Opasraportti

FTech - Mining Engineering and Mineral Processing, M.Sc. (Tech.) (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

MINING ENGINEERING AND MINERAL PROCESSING, MASTER’S PROGRAMME

The Master’s Programme of Mining Engineering and Mineral Processing (national, or the respective international programme Mineral Resources and Sustainable Mining) serves mining industry by educating professionals familiar with safe and sustainable mining and mineral processing, and able to design and manage the mining activities accordingly.

The MEMP Programme has three study options (majors) to choose from: Mining Engineering, Mineral Processing and Applied Geophysics. Their curricula include advanced level courses in the chosen major, as well as in process engineering and geosciences, etc.

The master level studies give the students profound understanding of the design, research and planning operations in mining engineering, mineral processing or in applied geophysics.

Study option Mining Engineering gives students excellent knowledge on the mine value chain and the phases therein. The graduating students will understand economical, regulatory, geological and technical principles related to sustainable mining. They are specialized in the processes of, for example rock engineering and excavation techniques and they recognize environmental and social aspects of the mining.

In the study option Mineral Processing students will master the unit processes used in processing of the minerals and are aware of the geological, technical, economical and legal aspects of sustainable operations. Students know mineral processing techniques, phenomena and automation, and simulation techniques used in concentrating plants.

Studies in the study option Applied Geophysics train students to master the main geophysical methods and measurement techniques and to analyze the data obtained and apply the knowledge in the whole mine life cycle, taking the requirements of the sustainable mining into account.

Tutkintorakenteet

Mining Engineering and Mineral Processing, Master of Science in Technology, 2020-21

Tutkintorakenteen tila: published

Lukuvuosi: 2020-21

Lukuvuoden alkamispäivämäärä: 01.08.2020

Modules of the Study Options, MSc Tech Mining Engineering and Mineral Processing (60 op)

Choose only one of the following modules, according to your study option: Mining Engineering, Mineral Processing, or Applied Geophysics.

Study Option Mining Engineering

A439128: Mining Engineering, Module of the Option, 0 - 60 op
- *Mining Engineering*
  - 493301A: Mining geophysics, 5 op
  - 491686S: Advanced rock mechanics, 5 op
  - 772694S: Geometallurgy and mineral processing, 5 op
  - 492607S: Stress wave theory and applications, 5 op
  - 491688S: Rock Dynamics and applications, 5 op
  - 492600S: Mining Engineering, 10 op
  - 492608S: Rock blasting, 5 op
  - 492602S: Financial and Project valuation of mining, 5 op
  - 492603S: Mining Project feasibility study, 5 op
  - 493609S: Mining, environment and society, 5 op
  - 491602S: Professional practical training, 5 op

Study Option Mineral Processing

A439127: Mineral Processing, Module of the Option, 0 - 60 op
- *Mineral Processing*
  - 772694S: Geometallurgy and mineral processing, 5 op
  - 493606S: Mine Geology, 5 op
  - 772335A: Introduction to ore mineralogy, 5 op
  - 477713S: Automation in Mineral Processing, 5 op
  - 493605S: Ore benefication technologies, 5 op
  - 491687S: Process modeling in mineral processing, 5 op
  - 493607S: Quality requirements for concentrate, 5 op
  - 493608S: Development of benefication processes, 10 op
  - 492603S: Mining Project feasibility study, 5 op
  - 493609S: Mining, environment and society, 5 op
  - 491602S: Professional practical training, 5 op

Study Option Applied Geophysics

A439131: Module of the Option, Applied Geophysics, 60 op
- *Applied Geophysics*
  - 493301A: Mining geophysics, 5 op
  - 494601S: Electrical and EM-methods I, 5 op
  - 494602S: Electrical and EM-methods II, 5 op
  - 494603S: GIS applications, 5 op
  - 494604S: Seismic soundings, 5 op
  - 494605S: Potential fields and airborne geophysics I, 5 op
  - 494606S: Potential fields and airborne geophysics II, 5 op
  - 493606S: Mine Geology, 5 op
  - 492603S: Mining Project feasibility study, 5 op
  - 493609S: Mining, environment and society, 5 op

492602S: Financial and Project valuation of mining, 5 op
491602S: Professional practical training, 5 op

Supplementary module (30 op)

The Master of Science in Technology includes minimally 120 ECTS cr of studies, of which 60+30 cr are compulsory and 30 cr come from free choices courses. Choose to this Supplementary Module minimally 30 cr courses. The courses must be suitable to your study option, giving you advanced or complementary knowledge. Choose the courses from University of Oulu Master level engineering courses or from other fields' MSc level courses, or e.g. respective courses completed during an exchange study period.

