AMRD

Study Handbook

International Master of Science in Advanced Mineral Resources Development

(Joint Master Degree Program)

1st Semester Montanuniversität Leoben

2nd Semester TU Bergakademie Freiberg

1st Edition, February 2025

Dear Students of the Joint Master Degree Program “Advanced Mineral Resources Development”,

this Study Handbook provides an overview on the AMRD courses of the first and second semester of the Joint Master Degree Program “Advanced Mineral Resources Development”.

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

In case you have any questions do not hesitate to contact us!

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We wish you good luck for your studies!
Glückauf

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AMRD Program Structure

Advanced Mineral Resources Development (AMRD) is a Joint Master Degree Programme between Montanuniversität Leoben (Austria) and TU (Technische Universität) Bergakademie Freiberg (Germany) and other partner universities. Students study the first semester at Montanuniversität Leoben, the second semester at TU Bergakademie Freiberg and the second year at either Montanuniversität Leoben, TU Bergakademie Freiberg or one of the partner universities. The fourth semester is for the preparation of the master's thesis. The language of instruction is English.

Current partner universities are

- Dnipro University of Technology, Ukraine
- China University of Mining and Technology Beijing, China
- Amirkabir University of Technology Tehran, Iran
- The Instituto Superior Técnico of the Universidade de Lisboa, Portugal
- Universidad Politécnica de Madrid, Spain
- Taita Taveta University, Kenia
- Navoi State University of Mining and Technologies, Uzbekistan
- Abylkas Saginov Karaganda Technical University, Kazakhstan

The joint master degree program AMRD comprises compulsory subjects (70,5 ECTS), electives (19,5 ECTS), Seminar Master Thesis (3 ECTS), the master thesis (25 ECTS) and the final exam for the master’s degree (2 ECTS).

	ECTS
Compulsory subjects	70,5
Restricted electives	19,5
Seminar Master Thesis International Master of Science in Advanced Mineral Resources Development	3
Master thesis	25
Presentation and final exam of the master thesis	2
Sum	120

Compulsory subjects

The compulsory subjects consist of the following areas

- Mineral Economics and Project Management (23 ECTS), Montanuniversität Leoben
- Mining and Environment (24 ECTS), TU Bergakademie Freiberg
- Mining Technology (23,5 ECTS), either Montanuniversität Leoben or TU Bergakademie Freiberg or one of the AMRD partner universities

Restricted electives

The restricted electives cover 19,5 ECTS, whereas at least 3 ECTS have to be completed at each of the universities.

The AMRD program covers 120 ECTS points. This corresponds to the usual study period of four semesters (two years). In each semester, 30 ECTS points are usually acquired.

All students complete the first semester of the master program at Montanuniversität Leoben, the second semester at TU Bergakademie Freiberg, and the third and fourth semester either at Montanuniversität Leoben, TU Bergakademie Freiberg or at one of the partner universities. The fourth semester, which is usually set aside for the delivery of the master's thesis. This study order is compulsory for all students.

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1. Montanuniversität Leoben

1. 1 Compulsory Subjects

Deposit Modelling and associated Software

Course Nb	200.109
ECTS	2
Type	Integrated course
Offering period	Wintersemester
Lecturer	Haindl
Course description	
Content	• Basics of data collection and organization of exploration results in a database • Database management • Data Analysis and Geological Modelling o Geological Controls o Composites • Resource Modelling o Basics in Geostatistics • Resource Classification
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 • List required steps and input parameter to create a deposit model. • Describe possible threats and limits of computer-generated models. • Use geostatistical methods to estimate resources. • Classify a deposit model based on the estimation.

	• Perform simple tasks (like creating strings or wireframes) using Datamine Studio and Geovia Surpac.
Languages of instruction	English
Teaching and learning method	Mandatory attendance (75% required) Theoretical introduction with assignments Practical part in computer laboratory
Assessment (Exam Method and Evaluation)	Intermediate written exam and assignments
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.

