, Vol. 15, Elsevier Amsterdam, The Netherlands: Glacial History of Finland, Norway and Denmark; Ehlers & Gibbard (2004) Quaternary Glaciations – Extent and Chronology, Elsevier: Glacial history of Sweden. Other materials delivered during the course.
Additional reading:
Svendsen et al. (2004) Late Quaternary ice sheet history of northern Eurasia. Quaternary Science Reviews 23, 1229-1271; Kleman et al. (2008) Patterns of Quaternary ice sheet erosion and deposition in Fennoscandia and a theoretical framework for explanation. Geomorphology 97, 73-90., Olsen et al. (2013) Quaternary glacial, interglacial and interstadial deposits of Norway and adjacent onshore and offshore areas. Geological Survey of Norway Special Publication, 13, pp. 79–144.
The availability of the literature can be checked from this link.

Assessment methods and criteria:
Participation in the lectures, activity in private or group works, final examination. The assessment of the course is based on the learning outcomes of the course.
Grading:
1-5/fail

Person responsible:
Pertti Sarala

772632S: Regional ore geology of Fennoscandia, 5 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: 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:
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 courses of the International Master programme.
Recommended or required reading:
Eilu P (Ed.) (2012) Mineral deposits and metallogeny of Fennoscandia **.** Geological Survey of Finland, Special Paper 53. 401 p., Maier, W., O'Brien, H., Lahtinen, R. (Eds.) (2015) Ore Deposits of Finland. 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:
N.N.
Working life cooperation:
No

491688S: Rock Dynamics and applications, 5 op

Voimassaolo: 01.08.2018 -
Opiskelumuoto: Advanced Studies
Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5 ECTS cr /133 hours of work
Language of instruction:
English
Timing:
Autumn: Period 1
Learning outcomes:
Upon completion of the course students should: (1) understand and remember basic rock properties under different loading conditions; (2) understand the characters of rock fragmentation under different loading conditions; (3) be able to apply the concept of rock dynamics to rock support; (4) make better design of open cut and tunnelling; (5) be able to apply rock dynamics to solve problems related to working safety and the environment.
Contents:
(1) dynamic properties of rock; (2) experimental techniques under dynamic loading to rock; (3) ground motions due to earthquakes; (4) rock fracture and fragmentation under dynamic loading conditions; (5) dynamic Responses and stability of rock foundations (6) dynamic responses and stability of rock excavation in rock; (7) dynamics of rock burst and possible countermeasure; (8) application in open cut and tunnelling; (9) application in production blasting; (10) application in safety and environment protection
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
Lectures, assignments, lab testing, written report, and presentation
Target group:
Students in mining engineering and mineral processing, geophysics, geology, and civil engineering
Prerequisites and co-requisites:
Bachelor's degree in one of the following fields: mining engineering, mineral processing, geology, other civil engineering
Recommended or required reading:
Recommended materials to read:
Li CC. Rock bolting. Oxford: Elsevier, 2017.
Zhang ZX. Rock fracture and blastng: theory and applications. Oxford: Elsevier, 2016 (Chapters 1, 3-6, 17-25).
Zhou, Y. and Zhao, J. Advances in rock dynamics and applications. CRC Press. (Eds.). (2011).
Some journal papers.
Assessment methods and criteria:
Assessment methods and criteria: Assessment methods include assignments, written report, and presentation. The total points gained will determine the final grade of the course, and it is given on the scale 0-5.

- For grade 1, the student must know and understand the basic knowledge in this course.
- For grade 2, the student must be able to do a very good analysis to one of five topics— dynamic rock properties / dynamic experiments, rock fracture / fragmentation, rock burst / seismic event, dynamic responses and stability of rock foundations and underground excavation , and one of the applications listed above (Contents).
- For grade 3 the student must be able to do a very good analysis to two of the above four topics.
- For grade 4, the student must be able to do a very good analysis to three of the above four topics.
- For grade 5, the student must be able to do a very good analysis to four of the above four topics.

Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale, zero stands for a fail.
Person responsible:
Adeyemi Aladejare

492608S: Rock blasting, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Zongxian Zhang