Master's Thesis and Maturity Test (30 op)

This module includes a Master's Thesis, 30 ECTS cr, and a Maturity Test, 0 ECTS cr. Both are a compulsory parts of the Master of Science in Technology degree.

491601S: Master's thesis, 30 op
491600S: Maturity test, 0 op

Studies Supplementing Previous Knowledge, MSc Tech Mining Engineering and Mineral Processing (enintään 30 op)

Here as the studies supplementing previous studies, students starting their Master's studies without a previous Bachelor's Degree in Mining Engineering and Mineral Processing from the University of Oulu, can choose BSc level studies supplementing their previous knowledge towards the MSc.

Students can take these courses only if the studies (max. 30 ECTS cr) have been planned and accepted for them together with their tutor teacher or study advisor in the beginning of Master's studies, while preparing their Personal Study Plans.

These studies will be included as compulsory to their MSc studies and will therefore disminish the number of optional credits or courses in their degree.

A439126: Bridge studies, Mining Technology and Mineral Processing, 0 - 60 op

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

491300A: Practical Training, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

A439128: Mining Engineering, Module of the Option, 0 - 60 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies
Laji: Study module
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Mining Engineering

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

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

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 geo-metallurgical 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

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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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

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

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

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

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

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

491602S: Professional practical training, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English, Finnish

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish or English

Timing:

Student usually works in summer intern time during his/her Master's studies. The course is completed by giving a seminar presentation during the autumn term after the internship.

Learning outcomes:

During the advanced practical training the student get familiarized with the working environment from the point of view of his/her studies and becomes acquainted with another possible future job or to a different assignment already in a familiar working environment. The student can identify the problems of the working environment and can solve them. The student can apply theoretical knowledge in practical tasks. The student identifies the tasks appropriate for the Master of Science in Technology at his/her workplace.

Contents:

Suitable areas for practical training are, for example, the mining and metallurgical industry and mining projects.

Mode of delivery:

Working as an employee or as supervisor

Learning activities and teaching methods:

Students will find the training positions themself. Suitable places/employers for the training are e.g. mines, mining projects, research institutes in the field, etc. The objective is to give a deeper and more detailed conception of the industrial area where the student will possibly work after graduation. Suitable tasks would be supervision tasks and R&D tasks.

Target group:

Master’s students in Mining Engineering and Mineral Processing

Assessment methods and criteria:

Completing the training period plus presenting it orally in a seminar. A job certificate (original referenced) must be shown and an application must be submitted to the seminar supervisor. 491602S Professional Practical Training cannot be substituted with work experience aquiered before starting the studies.

Grading:

Verbal scale Passed/Failed

Person responsible:

Professors and teachers teachers (e.g. Saija Luukkanen, Zongxian Zhang, Elena Kozlovskaya, Kari Moisio, Jukka-Pekka Ranta) of Mining Engineering and Mineral Processing

Working life cooperation:

Yes.

A439127: Mineral Processing, Module of the Option, 0 - 60 op

Voimassaolo: 01.08.2016 -
Opiskelumuoto: Advanced Studies
Laji: Study module
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Mineral Processing

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 geo-metallurgical 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

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

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.

477713S: Automation in Mineral Processing, 5 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Markku Ohenoja
Opintokohteen kielet: Finnish
Leikkaavuudet:

477510S	Automation in Mineral Processing	5.0 op
477724S	Numerical Mine Modelling	5.0 op

ECTS Credits:

5 ECTS /135 hours of work

Language of instruction:

English

Timing:

Implementation in the 4th period (spring term).

Learning outcomes:

The target is to give the students the skills to understand and develop models for minerals processing and apply these models in process monitoring, optimization and control.

Contents:

Models for processes like crushing, grinding, flotation, leaching, separation etc. Examples how to use these models in process control and what kind of benefits can be drawn from their use.

Mode of delivery:

Lectures and demonstrations

Learning activities and teaching methods:

Lectures during one period

Target group:

Master’s students in process and environmental engineering. Exchange students.

Prerequisites and co-requisites:

Basic knowledge in minerals processing and control engineering.

Recommended or required reading:

Lecture notes in English

Assessment methods and criteria:

Lecture exams. Final exam is also possible.