Economic Geology and Mining Economics

Course Nb	200.001
Credits	6
Type	Lecture
Offering period	Wintersemester
Lecturer	Haindl
Course description	
Content	• Basic introduction to micro mining economics o Sustainability and mining capital • Economic geology (deposit as factor of production) o Mineral occurrence, deposit, Mineral law o Prospection and exploration (+ costs) o Modelling, reserves and resources o Documentation of a deposit • Mining economics o Factors of production: labour o Factors of production: means of production, energy o Financial analysis and statements o Mine valuation • Risks and sensitivity analyses
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: • Perform simple financial analysis of mining related projects. • Explain official financial statements of a mining business.

	• Analyze elemental factors of production for a mining company. • Evaluate risks of a mining operation. • Use sensitivity analysis for financial analysis of mining projects. • Contrast official standards for reserves and resources reporting. • Describe basics of the mine valuation process.
Languages of instruction	English
Teaching and learning method	Theoretical knowledge transmission and active participation for calculations (Flipped Classroom Concept) Voluntary assignments
Assessment (Exam Method and Evaluation)	Written
Further information	
Note	The assessment methods and the compulsory readings of this course will be announced in detail in the first lecture. The lecture notes will be available on Moodle.

Mine Operation, Scheduling, Costing

Course Nb	200.110
ECTS	3
Type	Integrated course
Offering period	Wintersemester
Lecturer	Frömmer, Haindl
Course description	
Content	• Basics of a mining operation (exploration, factors of production) • Link mining operation – economic situation • Reserves and resources • Cost accounting • Scheduling in mining
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 • Describe internal and external influences on a mining operation from an economic point of view • Explain cost accounting principles • Create a simple mine schedule with given constraints
Languages of instruction	English
Teaching and learning method	• Class lecture with discussions • Active participation and interaction are supported • Practical part in computer laboratory with assignments
Assessment	Continuous assessment: • Attendance (min. 75%)

(Exam Method and Evaluation)	• Written test (part Mr. Frömmer) 60% (pre-condition for the participation at the exercise) • Active participation and assignments (part Haindl) 40%
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.

Mineral Economics

Course Nb	200.193
Credits	3
Type	Lecture
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	• 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
Assesment (Exam Method and Evaluation)	The written exam is in classroom and consists of four questions and one calculation example.
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.

Mining in Austria, in the European Union and worldwide

Course Nb	200.140
Credits	1
Type	Lecture
Lecturer	Sanchez
Course description	
Content	This lecture aims at providing an overview of mining operations, background, raw materials policy, and mining economics in a worldwide perspective. Therefore, background statistics, and theoretical considerations, are mixed with presentations from industry and government representatives aiming at providing a comprehensive oversight.
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 • Worldwide demand and supply of mineral resources • Critical future issues of the mining industry • Mining in different areas of the world
Languages of instruction	English
Teaching and learning method	Interactive lecture, presentations, active participation and discussion
Assessment (Exam Method and Evaluation)	Written and oral

Further information	
Recommended reading	Will be updated to Moodle
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 to moodle.

Seminar in Mining Engineering and Mineral Economics

Course Nb	200.114
Credits	2
Type	Seminar
Lecturer	Ungerer
Course description	
Content	This course aims at high-quality scientific working procedures, writing of thesis of publications as well as presentation of results. Students have a short introduction, and will then independently elaborate on a topic assigned, producing a report and presenting the findings to the audience)
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basics of mining and mining related processes
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to: • Independently perform a mining related project • Write a good report / thesis • Avoid plagiarism and fraud • Present findings written and oral
Languages of instruction	English
Teaching and learning method	Lecture with exercises Independent course work with supervision and feedback sessions by lecturer.

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 to moodle.

Sustainable Development: History of thought, basic concepts and current applications

Course Nb	200.098
ECTS	6
Type	Lecture
Lecturer	Grübler, Tost
Course description	
Content	• Basic introduction to the history and the multiple conceptual bases of Sustainable Development o Renewable resource management, conservation movement, human rights, Brundtland Commission, UN MDGs and SDGs • Overview of underlying fundamental concepts o Soft vs. hard sustainability, ecosystem services, planetary boundaries o Multidisciplinary perspective including ethics, economics, social and environmental sciences • Current applications across different social goals and industrial sectors, with a focus on mining o Historical perspective of mining development and current sustainability initiatives in extractive industries (GMI, ICMM, EITI, SLO, etc) o Mining related case study • Applied SD concepts and principles, in particular the UN Sustainable Development Goals (SDGs) and ongoing extensions (e.g. The World in 2050 Initiative)
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basic understanding of mining and raw materials
Objective (expected results of study	On completion of this course the participants shall be able to: • Name and differentiate the various concepts of sustainability and sustainable development