Opintokohteen kielet: English

ECTS Credits:
5 ECTS cr / 133 hours of work
Language of instruction:
English
Timing:
1st Master's year period 2
Learning outcomes:
Upon completion of the course students should: (1) have basic knowledge in explosives and detonators /initiators; (2) understand basic process of rock fracture and fragmentation by blasting; (3) understand those important factors or parameters that greatly influence blasting results; (4) be able to make a good plan for rock blasting in various type of operations such as tunnelling or excavation, surface and underground production blasting, vibration control, etc.; (5) be able to make any necessary improvement to current blasting operation if it is optimum.
Contents:
The course will: (1) introduce basic knowledge of explosives and initiators/detonators; (2) introduce process of rock blasting and mechanism of rock fracture by blasting; (3) present effect of free surface and expansion space on blasting results; (4) introduce effect of burden and spacing on blasting results; (5) discuss effect of stemming, primer placement, delay time, specific charge, air deck, and decoupling on blasting results; (6) present some examples from industry on increasing ore recovery, improving safety and so on by making a scientific blast plan; (7) introduce some special techniques in blasting applications.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
Lectures, seminars, written reports, and assignments.
Target group:
Students from mining engineering and mineral processing, geophysics and geology, and other civil engineering related blasting
Prerequisites and co-requisites:
Bachelor’s degree in engineering such as civil engineering, mining engineering or mineral processing, or in geology
Recommended or required reading:
Zhang ZX. Rock fracture and blasting: theory and applications. Oxford: Elsevier, 2016.
Assessment methods and criteria:
Assessment methods include oral presentations, written reports, seminars, assignments and written examination. The total points gained from the above determine the final grade of the course, and it is given on the scale 0-5.

- For grade 1, the student must be able to know and understand the basic knowledge in this course.
- For grade 2, the student must know how to make a blast plan in engineering.
- For grade 3 the student must be able to judge whether a blast is good or not by the theory in the course.
- For grade 4, the student must be able to make a better or best plan for practical blasting operation.
- For grade 5, the student must be able to apply the acquired knowledge to solve a practical problem related blasting and to do improvement on a current practical blast operation is it is not well designed.

Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Prof. Zongxian Zhang

492300A: Rock mechanics, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Zongxian Zhang

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS cr /133 hours of work
Language of instruction:
English
Timing:
Spring, period 3
Learning outcomes:
Upon completion of the course students should: (1) know the basic properties of rock; (2) be able to make stress or strain analysis to a rock sample and a rock structure; (3) be able to analyse rock failure under compression, shear and tension loads; (4) know which factors influence rock failure or fracture and know how those affect rock fracture; (5) know the basic principles and methods in rock support; (6) be able to do rock support design; (7) be able to apply rock mechanics theory to tunnelling, mining planning, rock drilling, rock excavation, slope engineering, and other rock-related engineering.
Contents:
The course will: (1) introduce basic properties and characteristics of rock and rock mass; (2) introduce stress analysis method; (3) present basic theory on rock failure or fracture; (4) introduce basic methods for measuring rock strengths (compressive, shear and tensile) in laboratory; (5) present methods for measuring in-situ stresses; (6) introduce methods for rock support; (7) give knowledge on how to apply rock mechanics to mining engineering and other types of rock engineering.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
Lectures, seminars, written reports, and assignments (mine visit if available).
Target group:
Students from mining and mineral processing, geophysics and geology
Recommended or required reading:
Brady BHG and Brown ET. Rock Mechanics for underground mining, third edition. New York: Kluwer Academic Publishers, 2004.
Goodman RE. Introduction to rock mechanics, second edition. New York: John Wiley & Sons, 1989.
Zhang ZX. Rock fracture and blasting: theory and applications. Oxford: Elsevier, 2016 (Chapters 1, 3-7, 10, 17-19, 21-24).
Assessment methods and criteria:
Assessment methods include oral presentations, written reports, seminars, assignments and written examination. The total points gained from the above determine the final grade of the course, and it is given on the scale Fail-1-5.
• For grade 1, the student must be able to know and understand the basic knowledge in this course.
• For grade 2, the student must know how to make stress analysis and rock failure analysis.
• For grade 3 the student must be able to make a plan for rock support.
• For grade 4, the student must be able to make a plan for rock support and evaluate such a plan.
• For grade 5, the student must be able to apply the acquired knowledge to make a very good plan for mining and rock engineering operation by using rock mechanics. He or she must do an outstanding design in at least one aspect, e.g. he/she can find a problem related rock mechanics or rock fracture and know how to solve the problem or how to make improvement.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Zongxian Zhang

772693S: Sedimentary ore deposits, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Strand

Opintokohteen kielet: English

ECTS Credits:
5 credits
Language of instruction:
English
Timing:
4th or 5th year
Learning outcomes:
Upon completion of the course the students should know the distribution of the main sedimentary ore deposits in Finland and globally, as well as their geology and petrogenesis.
Contents:
Global distribution and petrogenesis of sedimentary ore deposits, including Witwatersrand gold deposits, Ti beach sand deposits, and Western Australian and Brazilian BIFs as well as typical SEDEX deposits.
Mode of delivery:
Face to face
Learning activities and teaching methods:
Lectures 30 h, hand-specimen examination, microscopy sessions.
Target group:
Masters students and PhD students in geology.
Prerequisites and co-requisites:
Sedimentary petrology (772344A).
Recommended optional programme components:
Other courses in the International Master programme.
Recommended or required reading:
Hedenquist JW et al. (2005) Economic Geology 100 th 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.
Assessment methods and criteria:
Examination
Grading:
5-1/fail
Person responsible:
Kari Strand
Working life cooperation:
No