Grading:

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

Person responsible:

D.Sc. (Tech.) Markku Ohenoja

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

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

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

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

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

491602S: Professional practical training, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Practical training
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English, Finnish

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish or English

Timing:

Student usually works in summer intern time during his/her Master's studies. The course is completed by giving a seminar presentation during the autumn term after the internship.

Learning outcomes:

During the advanced practical training the student get familiarized with the working environment from the point of view of his/her studies and becomes acquainted with another possible future job or to a different assignment already in a familiar working environment. The student can identify the problems of the working environment and can solve them. The student can apply theoretical knowledge in practical tasks. The student identifies the tasks appropriate for the Master of Science in Technology at his/her workplace.

Contents:

Suitable areas for practical training are, for example, the mining and metallurgical industry and mining projects.

Mode of delivery:

Working as an employee or as supervisor

Learning activities and teaching methods:

Students will find the training positions themself. Suitable places/employers for the training are e.g. mines, mining projects, research institutes in the field, etc. The objective is to give a deeper and more detailed conception of the industrial area where the student will possibly work after graduation. Suitable tasks would be supervision tasks and R&D tasks.

Target group:

Master’s students in Mining Engineering and Mineral Processing

Assessment methods and criteria:

Completing the training period plus presenting it orally in a seminar. A job certificate (original referenced) must be shown and an application must be submitted to the seminar supervisor. 491602S Professional Practical Training cannot be substituted with work experience aquiered before starting the studies.

Grading:

Verbal scale Passed/Failed

Person responsible:

Professors and teachers teachers (e.g. Saija Luukkanen, Zongxian Zhang, Elena Kozlovskaya, Kari Moisio, Jukka-Pekka Ranta) of Mining Engineering and Mineral Processing

Working life cooperation:

Yes.

A439131: Module of the Option, Applied Geophysics, 60 op

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

Ei opintojaksokuvauksia.

Applied Geophysics

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

494601S: Electrical and EM-methods 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 / 133 hours of work

Language of instruction:

Finnish/English

Timing:

Every 2nd year (odd years) on autumn semester, period 1. Recommended at 1st or 2nd year of the Master' s studies.

Learning outcomes:

Upon completion of the course student will be able to explain the basis of the electrical resistivity methods, theory, application and usage and knows how to adapt, analyse and interpretate measured data from different methods in order to investigate near surface structure.

Contents:

The basic concepts of the electrical resistivity methods, their theoretical background and adaptation to the investigation of near surface structure.

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 electrical research methods.

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

Other information:

-

494602S: Electrical and EM-methods 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 theoretical background of electromagnetic methods of applied geophysics, they are familiar with main types of instrumentation and they can apply the EM methods to in mining, mineral exploration and environmental studies.

Contents:

This is a second part of the course Electric and Electromagnetic Methods devoted mainly to theory and application of geophysical methods that aim to determine variations in the electric properties of the Earth using propagation of electromagnetic waves.

Learning activities and teaching methods:

Lectures, on-line studying

Target group:

Mining Engineering and Mineral Processing students, especially in the Applied Geophysics study option

Prerequisites and co-requisites:

Bachelor's degree/studies, in Mining Engineering and Mineral Processing students, especially in the Applied Geophysics study option, or respective

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 Kozlvskaya

Working life cooperation:

No

494603S: GIS applications, 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 credits

Language of instruction:

English

Timing:

4th or 5th autumn

Learning outcomes:

After the course, students can can use GIS-software, he can identify, apply and modify different types of spatial data and analyze them with spatial analysis tools. He can also create understandable and clear visual presentations from the spatial data.

Contents:

This course focuses more on the capabilities of the GIS-software and the possibilities they offer in presenting and analyzing spatial data in practical exercises.

Mode of delivery:

Face to face teaching and exercises.

Learning activities and teaching methods:

Lectures and practicals totalling 30 h, plus independent study. Course is passed by returning exercise reports

Target group:

Students of Oulu Mining School and Faculties of science and technology etc

Prerequisites and co-requisites:

Course GIS and spatial data 1 or equivalent, basics of GIS

Recommended optional programme components:

-

Recommended or required reading:

Will be informed separately.

Assessment methods and criteria:

Assessment is based on the evaluation of the written reports of exercises

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Kari Moisio

Working life cooperation:

No

Other information:

-

494604S: Seismic soundings, 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:

Spring semester, period 4. Recommended at 1st or 2nd year of the Master's studies.