and acquired competences)	• Explain key components, i.e. the areas of the 17 SDGs, including e.g. climate change, poverty reduction and inequality • Identify what SD means for mining and understand and explain what role and contribution raw materials have in the context of the various underlying concepts of sustainability • Integrate SD considerations into mine planning and design • Rethink implications for your career and personal life
Languages of instruction	English
Teaching and learning method	• Interactive lecture • Presentations and videos • Q&A, discussions • Case studies • Guest lectures
Assessment (Exam Method and Evaluation)	• Written and oral: written exam (online) has to be passed in order to be admitted to the oral exam.
Further information	
Recommended reading	• The 17 Sustainable Development Goals https://sdgs.un.org/goals • Mapping Mining to the SDGs: An Atlas https://www.undp.org/content/undp/en/home/librarypage/poverty-reduction/mapping-mining-to-the-sdgs--an-atlas.html
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.

1. 2 Restricted Electives

Artisanal and Small-scale Mining in Developing Countries

Course Nb	200.149
ECTS	3
Type	Lecture
Lecturer	Hruschka
Course description	
Content	The course covers the importance and 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. Case studies from Latin America, Africa and Asia are used to illustrate the challenges and possible solutions. Starting out from a characterization of ASM as a poverty- as well as an opportunity-driven activity of roughly 50 million people in developing countries (chapter 1) and the typical ASM technology used by them (chapter 2), the course addresses the most important crosscutting key issues relevant for the ASM sector (chapter 3), such as environmental impacts and in particular mercury use, safety and occupational health, public health, child labour, gender, organization, legalization and formalization, coexistence with industrial mining, contribution to local development, climate change etc. Chapter 4 covers the interrelated key issues of conflict minerals, voluntary ASM standards- and

	certification initiatives, as well as the increasing relevance of legal requirements for responsible mineral supply chains based on the OECD Due Diligence Guidance. Chapter 5 deals with sustainable development-based strategies, approaches and instruments for ASM project planning and attempts to provide an outlook on future trends. The course concludes with an overview of relevant initiatives, institutions and further sources of information (chapter 6).
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
Objective (expected results of study and acquired competences)	On completion of this course, participants are expected to understand the differences and similarities of industrial mining and artisanal small-scale mining and the driving forces of communities and actors engaged in ASM. Participants shall be able to: • Resolve complex and multidisciplinary problems of ASM in developing countries. • 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	Multimedia-supported lecture with case studies. Active participation and discussion are expected.
Assessment (Exam Method and Evaluation)	• Written exam assessing the acquired understanding of the topic, and • Oral exam (usually as panel discussion) assessing the acquired abilities as stated in

	the learning objectives. Both parts must be passed positive. • In case of exams in online mode, both parts might be oral.
Further information	
Recommended reading	Electronic copies of relevant documents and articles will be provided (see "Online Information" - "course documents")
Note	The most recently updated version of the course documents (PowerPoint presentation for each chapter and supplementary materials) will be made available for download one week before the lecture. The password to access the course documents will be provided by the lecturer. The assessment methods will be announced in detail in the first lecture.

Continuous Mining Methods and Conveying Technologies in Surface and Underground Mining

Course Nb	200.111
ECTS	3
Type	Lecture
Lecturer	Bertignoll, Sifferlinger
Course description	
Content	This is a general course about continuous mining methods and conveying technologies in surface and underground mining. The following topics will be covered: • Basics of surface and underground mining • Surface Mining o Introduction o Bucket wheel excavator o Surface miner o Sizer/Breaker o Safety in surface mining • Underground mining o Introduction o Continuous mining in room and pillar (coal, salt, trona and potash) o Longwall mining methods o Continuous mining in hard rock o Safety in underground mining • Conveying technologies in surface and underground mining o Introduction o Overview continuous conveying technologies o Conveyor belt systems o Trucks and shuttle cars

	o Rail bound transport systems o Applications of conveying systems
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 be able to: • Understand and apply the basics of continuous surface and underground mining methods • Explain the different surface and underground mining operations • Differentiate between the mining and conveying methods by comparing the benefits and drawbacks, challenges and limitations
Languages of instruction	English
Teaching and learning method	multimedia-supported
Assessment (Exam Method and Evaluation)	Oral exam
Further information	
Recommended reading	SME Mining Engineering Handbook – Peter Darling

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.

