Study Guide

Chair of Mining Engineering and Mineral Economics

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Montanuniversitaet Leoben
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mining engineering
mineral economics

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Dear Students of our Master Study Programs,

Welcome to Montanuniversitaet Leoben,

Chair of Mining Engineering and Mineral Economics,

this Study Guide provides an overview on the Master courses offered by the Chair of Mining Engineering and Mineral Economics.

It should not only give you a detailed outline on the content of our programs, but also assist you when registering for a course. It describes the topics, learning outcomes and any prerequisites you might need.

Please note that not all of the courses are offered both in winter- and summer semester. We therefore advise you to contact our MIRO (Montanuniversitaet International Relations Office), incoming@unileoben.ac.at , before registering for a course.

In case you have any questions do not hesitate to contact us!
For academic questions and the syllabus:
Birgit Knoll, Chair of Mining Engineering and Mineral Economics
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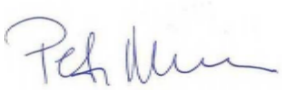
For questions concerning applications procedures for Erasmus- or any other incoming students:
MIRO
incoming@unileoben.ac.at

We wish you good luck for your studies!
Glückauf



Univ.Prof. Dipl.Ing. Dr.mont. Peter Moser
Head of the Chair of Mining Engineering and Mineral Economics
Vice-Rector for Infrastructure and International Relations

Table of Contents

Applied Geodesy

Course Nb	200.199
ECTS	3
Type	Lecture
Offering period	Summersemester
Lecturer	Mayer, Pilgram
Course description	
Content	• Theory of errors in observations and adjustments; method of least squares • Reference and mapping systems • Methods of precise surveying • Gyroscopic surveying • Methods of 3D positioning

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
	• Sustainable knowledge in the field of surveying.
	• At the beginning of the course the students have to pass an entrance test with the following contents:
	  ○ Implementation and evaluation of an angle measurement with a theodolite
	  ○ Calculation of the 1st and 2nd main task of geodesy
	  ○ Planning, implementation and calculation of a traverse
	  ○ Planning, implementation and calculation of a levelling
	  ○ Coordinate and mapping systems in geodesy and reference systems for position and height measurements

Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Detect and adjust errors in surveying • Apply reference and mapping systems including calculations • Plan, implement and evaluate precise surveying methods for distance measurements, angle measurements and levelling • Plan, implement and evaluate measurements with gyrotheodolites • Apply 3D positioning methods such as traversing, GNSS-surveying, free positioning, reverse cut and forward cut
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Active participation and discussion
Further information	
Recommended reading	Ghilani, C. D. and Wolf, P. R., Elementary Surveying
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunneling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunneling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A. Begin Leoben)

Applied Geodesy (Practical)

Course Nb	200.200
ECTS	2
Type	Practical
Offering period	Summersemester
Lecturer	Mayer, Pilgram
Course description	
Content	• See Applied Geodesy (200.199)

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
	• Sustainable knowledge in the field of surveying.
	• At the beginning of the course the students have to pass an entrance test with the following contents:
	  ○ Implementation and evaluation of an angle measurement with a theodolite
	  ○ Calculation of the 1st and 2nd main task of geodesy
	  ○ Planning, implementation and calculation of a traverse
	  ○ Planning, implementation and calculation of a levelling
	  ○ Coordinate and mapping systems in geodesy and reference systems for position and height measurements

Objective (expected results of study and acquired competences)	• See Applied Geodesy (200.199)
Languages of instruction	English

Teaching and learning method (delivery of skills) workload for students	Practical exercises
Further information	
Recommended reading	Ghilani, C. D., Wolf, P. R.: Elementary Surveying
Note	This Practical can only be enrolled together with the lecture Applied Geodesy (200.199)! The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunneling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)

Artisanal and Small-scale Mining in Developing Countries

Course Nb	200.034
ECTS	3
Type	Lecture
Offering period	Summersemester
Lecturer	Hruschka
Course description	
Content	The course covers the development potential of Artisanal and Small-scale Mining (ASM) as well as the severe problems of ASM with regards to technical, social, legal, political, economic and environmental aspects. Possible solutions will be discussed, based on case studies from Latin America, Africa and Asia. This includes approaches, instruments, strategies and institutions for development cooperation in the minerals sector; implications for private mining sector investment and large-scale mining in developing countries, as well as current international trends like the implementation of the Minamata Convention on mercury or measures to strengthen responsible mineral supply chains as a response to new markets and changing legal requirements.
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)

Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Resolve the complex and multidisciplinary problems of small scale mining in developing countries. • Understand the differences and similarities of industrial and artisanal mining and the driving forces of communities engaged in ASM • Analyze private or public development initiatives (by governments, mining companies or NGOs) for the ASM sector and anticipate their potential positive or negative effects.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Multimedia-supported lecture with case studies. Active participation and discussion
Further information	
Recommended reading	Electronic copies of relevant documents and articles will be provided
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"

Computer Applications in Mining

Course Nb	200.208
ECTS	2
Type	Lecture/Practical
Offering period	Wintersemester
Lecturer	Oberndorfer
Course description	
Content	• Overview of main fields of computer application in mining • Overview of mathematical tools applied, in particular optimization • Calculation models, relation reality – model, requirements, constraints • Ultimate pit (LG): basic assumptions, optimization goal • Consequences of LG model on practical application (time, blending, ramps, reasonable pit geometry) • Solution strategy Zhao-Kim • Mine sequencing: optimization goals, heuristics • Truck dispatching: optimization goals, system requirements
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basic knowledge of open pit mining
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Understand the potential contribution of discussed methods on mine design and mine operation

	• Understand the requirements, threats and constraints of these methods
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lecture Active participation and discussion
Further information	
Recommended reading	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Mineral Economics and Project Management

Deposit Modeling

Course Nb	200.060
ECTS	3
Type	Lecture
Offering period	Wintersemester
Lecturer	Haindl, Oberndorfer
Course description	
Content	• Goals of deposit modeling • General principles of modeling • Representation techniques: surface and volume/property models • Interpolation methods incl. introduction to geostatistics • Raw data handling (introduction databases) • Integration of modeling into mining operation (panning/forecast, validation) • The practical part: software based modeling and mine planning
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basic knowledge on geology (deposit types and characteristics), statistics and open pit mining (interaction mining/deposit)
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Understand the principle of creating geological and geometrical models • Use the basic tools of the mine planning software • Know fundamental methods available and their pro and cons

	• Design and introduce deposit modeling for a mine operation, in particular knowing the essential aspects to be considered • Analyze block models and calculate reserves and resources. • Create a 3D open pit design
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Theoretical part: lecture Practical part: covers demonstration with short exercises on real data and a homework assignment with final presentation
Further information	
Recommended reading	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"

Master program	Mining and Tunnelling 1. Part / Speciality 3 "Raw Materials and Energy Systems"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Mineral Economics and Project Management

Economic Geology and Mining Economics

Course Nb	200.050
ECTS	6
Type	Lecture
Offering period	Wintersemester
Lecturer	Haindl
Course description	

Content	• Introduction
	• Economic Geology (deposit as factor of production)
	  ○ Basics
	  ○ Prospection and exploration
	  ○ Reserves and Resources
	  ○ Documentation of a deposit
	  ○ European strategy on raw materials, Mining laws
	• Factors of production – labour
	  ○ Basics
	  ○ Influencing factors
	  ○ Cost factor labour
	• Means of production (incl. energy)
	  ○ Legal requirements
	  ○ Requirements (Benefit/Costs, Life time, availability, utilization, procurement)
	  ○ Energy
	• Cost accouting
	  ○ Internal cost calculation (cost-type, cost-centre, cost-unit)
	  ○ Budgeting and direct costing
	  ○ External cost calculation (balance sheet, P&L)