773655S: Sedimentology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Strand

Opintokohteen kielet: Finnish, English

ECTS Credits:
5 credits
Language of instruction:
Finnish (optionally English)
Timing:
4th or 5th study year
Learning outcomes:
Upon completion of the course, the student will be able to explain how different sediment bedforms and sedimentary associations are related to different sedimentary environments. The student will also be able link individual observations to various sedimentary processes and their products, understand facies analysis method 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
Learning activities and teaching methods:
30 h lectures
Target group:
Advanced-level geology students.
Prerequisites and co-requisites:
Bachelor of Science degree
Recommended or required reading:
Applicable parts of Reading, H.G. (1996) Sedimentary Environments. Blackwell Science Ltd. 688 s. and Coe, A.L. (2005) The Sedimentary Record of Sea-level Change. Cambridge University Press. 287 p. Lecture notes.
Assessment methods and criteria:
Examination
Grading:
5-1/fail
Person responsible:
Kari Strand
Working life cooperation:
No

494304A: Seismology, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Elena Kozlovskaya

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr
Language of instruction:
English
Timing:
Period 4
Learning outcomes:
The students understand the basics of seismology, its application for investigating the Earth interior and for solution of problems in engineering seismology
Contents:
The course consists of two parts. In the first part the background of seismology are considered: seismic waves, seismic sources and their mechanisms, application of different types of seismic waves for studying the Earth interior, inner structure of the Earth based on seismological data. In the second part the students get familiar with engineering seismology, including site investigation and characterisation, seismic zonation and seismic hazard assessment.
Learning activities and teaching methods:
Lectures, practicals,digital learning
Target group:
Students in Mining Engineering and Mineral Processing, Geosciences, etc.
Prerequisites and co-requisites:
Bachelor's degree or previous studies in Mining Engineering and Mineral Processing, Geosciences, etc
Recommended or required reading:
Lecture materials, on-line materials
Assessment methods and criteria:
Exam
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Elena Kozlovskaya

Working life cooperation:
No

772667S: Seminar in ore geology, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: 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 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.
Assessment methods and criteria:
Oral presentation and acting as an opponent
Grading:
Pass/fail
Person responsible:
Prof. Shenghong Yang

900027Y: Special Course in Finnish: Writing Skills, 3 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Proficiency level:
B1/B2, according to the Common European Framework.
Status:
Course is intended for the international students in every faculty at the University of Oulu.
Students of the Oulu University of Applied Sciences (OAMK) students and OAMK's international and exchange students may also participate to this cross-institutional study. The quota principle is as follows: at least two OAMK

students in a course and if there are more places, they are filled according to the queuing principle.See more information https://www.oulu.fi/forstudents/crossinstitutionalstudy.
Required proficiency level:
A2.2 Completion of the Finnish for Advanced Students (900020Y) or the equivalent language skills.
ECTS Credits:
3 ECTS credits
Language of instruction:
Finnish
Timing:
-
Learning outcomes:
By the end of the course the student can write coherent and detailed descriptions and summaries about various matters. S/he is able to summarize text and justify his/her own statements of opinions. In addition, the student knows the steps of the writing process and understands the significance of a text's function and target audience. S/he can also differentiate between formal and informal writing styles.
Contents:
During the course students develop their writing skills in Finnish and are guided in the drafting of different text types and documents needed in studies and work. In the course students learn how to write informal and formal letters, an argument-essay, a summary, a job application and a report.
Mode of delivery:
One contact lesson at the beginning of the course and guided independent studying using online
Learning activities and teaching methods:
The course will be held online using a Moodle environment.
Target group:
Course is intended for the international students in every faculty at the University of Oulu.
Students of the Oulu University of Applied Sciences (OAMK) students and OAMK's international and exchange students may also participate to this cross-institutional study. The quota principle is as follows: at least two OAMK students in a course and if there are more places, they are filled according to the queuing principle.See more information https://www.oulu.fi/forstudents/crossinstitutionalstudy.
Prerequisites and co-requisites:
Completion of the Intermediate Finnish Course 2
Recommended optional programme components:
-
Recommended or required reading:
Web based material in Moodle.
Assessment methods and criteria:
To pass the course, the student must complete all the required writing assignments.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Grading is on a pass/fail basis.
Person responsible:
Anne Koskela
Working life cooperation:
-
Other information:
Sign-up in WebOodi or in Tuudo. Staff members in staff training portal.