Excavation Engineering

Course Nb	200.059
Credits	3
Type	Integrated course
Lecturer	Hartlieb, Sifferlinger
Course description	
Content	This course provides an overview of the different excavation technologies used in mining and civil engineering. It mainly covers excavation by drilling and blasting, as well as mechanical excavation concepts, but also discusses alternative excavation concepts as e.g. Laser, and high-pressure water jets. The technologies are explained in detail, i.e. their technical functionality, pros and cons, environmental side effects and economic performance
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basics of Mining and mining related processes • Rock mechanic
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Know about the different excavation concepts • Know about different methods used for underground drifting and production • Identify and design the excavation method best suited for their operation
Languages of instruction	English

Teaching and learning method	Integrated lecture, group assignment for independent work, industry field trip (1 day) if possible, interactive lectures, lecture attendance
Assessment (Exam Method and Evaluation)	Written exam
Further information	
Recommended reading	Will be uploaded to Moodle
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.

German as a foreign language A1.1

Course Nb	641.549
Credits	4
Type	Integrated course
Lecturer	Ganzer, Oberländer, Reiger, Unterhauser
Course description	
Content	• Basic knowledge of the German language • Basic grammatical structures • Basic communicative situations (greeting, personal information, suggestions, restaurant, hobbies, opinions, describing the way etc.)
Previous knowledge expected	No
Objective (expected results of study and acquired competences)	The students are able to: • Understand und use familiar words and very basic phrases concerning themselves • Ask and answer simple questions in areas of immediate need or on very familiar topics • Communicate in a simple manner about their immediate surroundings when people speak slowly and clearly
Languages of instruction	German
Teaching and Learning Method	Communicative language course Courses are held as face-to-face classes.
Assessment (Exam Method and Evaluation)	Active in-class participation, attendance, homework, progress checks, final exam
Further information	
Recommended reading	Menschen A1.1

German as a foreign language A1.2

Course Nb	641.550
ECTS	4
Type	Integrated course
Lecturer	Ganzer, Unterhauser
Course description	
Content	• Repetition and consolidation of German level A1.1 • Vocabulary expansion and revision • Basic grammar topics such as reflexive verbs, conjunctions, tenses and articles • Topics: job, family, living, culture, visits, work, nutrition • Working on and improving the four language skills • Instructions for autonomous language acquisition
Previous knowledge expected	• Deutsch A1.1
Objective (expected results of study and acquired competences)	Students are able to: • understand and use familiar every day expressions and very basic phrases • interact in a simple way provided the other person talks slowly and clearly and is willing to help • introduce themselves and others • ask and answer questions about personal details (e.g. their family, friends and employment) • express decisions and make suggestions • express worries, fears and hopes.

Languages of instruction	German
Teaching and learning method	Communicative language course Courses are held as face-to-face classes.
Assessment (Exam Method and Evaluation)	Active in-class participation, attendance, homework, progress checks, final exam
Further information	
Recommended Reading	Momente A1.2, Kurs- und Arbeitsbuch, Hueber Verlag

Lab in Mine Ventilation

Course Nb	200.107
ECTS	1
Type	Practical
Lecturer	Nöger
Course description	
Content	• Numerical and analytical analysis of ventilation networks • Resistance, pressure drop & air flow • Fan performance and air flow calculations • Gas distribution and dilution analysis • Introduction in ventilation simulation software • Ventilation survey calculations
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Basic knowledge of: o Mine ventilation systems o Underground atmosphere o Ventilation surveys
Objective (expected results of study and acquired competences)	On completion of this course the participants shall be able to • Perform simple ventilation network analysi, fan design for underground mines, evaluation ventilation survey data; gas dilution and environment calculation • Set up of ventilation models with simulation software
Languages of instruction	English
Teaching and learning method	Laboratory

Further information	
Recommended reading	McPherson, Malcolm J. Subsurface ventilation and environmental engineering. 2012
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.