	• Profitability and investment
	  ○ Terms and basics
	  ○ Static investment calculations
	  ○ Dynamic investment calculations
	  ○ Evaluation
	• Risk and sensitivity analysis

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Understand the special conditions of the mining industry • Classify reserves and resources • Describe the factors of production • Understand the basics of cost calculation • Understand investment calculation methods and perform (simple) examples
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Active participation, discussions
Further information	
Recommended reading	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunneling 1. Part / Speciality 5 "Raw Materials and Energy Systems"
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"
Master program	Raw Materials Engineering 1. Part / Speciality Building Materials and Ceramics
Master program	Raw Materials Engineering 1. Part / Speciality Mineral Processing and Energy Systems
Master program	Raw Materials Engineering 1. Part / Speciality Mineral Processing
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Mineral Economics and Project Management
Master program	International Master of Science in Building Materials and Ceramics 1. Part / Technical and economic fundamentals of mineral resources engineering

Environmental Aspects of Mineral Extraction

Course Nb	200.058
ECTS	3
Type	Lecture
Offering period	Summersemester
Lecturer	Tscharf
Course description	
Content	This course provides a comprehensive outline and understanding on the impacts that mineral extraction may have on society and environment. The unit covers 7 broad areas • Mining, sustainability and ethical responsibilities • Impacts of mining projects on atmospheric environment • Impacts of mining projects on terrestrial environment • Impacts of mining projects on aquatic environment • Impacts of mining projects on social values • Site reclamation and mine closure • Environmental Impact Assessment (EIA)
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basics of Open Pit Mining (200.061) • Basics of Underground Mining (200.180)
Objective (expected results of study and acquired competences)	The students should become familiar and be capable of demonstrating an understanding with the environmental and social aspects associated with mining projects as well as environmental

	impact assessment processes (EIA) in Austria, Europe and Overseas. On completion of this course the participants shall be able to • Describe the principles of mining and sustainable development in context with ethical responsibilities • Identify, analyze and understand the major impacts of mining projects in atmospheric, terrestrial and aquatic environments • Describe the major issues associated with social/community impacts of mining projects • Discuss the aspects of site reclamation and mine closure in context with the prevention of environmental impacts for decades after mining ceases • Describe the purpose and the stages of the EIA process
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lecture Active participation, discussions
Further information	
Recommended reading	Azcue, J. M., Ed.: Environmental impacts of mining activities. Springer, 1999. Environmental Law Alliance Worldwide (ELAW): Guidebook for Evaluation Mining Project EIAs, 1st edition, 2010 Evans, A.M.: An introduction to economic geology and its environmental impact. Blackwell Science Ltd, 1997.

	Sengupta, M.: Environmental impacts of mining – monitoring, restoration and control. Lewis Publishers, 1993. Wagner, H. et al.: Umweltauswirkungen der Rohstoffgewinnung. Montanuniversitaet Leoben, 2006.
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
	Study Program
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Beginn Freiberg)
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"
Master program	Mining and Tunnelling 1. Part / Speciality 5 "Raw Materials and Energy Systems"

Excavation Engineering

Course Nb	200.059
ECTS	2,5
Type	Lecture/Practical
Offering period	Wintersemester
Lecturer	Hartlieb, Sifferlinger
Course description	
Content	This is a general course about rock blasting and how it is used in mining and civil engineering. The following topics will be covered: • Basics of explosives engineering • Blast fragmentation control • Blasting in drifts and tunnels • Design of an underground drift blast • Cautious blasting • Sinking of shafts and development raises • Underground production blasting • Alternative fragmentation methods • Visit to industry (if possible):
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basic Engineering Physics and Math (e.g. logarithms and power functions, equations, integrals, function analysis) • Basic Mining Engineering • Rock Mechanics
Objective (expected results of study and acquired competences)	On completion of this course the participants shall know about • The role of rock blasting in raw materials extraction

	• The properties and proper use of explosives and initiation devices in rock blasting • Fragmentation; how to describe it and factors that influence it • Outlines about environmental influence of blasting like ground vibrations, fly rock and noxious gases • Different types of tunnel rounds and how to design in detail a tunnel round with a parallel hole cut • Blast damage in excavation contours and design principles to minimize this in tunnels and road cuts • Outlines of shaft sinking and raise driving • Different methods used in underground production blasting for various mining methods and required charging • Outlines of breakage methods like water jets, micro waves etc.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Group assignment, 2-3 students working together. (Design of an underground drift blast) Oral examinations Lecture attendance

Further information	
Recommended reading	Lecture notes in pdf format
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunneling 1. Part / Speciality 1 "Mining"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Excursion

Course Nb	200.198
ECTS	2
Type	Field Trip
Offering period	Summersemester
Lecturer	Hartlieb, Seidl
Course description	
Content	• Visits of mining operations in Austria, in the European Union and overseas as an additional training to the theoretical study program at the university • Discussions with mine managers about the organization of mining operations and the planning of new mines.
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Bachelor in Mineral Resources Engineering or Applied Geosciences is essential. • Detailed knowledge of open pit- and underground mining methods • Knowledge of mine organization
Objective (expected results of study and acquired competences)	• Application of previously gained knowledge. • Comparison of theoretical knowledge and application case. • Comprehensive insight of entire mining operations from technological to economic aspects, from mining to processing.
Languages of instruction	English

Teaching and learning method (delivery of skills) workload for students	• Mine visits and tours • Talks to mine managers and discussion with persons in charge • Active preparation of the tour points • Final report after the excursion.
Further information	
Recommended reading	Will be updated on the website according to the specific dates and tour points of the excursion.
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Feasibility Study 1

Course Nb	200.048
ECTS	3
Type	Project work
Offering period	Summersemester
Lecturer	Hartlieb, Mali
Course description	
Content	• Working on a feasibility study for a mineral resource project based on an actual business case • Managing a project, teaming up for this purpose and distributing tasks amongst the team • Executing field, laboratory and desktop studies on a mining related subject • Presentation of milestones and final presentation of the results in front of the industrial project owner • Writing a technical report for an open pit or underground mining project
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1). • BSc in Mining Engineering or related fields of study and / or proof of advanced knowledge and skills in the areas of: ○ Open pit mining ○ Underground mining ○ Geology ○ Environmental issues of mining ○ Mine planning ○ Mining geomechanics

	○ Use of mine planning software (e.g. Surpac, Datamine) • Ability to independent and self-reliant work • Ability to structure, plan and perform a complex task in a group • Ability to write a scientific study report • Ability to present findings / results in front of a English speaking audience
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Approach a technical challenge successfully • Set-up a project plan and handbook • Solve practical challenges of a future mining engineer • Organize the documents, data, tools, equipment, etc. for performing the assigned task • Apply their theoretical knowledge to solve a mining or geological problem • Present complex results to the management board of a company
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	• Self-sufficient / self-reliant and group work • Regular guidance meetings • Periodical status reports (oral) • Presentation of the final results (oral) • Compiling results to a final report (written)

Further information	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. Grading is based on intermediate (30%) and final presentations (40%) and final report (30%). The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunneling 1. Part / Speciality 1 "Mining"

Feasibility Study 2

Course Nb	200.049
ECTS	3
Type	Project work
Offering period	Wintersemester
Lecturer	Hartlieb, Mali
Course description	
Content	On basis of “Feasibility Study 1 (200.048)” the students finalize their project. A joint project plan was set up at the beginning of “Feasibility Study 1”. This project plan is updated and open points and milestones are solved during this lecture. Students write a technical report and present milestones and final results in front of the industrial project owner.