492607S: Stress wave theory and applications, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Zongxian Zhang

Opintokohteen kielet: English

ECTS Credits:
5 ECTS /133 hours of work
Language of instruction:
English

Timing:
1st year 1st period
Learning outcomes:
Upon completion of the course students should: (1) know the basic theory on shock waves; (2) understand stress wave theory, especially one-dimensional elastic wave theory; (3) be able to apply some shock wave principles to civil engineering, particularly rock engineering; (4) be able to apply stress wave theory to general engineering practices such as rock drilling, rock blasting, rock support (especially dynamic rock support), excavation /tunnelling, testing or measuring dynamic behaviour or properties of general solids, controlling or reducing vibrations, safety engineering, material development, and other applications in rock and mining engineering.
Contents:
The course will: (1) introduce basic characteristics of shock waves and stress waves; (2) introduce shock wave collision and its applications in engineering; (3) present basic theory on stress waves, focusing on one-dimensional waves; (4) introduce wave reflection and transmission; (5) introduce spalling theory and its engineering applications; (6) present wave attenuation and dispersion in solids, focusing on rock mass; (7) introduce typical examples from engineering, focusing on rock, mining and mineral processing.
Mode of delivery:
Face to face
Learning activities and teaching methods:
Lectures, seminars, written reports, and assignments (lab testing if the instruments are ready).
Target group:
Students from civil engineering, material science, mechanical engineering, mining and mineral processing, geophysics and geology
Prerequisites and co-requisites:
Bachelor degree in engineering such as civil engineering, mining or mineral processing or geology.
Recommended optional programme components:
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Recommended or required reading:
Book used in teaching:
Zhang ZX. Rock fracture and blasting: theory and applications. Oxford: Elsevier, 2016 (Chapters 1 and 2 will be main contents for teaching, and some other chapters are for reading only).

Recommended materials to read:
Kolsky H. Stress waves in solids. New York: Dover Publications; 1963.
Johnson W. Impact strength of materials. London: Edward Arnold; 1972.

Assessment methods and criteria:
Assessment methods include oral presentations, written reports, seminars, assignments and written examination. The total points gained from the above determine the final grade of the course, and it is given on the scale Fail-1-5.
• For grade 1, the student must be able to know and understand the basic knowledge in this course.
• For grade 2, the student must know how to make stress wave analysis.
• For grade 3 the student must be able to use the theory to analyse a problem related to stress waves.
• For grade 4, the student must be able to solve a problem by using the theory.
• For grade 5, the student must be able to apply the acquired knowledge to solve a wave problem and to do improvement on a current practical operation is it is not perfect design.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Zongxian Zhang
Working life cooperation:
No
Other information:
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900017Y: Survival Finnish, 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay900017Y Survival Finnish Course (OPEN UNI) 2.0 op

Proficiency level:
A1.1
Status:
The course is intended for the international students in every faculty at the University of Oulu.
Required proficiency level:
No previous Finnish studies.
ECTS Credits:
2 ECTS cr
Language of instruction:
Finnish and English.
Timing:
-
Learning outcomes:
By the end of the course the student can understand and use some very common everyday expressions and phrases, and s/he can locate informational content in simple texts and messages. The student also knows the basic characteristics of Finnish language and Finnish communication styles.
Contents:
This is an introductory course which aims to help students to cope with the most common everyday situations in Finnish. During the course, students learn some useful everyday phrases, some general features of the vocabulary and grammar, and the main principles of pronunciation.

The topics and communicative situations covered in the course are: general information about the Finnish language, some politeness phrases (how to greet people, thank and apologize), introducing oneself, giving and asking for basic personal information, numbers, some time expressions (how to tell and ask the time, days of the week, time of day), food, drink and asking about prices.

The structures studied are: personal pronouns and their possessive forms, forming affirmative, negative and interrogative sentences, the conjugation of some verbs, the basics of the partitive singular and some local cases for answering the ‘where'-question.
Mode of delivery:
Contact teaching, on-line learning and independent work. There will be organized also one on-line group in each semester.
Learning activities and teaching methods:
Lessons 2 times a week (26 h, including the final exam) and guided self study (24 h).
Target group:
International degree and post-graduate degree students, exchange students and the staff members of the University.
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Will be provided during the course.
Assessment methods and criteria:
Regular and active participation in the weekly lessons (twice a week), homework assignments and written exam at the end of the course will be observed in assessment.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Grading scale is on a pass/fail basis.
Person responsible:
Arja Haapakoski
Working life cooperation:
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Other information:
Sign-up in WebOodi or in Tuudo.