Marine Mining

Course Nb	200.148
ECTS	2
Type	Lecture
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	Lectures Active participation and discussion

Assessment (Exam Method and Evaluation)	Oral
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.

Mine Ventilation, Water Control, Infrastructure

Course Nb	200.106
Credits	3
Type	Lecture
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 • Physics of airflow • Basics of Underground Mining
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	Lectures Homework calculations Active participation and discussion
Assessment (Exam Method and Evaluation)	Oral exam
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.

1. 3 Additional Courses[1]

Introductory Mining Engineering

Course Nb	200.067
ECTS	3
Type	Lecture
Lecturer	Varelja
Course description	
Content	This course gives a general introduction to mining. Starting from the intersection of geology and economic geology, to basic mining equipment and its modes of operation, to the wide range of underground and open pit mining methods who will be discussed in detail, highlighting their relevance as well as pre-requisites to the deposit and rock mechanics.
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Geology and knowledge of deposit types • Basic rock mechanics and mineral processing
Objective (expected results of study and acquired competences)	On completion of this course the participants shall: • Know the economic definition of a deposit • Know the basic mining processes and their equipment • Be able to distinguish between different mining system classifications • Know the main surface and underground mining methods, explain them and their area of use.

[1] Compulsory for those students who do not have a background in mining engineering

	• Know the main excavation concepts and their area of application as well as constraints
Languages of instruction	English
Teaching and learning method	Lectures
Assessment **(Exam Method and Evaluation)**	Written
Further information	
Recommended reading	• Will be uploaded to Moodle
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 to moodle.

Introduction in Mining

Course Nb	200.096
ECTS	2,25
Type	Lecture
Offering period	Online self-study course prior to the start of the wintersemester
Lecturer	Moser-Tscharf
Course description	
Content	Within approx. two weeks of self-study this 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
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Background in mining or related fields, e.g.: o Tunneling o Mineral Processing o Geology o Environmental Engineering o 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 Montanuniversität. On

	completion of this course, the participants shall be able to: • Know and use relevant terms and definitions in the abovementioned topics • Solve basic tasks in the field of the abovementioned topics • Understand the interaction between the abovementioned topics • Follow Master lectures in Mining at Montanuniversität
Languages of instruction	English
Teaching and learning method	Online self-study assisted by moodle
Assessment **(Exam Method and Evaluation)**	Written exam
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 can only be attended by those AMRD students who have received it as a pre-condition for their admission.

Lab in Introductory Mining Engineering

Course Nb	200.028
ECTS	1
Type	Practical
Lecturer	Fernandez Munoz, Haindl
Course description	
Content	Practical approach to underground mine design • Genesis of a deposit • Access to underground mine • Mining method and layout
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: • Identify possible mine methods based on given constraints of a deposit • Describe possibilities to access an orebody • Prepare a report describing the deposit portfolio
Languages of instruction	English
Teaching and learning method	• Mandatory attendance (75% required) • Group work • Model examination via VR
Assessment (Exam Method and Evaluation)	Final report and presentation of group activities
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.

2. TU Bergakademie Freiberg

2. 1 Compulsory Subjects

Environmental Geotechnics

Course Nb	SUSBFR. MA. Nr. 090
Credits	3
Type	Lecture
Lecturer	Butscher
Course description	
Content	• Waste disposal scientific fundamentals; legal framework; geologicalhydrogeological aspects of construction and operation of landfills, industrial sedimentation basins and deep geological repositories; computer-aided stability analysis; preparation of a geotechnical report. • Old mining legal framework; exploration methods; methods of assessment, remediation and securing; regional topics in Saxony (lignite open pits, uranium mining); water management of flooded underground mines; international case studies.
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • B.Sc. in Geosciences or Geo-Engineering • Basic Knowledge of Geosystems
Objective (expected results of study and acquired competences)	On completion of this course the participant should be able to • Become familiar with topics of environmental geotechnics