Previous knowledge expected	• Participation in Feasibility Study 1 (200.048)
	• Good English skills (Minimum: CEF Level B1).
	• BSc in Mining Engineering or related fields of study and / or proof of advanced knowledge and skills in the areas of:
	  ○ Open pit mining
	  ○ Underground mining
	  ○ Geology
	  ○ Environmental issues of mining
	  ○ Mine planning
	  ○ Mining geomechanics
	• Use of mine planning software (e.g. Surpac, Datamine)
	• Ability to independent and self-reliant work

	• Ability to structure, plan and perform a complex task in a group • Ability to write a scientific study report • Ability to present findings / results in front of a English speaking audience
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Approach a technical challenge successfully • Set-up a project plan and handbook • Solve practical challenges of a future mining engineer • Organize the documents, data, tools, equipment, etc. for performing the assigned task • Apply their theoretical knowledge to solve a mining or geological problem • Present complex results to the management board of the company
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	• Self-sufficient / self-reliant and group work • Regular guidance meetings • Periodical status reports (oral) • Presentation of the final results (oral) • Compiling results to a final report (written)

Further information	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. Grading is based on intermediate (30%) and final presentations (40%) and final report (30%). The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Geoinformatics

Course Nb	200.185
ECTS	2,5
Type	Lecture / Excercise
Offering period	Wintersemester
Lecturer	Mayer
Course description	
Content	• Introduction into the methods and concepts of spatial informatics and some applications in the mineral extraction industry. Practical work using software tools.
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Visualize spatial data, as used in the mineral resources industry with software tools • Perform simple analyzes and calculations, such as resource estimations.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Active participation, discussions
Further information	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Mineral Economics and Project Management

Introduction in Mining

Course Nb	200.096
ECTS	2,25
Type	Lecture
Offering period	Two weeks intensive course prior to the start of the wintersemester
Lecturer	Team
Course description	
Content	This two-weeks intensive course gives a basic introduction in: • Excavation Engineering • Surface Mining Methods • Underground Hard Rock Mining Methods • Rock Mechanics • Rock and Rock Mass Parameters • Mine Ventilation • Mining Subsidence Engineering • Mine Surveying • Environmental Aspects of Mineral Extraction Additional there will be a (one day) mine visit to an Austrian mining site, either surface or underground.

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
	• Background in mining or related fields, e.g.:
	  ○ Tunneling
	  ○ Mineral Processing
	  ○ Geology
	  ○ Environmental Engineering
	  ○ Mine Surveying

Objective (expected results of study and acquired competences)	The aim of this course is to give incoming students an insight into mining and into the requirements and focus of the courses of the mining study programs at Montanuniversitaet. On completion of this course the participants shall have a basic understanding of the above mentioned topics, be familiar with relevant terms and definitions and especially be prepared to attend lectures of the MA study programs at Montauniversitaet.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Active participation, discussions
Further information	
Recommended reading	• Introductory mining engineering, Hartman, Howard L; Mutmansky, Jan M, 2002, 2. Ed • SME Mining Engineering Handbook, Society for Mining, Metallurgy and Exploration
Note	This course is exclusively reserved for international/incoming students!
Study Program	
Type	Free elective subject

Introductory Mining I

Course Nb	200.099
ECTS	3
Type	Lecture/Practical
Offering period	Wintersemester
Lecturer	Haindl
Course description	
Content	• Introduction • History of mining • Terms, Definitions standards • Special case mining • Phases in mining • Geology and Mineralogy • Enhanced basics in Mining, Processing, Surveillance, Soil- and Rock mechanics • Future in Mining
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
Objective (expected results of study and acquired competences)	The aim of this course is to give students, who do not have a mining background, an introduction and insight into mining. On completion of this course, the participants shall be able to: • have a basic understanding of the above mentioned topics • be familiar with relevant terms and definitions
Languages of instruction	English

Teaching and learning method (delivery of skills) workload for students	Lectures Active participation, discussions
Further information	
Recommended reading	• Introductory mining engineering, Hartman, Howard L; Mutmansky, Jan M, 2002, 2. Ed
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Type	Free elective subject

Lab in Mining Engineering

Course Nb	200.074
ECTS	3
Type	Practical
Offering period	Wintersemester
Lecturer	Heiss, Seidl
Course description	
Content	• Mine Visit • Rock Mass Classification on site • Rock sample preparation • Rock testing in the lab • Interpretation of results • Stability calculations (based on the developed parameters) • Preparing a scientific report • Presentation of the results

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
	• Sustainable knowledge in the following fields - successful completion of the following lectures:
	  ○ Mining Rock Mechanics (200.179)
	  ○ Underground Mining (200.036)
	• Practical experience in an underground mine!

Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Merge the acquired knowledge from the lectures Rock Mechanics and Underground Mining. • Work independently!

	• Carry out a rock mass classification after Barton, Hoek, Bieniawski & Laubscher on the mine site • Prepare a rock sample in the lab • Carry out rock tests in the lab (UCS,…) • Calculate and interpret the acquired results • Carry out stability calculations for an underground situation
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	• Lectures • Underground mine visit (1day) • Active participation • Group sessions with the lecturer
Further information	
Recommended reading	Brady & Brown: Rock Mechanics for underground mining. 2004. Print ISBN: 1-4020-2064-3.
Note	Will be held in the sense of a “practical course”. Participants have to prepare and test “their” rock sample! This is the base for the stability calculations. The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunneling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Mineral Economics and Project Management

Marine Mining

Course Nb	200.042
ECTS	1,5
Type	Lecture
Offering period	Wintersemester
Lecturer	Groß, Wamser
Course description	
Content	• Introduction in marine mining • Marine mining methods • Overview of marine mineral deposits • Geology and mining methods for different raw materials • Environmental impact • Marine mining regulations • International law of the sea • International dispute resolution • Safety regulations for offshore employment
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basics of mechanical excavation methods, geology and mineralogy
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Know the principles of marine mining methods depending on different geological requirements • Have a basic understanding of legal requirements for marine mining activities • Assess potential legal problems and know mechanics for dispute resolution
Languages of instruction	English

Teaching and learning method (delivery of skills) workload for students	Lectures Active participation and discussion
Further information	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Mineral Economics

Course Nb	200.193
ECTS	3
Type	Lecture
Offering period	Wintersemester
Lecturer	Drnek
Course description	
Content	• Theory of mineral demand • Determinants of mineral demand • Demand functions, elasticities of demand, supply-cost functions of mineral resources and secondary materials • Competitive vs. producer markets • Factors affecting mineral prices, commodity exchanges, objectives and instruments of mineral policy • Long-term trends on mineral markets • Statistics of energy resources and mineral commodities. • The raw-material commodities are introduced in detail.
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Good general knowledge is helpful
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Understand the connections and events on raw material markets • Know the fundamentals for analyses of the raw material markets

	• Impart knowledge in the field of raw material policies and trade
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	• Intensive and permanent active participation; i.e.: presentations, pre-reading assignments • Critical analysis and argument of the presented material Teaching and learning method • Presentation of theory and practical examples • Question and answer session • Discussion • Analysis of current economic situation
Further information	
Recommended reading	Britton S. et al: Minerals Economics. In: Mining Engineering Handbook, SME (2nd ed., Vo.1),p. 43 – 139 Fettweis G.B.: Der Produktionsfaktor Lagerstätte. In: Die elementaren Produktionsfaktoren des Bergbaubetriebs. Band 1 Gschwindt, E.: Projektierung von Bergwerken im Ausland, In: Die Wirtschaftlichkeit und Bewertung im Bergbau. Band III Von Wahl: Bergwirtschaft Band I bis III Von Wahl: Wirtschaftliche Bewertung von Lagerstätten und von Bergwerksunternehmen. In: Die Wirtschaftlichkeit und Bewertung im Bergbau. Band III • Business- and Financial section of the following newspapers: Frankfurter Allgemeine Zeitung Neu Zürcher Zeitung