Learning outcomes:

Upon completion of the course student will be able to use and adapt seismic methods in studying the structure of the bedrock and soil. Student can explain and justify theoretical background of the seismic methods, and the limitations and error sources involved in them. Student can also make measurements in the field, produce seismic data, interpretate and analyse it and summarize the results.

Contents:

The basic concepts of seismic refraction and reflection soundings and surface wave methods and their interpretation. Physical background of the seismic methods, theory, interpretation and processing methods together with field measurement layouts.

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 seismic research methods.

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:

-

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

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

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

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

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

491602S: Professional practical training, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English, Finnish

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish or English

Timing:

Student usually works in summer intern time during his/her Master's studies. The course is completed by giving a seminar presentation during the autumn term after the internship.

Learning outcomes:

During the advanced practical training the student get familiarized with the working environment from the point of view of his/her studies and becomes acquainted with another possible future job or to a different assignment already in a familiar working environment. The student can identify the problems of the working environment and can solve them. The student can apply theoretical knowledge in practical tasks. The student identifies the tasks appropriate for the Master of Science in Technology at his/her workplace.

Contents:

Suitable areas for practical training are, for example, the mining and metallurgical industry and mining projects.

Mode of delivery:

Working as an employee or as supervisor

Learning activities and teaching methods:

Students will find the training positions themself. Suitable places/employers for the training are e.g. mines, mining projects, research institutes in the field, etc. The objective is to give a deeper and more detailed conception of the industrial area where the student will possibly work after graduation. Suitable tasks would be supervision tasks and R&D tasks.

Target group:

Master’s students in Mining Engineering and Mineral Processing

Assessment methods and criteria:

Completing the training period plus presenting it orally in a seminar. A job certificate (original referenced) must be shown and an application must be submitted to the seminar supervisor. 491602S Professional Practical Training cannot be substituted with work experience aquiered before starting the studies.

Grading:

Verbal scale Passed/Failed

Person responsible:

Professors and teachers teachers (e.g. Saija Luukkanen, Zongxian Zhang, Elena Kozlovskaya, Kari Moisio, Jukka-Pekka Ranta) of Mining Engineering and Mineral Processing

Working life cooperation:

Yes.

491601S: Master's thesis, 30 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English, Finnish

ECTS Credits:
30 cr

Language of instruction:
Finnish or English
Timing:
Spring term of the 5th academic year

491600S: Maturity test, 0 op

Voimassaolo: 01.08.2016 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish, English

Ei opintojaksokuvauksia.

A439126: Bridge studies, Mining Technology and Mineral Processing, 0 - 60 op

Voimassaolo: 01.08.2016 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

491300A: Practical Training, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Practical training
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS = 2 months working full-time
Language of instruction:
Finnish or English
Timing:
Student usually works during a summer and gives a seminar included to the reporting of the training after the practical part in the forthcoming autumn or spring term.
Learning outcomes:
During the practical training the student gets experience of his/her working environment from the point of view of his/her studies and becomes acquainted with one possible future job. He/she can identify the problems associated with the working environment and can propose improvements to them. The student will experience points of contact between working life and studies.
The objective is to give an overview of the industrial area where the student may possibly work after graduation. Practical training nurtures theoretical study. In addition the training should give the student a general idea about

the company and its technical and organizational operations, financial management and supervision. Student training positions often place students in employee-type positions so that the student becomes familiar with practical work, work safety, as well as with the social nature of the working environment. Students will land the jobs themselves.

Contents:

Suitable areas for practical training are, for example, the mining and metallurgical industry and mining projects.

Mode of delivery:

Working as an employee. Giving a seminar.

Learning activities and teaching methods:

Students should search for suitable training places themselves: E.g. mines, mining projects, benefication plants, or research institutes of the field are suitable for the training.

Target group:

Bachelor’s students in Mining Engineering and Mineral Processing

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Student has to present his/her original job certificates/references and submit a course credit application and a report to the supervisor of the training course (professor, student advisor, etc.). The certifcate must include the dates (from-to) for the training period and the duties.

The training is completed by writing a report, and presenting it orally in a seminar. A job certificate (original reference) must also be shown and an application must be submitted to the seminar supervisor (supervisor of the course).

Grading:

Verbal scale Passed/Failed

Person responsible:

Professors and teachers, and tutor teachers of Mining Engineering and Mineral Processing, and student advisor Marita Puikkonen

Working life cooperation:

Yes

Other information:

-