	• Know the relevance and consequences of abandoned contaminated sites, waste disposal and old mining • Understand the respective processes and can discuss and plan mitigation measures.
Languages of instruction	English
Teaching and learning method (delivery of skills) workload for students	The workload is 90h. It is the result of 30h attendance and 60h self-studies. Latter includes the review of the taught materials and exam preparation.
Assesment	For the award of credit points, it is necessary to pass the module exam. The module exam contains: KA: Environmental Engineering Geology and Brownfield Revitalisation [120 min]. The Grade is generated from the examination result(s) with the following weights (w): KA: Environmental Engineering Geology and Brownfield Revitalisation [w: 1]
Further Information	
Recommended reading	• Daniel (ed.): Geotechnical Practice for Waste Disposal. Chapman & Hall, London, 1993 • Price, D.G.: Engineering Geology, Principles and Practice, Springer-Verlag, Berlin-Heidelberg, 2009 • Suthersan et al.: Remediation Engineering. CRC Press, Boca Raton, 2017

Introduction to Biohydrometallurgy

Course Nb	Bhymet. MA.
Credits	4
Type	Lecture/Exercises
Lecturer	Hedrich
Course description	
Content	• Microbial basics, origin of life, cell structure, metabolism • Energy acquisition, redox reactions, microbial element cycling • Microbial habitats and biofilms, extremophiles • Biomining microorganisms, iron- and sulfur metabolizing acidophiles • Basics of bioleaching and bio oxidation, mechanisms, metal sulfides • Biomining technologies, stirred tank, heap and dump bioleaching • Bioleaching of primary and secondary resources • Oxidative and reductive bioleaching, current technologies and application • Stirred tank bioreactor operation and control, heap bioleaching set up and control • Biodesulphurisation of coal • Biological mine water treatment and metal recovery, iron oxidizing and sulfate reducing microorganism, application examples • Biosorption, bioaccumulation, biosynthesis of nanomaterials

	• Analytical methods in biohydrometallurgy, mineralogy, analytical chemistry, microbiological methods, molecular biology
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Bachelor degree in natural science, mining- or metallurgy-related engineering • Basic knowledge in chemistry
Objective (expected results of study and acquired competences)	On completion of this course the participant should be able to • Describe basics in microbiology and the general concept of microbial lifestyle and metabolism • Balance the advantages and limitations of various biohydrometallurgical process options taught during the lecture for the winning of metals from primary and secondary resources • Identify the role of different types of microorganisms in the process and how they catalyze metal recovery and interact with each other and their environment • Apply the taught methods and basics to analyze given case studies and present the results in a seminar
Languages of instruction	English
Teaching and learning method	The workload is 120h. It is the result of 45h attendance and 75h self-studies.
Assesment	For the award of credit points, it is necessary to pass the module exam. The module exam contains: KA [90 min]

	AP*: Übungsaufgaben und Case study report * In modules requiring more than one exam, this exam has to be passed or completed with at least "ausreichend" (4,0), respectively.
Further Information	
Recommended reading	• W. Reineke & M. Schlömann: Umweltmikrobiologie, Springer Spektrum, 2015. • Michael T Madigan; Kelly S Bender; Daniel H Buckley; W Matthew Sattley; David Allan Stahl, Brock biology of microorganisms, Pearson • D. R. Lovley (Ed.): Environmental Microbe-Metal Interactions, ASM Press, 2000 • D. E. Rawlings & D. B. Johnson (Eds.): Biomining, Springer, 2007 • E. R. Donati & W. Sand (Eds.) Microbial Processing of Metal Sulfides, Springer, 2007 • L. G. Santos Sobral, D. Monteiro de Oliveira & C. E. Gomes de Souza (Eds.): Biohydrometallurgical Processes: a Practical Approach, CETEM/MCTI, 2011 • A. Schippers, F. Glombitza & W. Sand (Eds.): Geobiotechnology I. Metal-related Issues, Springer, 2014

Problem Based Learning on Licensing, Expectation and Stakeholder Management

Course Nb	LICENS. MA.
Credits	5
Type	Lecture/Practical
Lecturer	Bongaerts, Drebenstedt
Course description	
Content	• Mining laws: general overview, essential elements • Stakeholders "mining authorities" and licensing practical organization of licensing and inspectorate activities • Stakeholders "land owners" and access of miners to their land • Stakeholders "real estate owners" and forced sales to miners • Stakeholders "employees and contracted parties" and health and safety management • Stakeholders "damaged third parties" and rules of liability and of compensation • stakeholders "in general" and models and methods of stakeholder identification and management
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Fundamentals in engineering and natural science
Objective (expected results of study and acquired competences)	Students learn to understand and especially practice tools and techniques for an effective management of stakeholders in mining operations. They acquire this knowledge and best practice through an application of the PBL (Problem Based Learning) technique. They learn the various steps of the PBL (Knowing the problem scenario, identifying facts, identifying knowledge gap, develop resources,