	Süddeutsche Zeitung Financial Times The Times: London and New York • Reference Books: Gabler: Wirtschaftslexikon • Further Reading: Annual Report Rio Tinto (Internet) Annual Report BHP (Internet)
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
	Study Program
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"
Master program	Mining and Tunnelling 1. Part / Speciality 5 "Raw Materials and Energy Systems"
Master program	Raw Materials Engineering 1. Part / Speciality Mineral Processing and Energy Systems
Master program	Raw Materials Engineering 1. Part / Speciality Building Materials and Ceramics
Master program	Raw Materials Engineering 1. Part / Speciality Mineral Processing

Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Mineral Economics and Project Management
Master program	International Master in Sustainable Materials 1. Part / Sustainability, Entrepreneurship & Innovation
Master program	International Master of Science in Building Materials and Ceramics 1. Part / Technical and economic fundamentals of mineral resources engineering

Mine Surveying Project Study

Course Nb	200.032
ECTS	4,5
Type	Project Work
Offering period	Wintersemester
Lecturer	Mayer, Pilgram
Course description	
Content	• Project study on various topics in the field of Mine Surveying and Mining Subsidence Engineering
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Successful completion of the courses ○ Applied Geodesy (200.199) ○ Applied Geodesy Practical (200.200) ○ Engineering Surveying (200.201) ○ Engineering Surveying Practical (200.202) ○ Pre-Calculation of Ground Movements (200.028)
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Structure the project, define the sequence with milestones and form working groups • Combine interdisciplinary knowledge from mine surveying and mining subsidence engineering on a practical topic
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Practical teamwork

Further information	
Recommended reading	Ghilani, C. D., Wolf, P., Elementary Surveying Kratzsch, H.: Bergschadenkunde, ISBN 3-00-001661-9 Kratzsch, H.: Mining Subsidence Engineering, ISBN 0-387-11930-2 Möser, Müller, Schlemmer, Werner: Handbuch Ingenieurgeodäsie- Grundlagen; 3.Auflage; ISBN 3-87907-293-0 Torge, W., Müller, J.: Geodesy; 4th edition; ISBN 978-3-11-020718-7
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Mine Ventilation

Course Nb	200.055
ECTS	3
Type	Lecture
Offering period	Wintersemester
Lecturer	Sifferlinger
Course description	
Content	• Repetition of the basics of mine ventilation from BSc program including mine climate • Context of mine ventilation in the frame of mine design and layout • Basics of air flow mechanics and relevant physical laws • Basics and principles of mine ventilation including air flow principles in underground mining including ventilation laws • Analytical mine ventilation calculations • Numerical mine ventilation calculations, demonstration of ventilation software • Secondary ventilation including design and layout
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Mathematics 1 (380.110) • Physics of airflow • Basics of Underground Mining (200.180)

Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Understand why it is important to have a proper mine ventilation system • Know the work safety risks associated with insufficient mine ventilation • Apply principles of air flow physics to mine ventilation problems • Do analytical calculations of simple ventilation networks • Understand the algorithm which is typically used in mine ventilation software packages • Do the design and layout of a secondary ventilation system • Understand the influence of design parameters of secondary ventilation on the ventilation results
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Homework calculations Active participation and discussion
Further information	
Recommended reading	Mc Pherson M. J.: Mine Ventilation Handbook
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Mining in Austria, in the European Union and worldwide

Course Nb	200.140
ECTS	1,5
Type	Lecture
Offering period	Wintersemester
Lecturer	Hartlieb
Course description	
Content	• Mining Industry in Austria and the EU • Securing Supply of Mineral Resources in Europe • Construction Aggregates in Europe • World View on Mineral Production • Artisanal and Small Scale Mining • Economic Outlook in Mining • Innovation in Mining • Operational Excellence Framework in Mining • Different Presentations by national and international mining executives
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basic knowledge in mineral economics • Main economic drivers in the mining industry
Objective (expected results of study and acquired competences)	On completion of this lecture the participants shall be able to have a good comprehension of: • The mining industry in terms of production and economic outlook • Demand and supply of mineral resources • Critical future issues in the mining industry • European mineral policies • Operational Excellence Framework

Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures, presentations, active participation and discussions
Further information	
Recommended reading	• British Geological Survey: World Mineral Production 2002 – 06/ L.E. Hetherington et.all. – Keyworth, Nottingham: British Geological Survey, 2008 • Ekdahl, E.: Mineral Resources in Europe, Presentation, International Symposium on the Planet Earth, Trondheim, 7-8 February 2008 • Nötstaller, R.: Patterns of Mineral Demand and supply global and regional perspectives, in: BHM – Berg- und Hüttenmännische Monatshefte, 147/2002, H.12, p.402 ff • Website of the European Union: Raw Materials
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"
Master program	Mining and Tunnelling 1. Part / Speciality 5 "Raw Materials and Energy Systems"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Mineral Economics and Project Management

Mining Rock Mechanics 2

Course Nb	200.052
ECTS	5
Type	Lecture / Practical
Offering period	Summersemester
Lecturer	Ladinig, Wagner
Course description	
Content	• Introduction into the importance of good rock engineering in underground mining and the significance of changing rock engineering conditions throughout the life of a mine. • Introduction into the topic of stresses, stresses in the earth crust, rock stresses and faulting, principles of stress measurement methods, discussion of stress measurement methods. • Stress changes caused by rock excavation, stress distributions around common mining excavations. Rock deformation around mining excavations. • Principles governing rock fracturing around mining excavations. Geological factors affecting rock fracturing. • Role of mine support. Functional requirements of mine support systems. Principles governing rock reinforcement systems. Support definitions. Discussion of support materials, structures and systems. Design of mine support systems for use in mine tunnels, tabular and large production excavations. • Rock mechanics principles governing design of mine infrastructure systems. Criteria for siting of mine infrastructure in tabular mining situations.

	• Rock mechanics aspects of stoping. • Design of stoping excavations for tabular and massive mineral deposits. The role of pillars and design of pillar systems. Design criteria for caving stopes. Sequencing of stoping activities • Rock bursts and dynamic rock failures.. Rock burst mechanisms. Strategies to combat the rock burst problem in deep mines. • Role of backfill in mining. Backfill types and systems. Backfill and pillar systems. • Rock mechanics management on mines.

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
	• Bachelor in Mineral Resources Engineering or related fields of study, or proof of basic knowledge in the areas of
	  ○ Strength of materials
	  ○ Structural geology
	  ○ Basics of rock mechanics and
	  ○ Underground mining systems

Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Plan stable mining layouts • Select the most appropriate stoping method • Design stable stoping excavations and pillar systems • Select and implement the most effective and economic mine support systems to protect mine workers against the hazards of rock falls and rock bursts.
Languages of instruction	English

Teaching and learning method (delivery of skills) workload for students	Lectures Active participation and discussion
Examination	Written examination (2 h), oral examination
Further information	
Recommended reading	• Brady, B.H.G., Brown, E.T.: Rock Mechanics for Underground Mining. 3rd Ed., Kluwer Academic Publishers, New York, Boston, Dordrecht, London, Moscow, 2004, 628 pp • Budavari, S. Ed.:(1982) Rock Mechanics in Mining Practice. S. Afr. Inst. Min. Metall. Monograph Series Nr. 5, Johannesburg, 1982, 282 pp • Hudson, J.A., Harrison, J.P.: Engineering Rock Mechanics – An Introduction to the Principles. Elsevier Science Ltd. The Boulevard, Langford Lane, Kidlington, Oxford OX5, UK, 1997, 444 pp • Hoek, E., Brown, E.T.: Underground Excavations in Rock, Institution of Mining and Metallurgy. E&FN Spon, London, 1994, 525 pp • Jaeger, J.C., Cook, N.G.W.: Fundamentals of Rock Mechanics, Chapman & Hall, London, 1979, 593 pp • Obert, L., Duvall, W.I.:(1967) Rock Mechanics and the Design of Structures in Rock. John Wiley & Sons, New York, London, Sydney, 1967, 650 pp • Salamon, M.D.G.: Rock Mechanics of Underground Excavations, In: Advances in Rock Mechanics, Proc. 3rd Congr. Int. Soc. Rock Mech., Denver, vol. 1(B), 1974, 951-1099pp

Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Programs	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"

Mining Subsidence Engineering

Course Nb	200.045
ECTS	3
Type	Lecture
Offering period	Wintersemester
Lecturer	Pilgram
Course description	
Content	• Legal issues applied to mining subsidence engineering especially the pre-calculation of ground subsidence • The dynamics of ground movement and the critical areas of extraction in a subsidence trough after Lehmann • Calculation of trough components • Some varieties of calculation procedure • Measures to reduce mining damage • The components of ground movement • The time factor • Mining damage above ground • Compensation of subsidence damage • The calculation of diminished value
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • plan, implement and evaluate the pre-calculation of Ground Movements with some simple different methods.

	• plan, assemble and analyze deformation profiles and monitoring networks of ground movements • know the basics about the legal relationship between mining and land ownership • calculate the diminished value • plan and implement measures to reduce mining damage • share the costs for damage from two or more mines.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Active participation, discussions Practical examples
Further information	
Recommended reading	Kratzsch, H.: Bergschadenkunde, ISBN 3-00-001661-9 Kratzsch, H.: Mining Subsidence Engineering, ISBN 0-387-11930-2 Pilgram, R.: Lehrbehelf zur Vorausberechnung von Bodenbewegungen, The Precalculation of Ground Subsidence, Chair of Mining, Montanuniversitaet Leoben
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Numerical Methods of Deposit Modeling

Course Nb	200.207
ECTS	2
Type	Lecture / Practical
Offering period	Wintersemester
Lecturer	Oberndorfer
Course description	
Content	• Modeling theory • Data used for deposit modeling (geological mapping, sampling, etc.) • Data handling (database applications) • Concepts of interpretation and interpolation • Global estimates and descriptive statistics (property distribution, grouping, clustering) • Interpolation: qualitative and quantitative properties, principles and overview of methods • Linear Interpolation (triangulation): algorithms, assumptions, properties of generated surfaces, representation methods • Geostatistical methods: basic theory (linear combination, minimizing estimation error), algorithm, consequences • Statistical description of variability properties (covariances, variogram) • Point and volume estimates (size effect of sampling and estimation data) • Ordinary and indicator kriging • Aspects of integration into mining operation (methods, effort, realization, potential errors)

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basic knowledge of geology (deposit types and characteristics) and mining (interaction mining/deposit) • Basic knowledge of descriptive geometry • Basic knowledge of statistics • Skills/experiences with mine planning / deposit modeling software is advantageous but not mandatory
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Have a thorough understanding on modeling techniques • Understand reliability and accuracy of deposit modeling • Understand reasonable application of deposit models (global, regional, local estimates) • Understand cross-links and consequences on mine design, in particular quality control.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lecture Active participation and discussion Focus is on theoretical background, but for illustration and better understanding some simple examples are presented and/or executed by the students (as far as possible, e.g. vacancy computer lab, basic skills of students in Surpac)

Further information	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"
Master program	Raw Materials Engineering 1. Part / Speciality Mineral Processing
Master program	Raw Materials Engineering 1. Part / Speciality Mineral Processing and Energy Systems
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Occupational and Process Safety

Course Nb	200.007
ECTS	1,5
Type	Lecture
Offering period	Wintersemester
Lecturer	Sifferlinger
Course description	
Content	• Safety: Definitions, Measurement, Statistics, Risk Assessment • Safety culture, People-based Safety • Safety strategy: excellent planning, excellent implementation, mindfulness and flexibility, understanding of the system, crisis management
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basics in Engineering • Knowledge of Mining or Industry
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Do a simple risk assessment • Start up a simple safety culture • Implement a simple safety strategy
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures with active participation

Further information	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"

Open Pit and Underground Coal Mining

Course Nb	200.006
ECTS	2,5
Type	Lecture / Exercise
Offering period	Summersemester
Lecturer	Wagner
Course description	
Content	• The importance of coal as an energy fuel, feedstock for chemical plants and in the metallurgy. Worldwide coal production and consumption. Coal deposits and global distribution of coal resources. Geology of coal deposits and its relevance for the coal mining process. The significance of depth, seam thickness, angle of dip, strata conditions and geological disturbances for the selection of coal mining methods. • Surface coal mining. The effect of overburden on surface mining methods. Truck and shovel and drag line methods for competent overburden strata. Bucket wheel excavator technology for incompetent overburden strata. Description of methods, equipment used and operational aspects. The importance of post mining land reclamation. Discussion of reclamation process. • Underground coal mining. Two basic approaches to underground coal extraction: partial extraction and total extraction. Discussion of effects of depth and geological parameters on mining method selection. Room and pillar mining method. Areas of application. Principles of method. Rock mechanics design: Pillar strength, tributary area concept and pillar load, safety factor of coal pillars, roof support. Equipment used in

	room and pillar mining. Conventional mechanized and fully mechanized room and pillar methods. Operational aspects, ventilation. Performance of room and pillar mining methods. • Two basic methods of total extraction of coal from underground. Pillar extraction or pillar recovery method and longwall mining method. Rock mechanics aspects of total coal seam extraction. The significance of overburden strata on caving process. Abutment stresses in pillar extraction line and critical panel width. Panel design for strata caving. The Laubscher stability graph method. Description of pillar extraction method in existing room and pillar panels. Operational principles. Equipment used, pillar extraction sequence: individual pillars and pillars in extraction panel. Significance of safety factor for safe pillar extraction. Advantages of fully mechanized pillar extraction. Discussion of operational aspects of method including ventilation and support principles in extraction area. Special pillar extraction methods. Underlying principles. Advantages compared to traditional pillar extraction. Performance of pillar extraction methods. Specific safety hazards of pillar extraction mining. • Longwall mining. Principles of method. Single entry and multiple entry longwall development. Advance and retreat longwall mining. Advantages and disadvantages of two methods. Longwall mining equipment for coal winning, conveying at the face and face support. Specific coal mining hazards: methane ignitions and explosions, coal dust explosions, coal- and gas

	outbursts, spontaneous combustion, wind blasts. Management of safety hazards in coal mining.
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Bachelor in Mineral Resources Engineering or related subjects. • Proof of basic knowledge in geology and basic principles of mining and mining equipment.
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Have an awareness of the economic importance of coal • Know the specific features of coal deposits on coal mining activities • Have a sound basis for coal mining methods, systems and equipment decisions • Have an understanding of rock mechanics aspects of coal mining and their significance for coal mine design and operation • Have an awareness of specific coal mining hazards.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Active participation and discussion
Examination	Oral examination
Further information	
Recommended reading	Fauconnier, C. J., Kersten, W. W. O.: Increased underground extraction of coal. S.Afr. Inst. Min. Metall. Monograph Series Nr. 4., 1982, 345 pp

	Hartman; H. L., Mutmansky, J. M.: Introductory mining engineering. 2nd Ed., John Wiley & Sons, Inc., 2002, 570 pp
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Raw Materials and Energy Systems"

Open Pit Mining

Course Nb	200.051
ECTS	4,5
Type	Lecture
Offering period	Wintersemester
Lecturer	Häupl, Oberndorfer
Course description	
Content	• Overview on aspects affecting open pit mining • Mining situation Austria (design range, influencing factors) • Discussion on overall efficiency / effectivity (equipment/personnel/process) • Quality control (material classes), process transformation (extraction, loading/hauling, transport), forecast & surveillance, open pit design (geometry, equipment) • Truck haulage: loading & hauling, truck fleet, equipment aspects • Estimation & surveillance • Discussion of several examples (case studies): alternative evaluation, design aspects, decisive influencing factors • Operation monitoring, data management • Overview on a quarry operation from an economical and a technical point of view • Operation cycle of a typical quarry operation during a year's period • Factors of production: Material, utilities & energy, goods and services • Balance of cost and total revenue

	• Business processes: Drilling & Blasting, Loading & Hauling, Mineral-Processing, Mineral-Stock, Shipment onto the market • Organizational structure and main processes (leading and supporting processes / internal and external processes) • Process organization with a detailed view on the supply and value-chain • Discussion of an specific case study
Previous knowledge expected	• Good English skills • Basic knowledge on open pit mining and mining equipment • Basic knowledge on open pit mining business economics
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Have a knowledge about evaluation, design and operation of open pits (hard rock) • Have a knowledge about organizing, analyzing and administrating an open pit operation
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lecture Active participation and discussion Case study discussion has a prominent focus on interactive collaboration of the participants in teamwork

Further information	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"
Master program	Mining and Tunnelling 1. Part / Speciality 5 "Raw Materials and Energy Systems"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Planning of Mineral Resources Projects

Course Nb	200.002
ECTS	4,5
Type	Lecture
Offering period	Summersemester
Lecturer	Froemmer
Course description	
Content	• Introduction project planning and project development, mine lifecycle and phases • Planning cycles, Management system • Dealing with and management of probabilities and uncertainties, information acquisition • Path dependent decision tree • Interactions of involved planning tasks and (eventually) contradicting goals • Strategic mine planning, mine design, mine operation • Exemplary discussion of exploration concepts (goals, requirements, benefit, evaluation) • Exemplary discussion of longterm/midterm mine design • Aspects of sensitivity of changes • Project evaluation, due diligence • Some exemplary illustrations of particular aspects (deposit, technical development, economical evaluation, etc.)
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basic knowledge on all of the involved fields (geology, mining, processing, environmental aspects, economics, risk analysis)

Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Understand the steps and progress of planning projects (project cybernetics) • Understand the relevance of information, uncertainties and risk
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lecture Active participation and discussion
Further information	
Recommended reading	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunneling 1. Part / Speciality 1 "Mining"

Regulation of Mining Damages and Ensuring Land Use

Course Nb	200.091
ECTS	1,5
Type	Lecture
Offering period	Summersemester
Lecturer	Pilgram, Tscharf
Course description	
Content	• The law in Austria and Germany governing mining damage • Construction in mining areas • Subsoil and structural damage • Pseudo mining damage: delimitation of mining damage - structural damage • Assessment of mining damages: determination of market value and calculation of depreciation of affected objects • Compensation for subsidence damage - Calculation of diminished value • Sharing the costs for damage from two or more mines • Mining damage protection - damage removal • Ensuring land use after termination of mining activities - Formation of reserves • Determination of the risk potentials of closed mines near surface and risk zoning for spatial planning • Eternity burdens in mining - future costs
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Sustainable knowledge in the field of mining subsidence especially the following contents:

	○ The dynamics of ground movement and the critical areas of extraction in a subsidence trough after Lehmann ○ Calculation of trough components ○ Ground movement with flat-lying measures and trough components ○ Ground movement in steep-lying measures and trough components ○ Important angels of ground movement ○ The theoretical basis for methods employing theoretical models ○ Pre-calculation of ground movements with different methods, like some empirical methods, Methods employing Influence Functions and methods employing theoretical models
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to apply the knowledge about: • The law governing mining damage • Construction in mining areas • Subsoil and structural damage • Pseudo mining damage: delimitation of mining damage - structural damage • Assessment of mining damages: determination of market value and calculation of depreciation of affected objects • Compensation for subsidence damage - Calculation of diminished value • Sharing the costs for damage from two or more mines • Mining damage protection - damage removal

	• Ensuring land use after termination of mining activities - Formation of reserves • Determination of the risk potentials of closed mines near surface and risk zoning for spatial planning • Eternity burdens in mining - future costs
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Practical teamwork
Further information	
Recommended reading	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)
Master program	1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)

Risk Management in Mines

Course Nb	200.145
ECTS	1,5
Type	Lecture
Offering period	Wintersemester
Lecturer	Wagner
Course description	
Content	• Introduction into the objectives and methods of risk management in mines • Definitions: hazard, risk, damage, severity number, risk number • Types of risks in mining: safety, human, geological, technical, economic, contractual, political, time, environmental • Safety risk-safety statistics • Acceptable and tolerable risks • Methods of risk identification: brain storming, risk check lists, expert risk evaluation • Methods of risk analysis: Regression and correlation analysis, probabilistic event analysis, fault tree analysis, Delphi-method, Monte Carlo simulation, scenario building • Risk classification: risk matrix-severity and probability; risk register • Risk treatment: eliminate • Monitoring: physical, environmental, financial, human • Human factor in risk management

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
	• Proven knowledge of mining engineering (Bachelor in Mineral Resources Engineering, examination in major mining engineering subjects)
	• In case these are missing the student has to pass an entrance test at the beginning of the course with the following contents:
	  ○ Surface and underground mining methods
	  ○ Mining equipment
	  ○ Mine ventilation
	  ○ Geology

Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Have an appreciation of the inherent risks in mining • Have skills to identify and quantify mining risks • Know the risk management process with the emphasis on mining risks • Know risk analysis and evaluation techniques • Know about basic capabilities to perform risk assessment and management in mines.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Active participation and discussion
Examination	Oral examination

Further information	
Recommended reading	Hartman, h. L. and Mutmansky, J. M. (2002): Introductory Mining Engineering, John Wiley &Sons Inc., 570 pp. ISO 3100- Risk Management. Intern. Standards Organization Wagner, H. (2001): Die Besonderheiten des Risikomanagements im Bergbau. Berg- und Hüttenmännische Monatshefte, BHM., 146 Jg., Springerverlag Wien, S.37-41.
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
	Study Program
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunneling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"
Master program	Mining and Tunnelling Speciality 5 "Raw Materials and Energy Systems"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Selected Aspects of Engineering Surveying in Mining and Tunelling

Course Nb	200.201
ECTS	3
Type	Lecture
Offering period	Summersemester
Lecturer	Mayer, Pilgram, Pollak
Course description	
Content	• Introduction into the objectives and methods of engineering surveying • Selected topics of engineering surveying in mining and tunneling: • Construction surveying • Heading control • Monitoring and control measurements in cavity construction • Deformation analysis • Shaft Surveying • Hydrographic surveying
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Sustainable knowledge in the field of surveying. • At the beginning of the course the students have to pass an entrance test with the following contents: ○ Implementation and evaluation of an angle measurement with a theodolite ○ Calculation of the 1st and 2nd main task of geodesy ○ Planning, implementation and calculation of a traverse

	○ Planning, implementation and calculation of a levelling ○ Coordinate and mapping systems in geodesy and reference systems for position and height measurements
Objective (expected results of study and acquired competences)	On completion of this course the students will have developed skills for complex problem solutions in the field of engineering surveying for mining and tunneling. They shall be able to • Plan and carry out of stake out in mining and tunneling • Plan, implement and evaluate the complete orientation (3D) of a mine • Plan and carry out surveying for heading control • Plan, assemble, survey and analyze deformation profiles and networks • Select the method and planning of hydrographic surveying
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Active participation and discussion
Further information	
Recommended reading	Möser, Müller, Schlemmer, Werner: Handbuch Ingenieurgeodäsie- Grundlagen; 3.Auflage; ISBN 3-87907-293-0 Torge, W., Müller, J.: Geodesy; 4th edition; ISBN 978-3-11-020718-7

Note	This lecture can only be enrolled together with the practical “Selected Aspects of Engineering Surveying in Mining and Tunelling” (200.202)! The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
	Study Program
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 2 "Geotechnics and Tunnelling"

Selected Aspects of Engineering Surveying in Mining and Tunelling (Practical)

Course Nb	200.202
ECTS	3
Type	Practical
Offering period	Summersemester
Lecturer	Mayer, Pilgram, Pollak
Course description	
Content	• See: Selected Aspects of Engineering Surveying in Mining and Tunelling (200.201)

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
	• Sustainable knowledge in the field of surveying
	• At the beginning of the course the students have to pass an entrance test with the following contents:
	  ○ Implementation and evaluation of an angle measurement with a theodolite
	  ○ Calculation of the 1st and 2nd main task of geodesy
	  ○ Planning, implementation and calculation of a traverse
	  ○ Planning, implementation and calculation of a levelling
	  ○ Coordinate and mapping systems in geodesy and reference systems for position and height measurements

Objective (expected results of study and acquired competences)	• See: Selected Aspects of Engineering Surveying in Mining and Tunelling (200.201)

Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Practical exercises
Further information	
Recommended reading	Möser, Müller, Schlemmer, Werner: Handbuch Ingenieurgeodäsie- Grundlagen; 3.Auflage; ISBN 3-87907-293-0 Torge, W., Müller, J.: Geodesy; 4th edition; ISBN 978-3-11-020718-7
Note	This practical can only be enrolled together with the lecture “Selected Aspects of Engineering Surveying in Mining and Tunelling” (200.201)! The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunneling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunneling 1. Part / Speciality 2 "Geotechnics and Tunnelling"
Master program	Mining and Tunneling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)

Selected Aspects of Mechanical Cutting

Course Nb	200.070
ECTS	2,25
Type	Lecture
Offering period	Summersemester
Lecturer	Sifferlinger
Course description	
Content	This is an advanced course about the use of mechanical cutting in mining and civil engineering. The following topics will be covered: • Main parameters of cutting process • Types of Sliding tools • Stress&Chip Forming at radial tool • Stress&Chip Forming at conical tools • Geometry of interaction at conical and radial tools • Definition of Angles and Forces at conical tool • Tool pick inserts (Tungsten Carbide, Diamond) • Different tool systems for different rock conditions • Tool Wear • Different Cutter Head Designs • Radial and Linear Cutting Test Rigs • Examples of operational references • Vibration induced by cutting process, Dust • Field trip (Sandvik, Zeltweg)

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Excavation Engineering (200.059) or equivalent or practical experience
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to understand the: • mechanical cutting process in detail • layout of cutting devices • selection of the right tools for different rock conditions • cutter head design • environmental impact of cutting process (vibration, noise, dust) • tool types, design and inserts • tool wear mechanism and failure modes • prediction of expected cutting performance • function and use of Cutting Test Rigs • operational performance evaluation
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Assignment of selection of the correct cutting device for a given operational condition (mining: hardrock/softrock, tunnelling: profile), presentation, oral examination
Further information	
Recommended reading	Lecture notes in pdf format Bilgin, N., Copur, H., Balci, C.: Mechanical Excavation in Mining and Civil Industries, CRC Press, 2013

Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
	Study Program
Master program	Mining and Tunnelling Speciality 4 "Global Resources, Earth and Technology"

Seminar in Mining Engineering and Mineral Economics 1

Course Nb	200.043
ECTS	1,5
Type	Seminar
Offering period	Wintersemester
Lecturer	Hartlieb
Course description	
Content	• Introduction to scientific writing • Presentation of the Guideline for Scientific Writing from the Chair of Mining • Systematic literature research • Proper handling and citation of literature • Development of structure and contents of a scientific report or thesis • Writing a scientific report about a mining-related topic from given literature sources
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Write a scientific report • Look for information systematically • Reference correctly • Structure, layout and format a scientific paper / report
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Exercises in-class with active participation of the students Assignment: writing a report

Further information	
Recommended reading	• Guideline for Scientific Writing from the Chair of Mining
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 5 "Raw Materials and Energy Systems"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Mineral Economics and Project Management

Seminar in Mining Engineering and Mineral Economics 2

Course Nb	200.044
ECTS	3
Type	Seminar
Offering period	Summersemester
Lecturer	Hartlieb, Mayer, Sifferlinger
Course description	
Content	• Introduction to (scientific) presentation • Structure and layout of a presentation • Presentation of data, figures and other sources • Writing of a scientific report about a mining related topic
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Seminar in Mining Engineering and Mineral Economics 1 (200.043) • Basics in Mining Engineering
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Search for literature systematically and compile a comprehensive scientific report about the findings • Summarize findings and present data to an audience • Give a scientific presentation
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Independent writing of a scientific report Presentation Active participation and discussion

Further information	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 5 "Raw Materials and Energy Systems"

Seminar on Mining Rock Mechanics

Course Nb	200.031
ECTS	1
Type	Tutorial
Offering period	Wintersemester
Lecturer	Wagner
Course description	
Content	• Detailed discussion of rock mechanics topics selected by students • The topics selected by the participants will be discussed at an advanced level and in greater detail than in the basic mining rock mechanics courses

Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
	• Bachelor in Mineral Resources Engineering or related fields of study, or proof of basic knowledge in the areas of
	  ○ Strength of materials
	  ○ Structural geology
	  ○ Basics of rock mechanics and
	  ○ Underground mining systems
	  ○ Mining Rock Mechanics 2 (200.210)

Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Have an advanced knowledge in rock mechanics by discussing theoretical and practice related rock mechanics topics in considerable detail • Address complex rock mechanics topics • Find solutions to complex rock engineering design problems

Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Seminar Active participation and discussion Preparation for topics under discussion
Examination	Continuous assessment of the active level of participation during the lecture
Further information	
Recommended reading	Brady, B.H.G., Brown, E.T.: Rock Mechanics for Underground Mining. 3rd Ed., Kluwer Academic Publishers, New York, Boston, Dordrecht, London, Moscow, 2004, 628 pp Budavari, S. Ed.: Rock Mechanics in Mining Practice. S. Afr. Inst. Min. Metall. Monograph Series Nr. 5, Johannesburg, 1982, 282 pp Hoek, E., Brown, E.T.: Underground Excavations in Rock. Institution of Mining and Metallurgy. E&FN Spon, London, 1994, 525 pp Hudson, J.A., Harrison, J.P.: Engineering Rock Mechanics – An Introduction to the Principles. Elsevier Science Ltd. The Boulevard, Langford Lane, Kidlington, Oxford OX5, UK, 1997, 444 pp Jaeger, J.C., Cook, N.G.W.: Fundamentals of Rock Mechanics. Chapman & Hall, London, 1979, 593 pp Obert, L., Duvall, W.I.: Rock Mechanics and the Design of Structures in Rock. John Wiley & Sons, New York, London, Sydney, 1967, 650 pp

	Salamon,M.D.G.: Rock Mechanics of Underground Excavations. In Advances in Rock Mechanics, Proc. 3rd Congr. Int. Soc. Rock Mech., Denver, vol. 1(B), 1974, 951-1099pp Selected papers
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Type	Free elective subject

Spatial Planning

Course Nb	200.177
ECTS	1,25
Type	Lecture / Practical
Offering period	Wintersemester
Lecturer	Pilgram
Course description	
Content	• Functional and Legal Spatial Planning • Overview of the levels and planning instruments of Spatial Planning in Austria • How to use these planning tools • How and where can I get information about sources of data and accuracy of these data • Data sets and services of the Austrian provinces for free of use based on the principles of Open Data • Spatial Planning tasks associated with Mining License Procedures • Reorganization of Land • Cadaster and Land registration
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Use the basics of Functional and Legal Spatial Planning • Use the planning instruments of Spatial Planning in Austria, the countries and Planning Tools of the regions and urbans

	• Know how and where to get information about sources of data and accuracy of these data • Use data sets and services of the Austrian Provinces • Use Spatial Planning Tasks associated with Mining License Procedures • Know about reorganization of land • Know about cadaster and land registration
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Lectures Active participation, discussions
Further information	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)

Special Mineral Economics

Course Nb	200.165
ECTS	1,5
Type	Lecture
Offering period	Summersemester
Lecturer	Drnek
Course description	
Content	• Principal determinants of mineral demand • Demand functions • Supply-cost functions of minerals, recycling and secondary supply • Mineral markets and prices • Major trends on resource markets • Mineral policy with special regard to resource-related environmental policy. The raw-material commodities are only briefly introduced
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Good general knowledge is helpful
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Understand the connections and events on raw material markets • Know the fundamentals for analyses of the raw material markets • Apply the knowledge in the field of raw material policies and trade
Languages of instruction	English

Teaching and learning method (delivery of skills) workload for students	Lectures Active participation in discussions and questions-and-answer sessions Active analysis of current economic situation
Further information	
Recommended reading	Britton S. et al: Minerals Economics. In: Mining Engineering Handbook, SME (2nd ed., Vo.1),p. 43 – 139 Fettweis G.B.: Der Produktionsfaktor Lagerstätte. In: Die elementaren Produktionsfaktoren des Bergbaubetriebs. Band 1 Gschwindt, E.: Projektierung von Bergwerken im Ausland, In: Die Wirtschaftlichkeit und Bewertung im Bergbau. Band III Von Wahl: Bergwirtschaft Band I bis III Von Wahl: Wirtschaftliche Bewertung von Lagerstätten und von Bergwerksunternehmen. In: Die Wirtschaftlichkeit und Bewertung im Bergbau. Band III • Business- and Financial section of the following newspapers: Frankfurter Allgemeine Zeitung Neu Zürcher Zeitung Süddeutsche Zeitung Financial Times The Times: London and New York • Reference Books: Gabler: Wirtschaftslexikon • Further Reading: Annual Report Rio Tinto (Internet) Annual Report BHP (Internet)

Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Further information	
Recommended reading	Von Wahl et al: Bergwirtschaftslehre I - III
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.
Study Program	
Master program	Industrial Environmental Protection and Process Technology 1. Part / Main Elective Subject Process Engineering

Surpac Introduction

Course Nb	200.009
ECTS	2
Type	Lecture / Practical
Offering period	Winter- and Summersemester
Lecturer	Oberndorfer
Course description	
Content	• Mine planning software – capabilities and applications • Data structure, viewing, display, graphical appearance, property inquiry (interactive working) • Basic data (1d/2d objects, points/lines): editing, import, manipulation (polygon intersection) • Surfaces (s3d): generation, intersections, clipping, volumes, etc. • Surfaces (f3d, solids): generation, intersection, volumes, etc. • Block models (property model): generation, assigning block values (surfaces, simple interpolation), analysis using BM (reporting, constraints) • Geological databases: concept, Surpac-3rd party products interface, viewing, data extraction • Open pit and underground design: tools assisting mine design
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)

	• This course focuses on software skills; no particular basic knowledge required • Knowledge in geology and mining, mathematical geometry and spatial sensing is advantageous but not mandatory
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Use Surpac for typical educational tasks such as a diploma thesis or project work and later during professional career. Sound basis for further enhancing skills while working with Surpac • Have a good overview on what mine planning software can do and have rough idea on effort (worktime) required for specific tasks.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	Students have to perform an exam exercise independently and present the result.
Further information	
Recommended reading	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)
Master program	Mining and Tunnelling 1. Part / Speciality 5 "Raw Materials and Energy Systems"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Mineral Economics and Project Management

Technology and Global Change (Socio-Economic and Environmental Impacts of the Technological Society)

Course Nb	200.174
ECTS	2,5
Type	Lecture
Offering Period	Summersemester
Lecturer	Grübler
Course description	
Content	• Basics of economic history • Theories and models of innovation systems • Technological change and diffusion • Sociology of science and technology • Economics (incl. neoclassical and evolutionary perspectives) • Management science and marketing (one third of the class) • Empirical case studies (two thirds of the class) discuss specific human activities/sectors in more detail including mineral resources and mining, energy, agriculture, industrial production, as well as end-use and service sectors (e.g. transportation and ITC) giving both an overview on the most significant historical and emerging technology trends as well as their multiple social and environmental impacts.
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)

Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Know about technology and the importance of technological change in order to engage in wider social dialogue • Understand major environmental issues across different raw material and industrial sectors that shape associated engineering and business environments • Develop skills to conceptualize, understand, and quantitatively model technological diffusion and substitution as input for strategic planning and product marketing
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	• Active class participation and engagement in class discussion • One homework assignment
Further information	
Recommended reading	Will be uploaded on the class server
Note	Lectures conducted as block courses on two weekends
Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 4 "Global Resources, Earth and Technology"

Underground Coal Mining

Course Nb	200.057
ECTS	1,5
Type	Lecture
Offering period	Wintersemester
Lecturer	Bertignoll, Sifferlinger
Course description	
Content	Overview of major aspects of Underground Coal Mining: • World Coal Resources and Production • Prospecting and Exploration • Underground Mine Development • Underground Coal Mining Methods • Underground Coal Mine Operation and Machinery • Coal Preparation, Storage and Transport • Underground Coal Mining Investment and Cost • Underground Coal Mining Health and Safety • Environmental Impact of the Coal Industry • Examples of Underground Coal Mining Operations • Outlook and future developments
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Knowledge in Mining Engineering
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Understand underground coal mining operations

	• Know the methods of longwall and room & pillar mining, including roof control, ventilation, machinery, safety, infrastructure and transport. • Understand the cost and organization of an underground coal mine. • Know the health and safety in underground coal mining, including explosion protection, roof control, dust suppression, functional safety of equipment and personal protection.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	• Lectures, multimedia-supported (e.g. Video-Clips) Power Point Presentation with further reference to special sources. • Active participation and discussion of examples. • Discussion of accident reports
Further information	
Recommended reading	Bise, C. J., Modern American Coal Mining, Methods and Applications, Society for Mining, Metallurgy and Exploration, Englewood 2013
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunneling 1. Part / Speciality 5 "Raw Materials and Energy Systems"
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects

Underground Mining

Course Nb	200.036
ECTS	4,5
Type	Lecture
Offering period	Wintersemester
Lecturer	Moser P., Ladinig
Course description	
Content	• Underground mining methods. • Mine development. • Stoping methods for tabular deposits. • Rock Mechanic design of room and pillar system. • Pillar extraction mining. • Longwall mining. • Cut and fill mining methods. • Shrinkage stoping. • Open stoping. • Caving methods • Backfill
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Sustainable knowledge in the following fields - successful completion of the following lectures: ○ Mining Rock Mechanics (200.179) ○ Basics of Excavation Engineering (200.054)
Objective (expected results of study and acquired competences)	On completion of this course the participant should be able to -on the basis of a practical (deposit) example-: • Design the access to the deposit

	• Develop a mining method • Discuss the geotechnical requirements and implications of different mining methods • Join together and combine all his acquired knowledge (systems thinking)!!
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	• Lectures • Active participation and discussion.
Further information	
Recommended reading	Brady, B.H.G. and Brown, E.T.; Rock mechanics for underground mining; 3rd Ed., 2004 Cernica, J.; Soil Mechanics; 1995 Hustrulid: Underground mining methods. 200 Potvin, Y.; Thomas, E.; Handbook in Mine Fill; 2005
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The latest version of the lecture notes will be uploaded at the beginning of the semester.

Study Program	
Master program	Mining and Tunnelling 1. Part / Speciality 1 "Mining"
Master program	Mining and Tunneling 1. Part / Speciality 3 "Raw Materials and Energy Systems"
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route A: Begin Leoben)
Master program	Mining and Tunnelling 1. Part / Speciality 3 "Geomatics for Mineral Resources Management" (Route B: Begin Freiberg)
Master program	International Master of Science in Advanced Mineral Resources Development 1. Part / Elective Subjects