	gain insights to apply knowledge, reflecting on knowledge gained). They acquire skills to conduct research work focusing on a specific problem. They design and work out an appropriate solution for the problem at hand. They learn to engage in group work with setting and fulfilling individual tasks and coordinating the results in a joint overall output. They learn how to present their project, its method and the output. They apply PBL to a specific problem related to Responsible Consumption.
Languages of instruction	English
Teaching and learning method	The workload is 150h. It is the result of 90h attendance and 60h self-studies.
Assessment (Exam Method and Evaluation)	For the award of credit points, it is necessary to pass the module exam. The module exam contains: MP*: Presentation with Question and Answers [45 min] AP*: Term Paper * In modules requiring more than one exam, this exam has to be passed or completed with at least "ausreichend" (4,0), respectively.
Further information	
Recommended reading	• Rod McCrea, Andrea Walton, Tom Measham: Stakeholder engagement processes for mining projects - Phase 2: Testing the effects of benefits and governance information on social acceptance of different mining activities Rod McCrea, CSIRO, Canberra, September 2018

	• https://www.industry.gov.au/sites/default/files/2019-02/stakeholderengagement-processes-for-mining-final-report.pdf • Helena Ranängen: Stakeholder management theory meets CSR practice in Swedish mining, in: Mineral Economics, Vol. 30 (1), 1 – 15, April 2017, Springer DOI 10.1007/s13563 016 0098 • https://teaching.cornell.edu/teaching-resources/engagingstudents/problem-based-learning • Andrew Walker, Heather Leary, Cindy Hmelo-Silver (Eds.): Essential Readings in Problem-Based Learning: Exploring and Extending the Legacy of Howard S. Barrows, Purdue University Press, 2015 • David H. Jonassen & Woei Hung: Problem-Based Learning, in: Encyclopedia of the Sciences of Learning, pp 2687–2690, Springer DOI: 10.1007/978-1-4419-1428-6_210

Radioactivity

Course Nb	SUSRAD. MA. Nr. 2091
Credits	6
Type	Lecture/Practical
Lecturer	Mischo, Weyer
Course description	
Content	• Radioactive decay • Special consideration of Rn222 and Radon decay, • Products • ICRP principles • Protection against radiation • Measurement and sampling, • Pathways • Risk analysis • Optimal remedial procedures • Decontamination techniques • Ventilation systems • Gases • Airway resistance
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Fundamentals in engineering and natural science
Objective (expected results of study and acquired competences)	On completion of this course the participant should be able to have a basic knowledge of • Radioactive decay • Measurement of radiation • Units • Technique of sampling • Decontaminations techniques
Languages of instruction	English

Teaching and learning method	Lectures (3 SWS), practical application (3 SWS). The workload is 180h. It is the result of 90h attendance and 90h self-studies. The latter includes industrial placement.
Assessment	For the award of credit points, it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 15 students or more) [MP minimum 30 min / KA 120 min] PVL: Project report PVL have to be satisfied before the examination. The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1] PVL: Project report [w: 0]
Further information	
Recommended reading	ICRP publications, especially ICRP 43 and 65, conference proceedings

Reclamation

Course Nb	BBREKL .MA.Nr. 2087
ECTS	6
Type	Lecture/Practical
Lecturer	Drebenstedt
Course description	
Content	• Impacts of mining and its effects • Legal requirements for permission • Scientific fundamentals of reclamation (soil, ground water balance,…) • Utilization requirements and realization in the post-mining landscaping (agriculture, forestry, waterbodies, nature protection, recreation, miscellaneous) • Concepts, Case studies
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Mathematic-scientific fundamentals
Objective (expected results of study and acquired competences)	The module provides the development of expertise and methodological skills in the field of mining engineering. The students learn the theory and practice of reclamation in mining as essential element of balance for mining impacts. They understand the parallelism of mine and reclamation planning and the fact, why reclamation can exceed the mine project phase. Additionally, the students will be qualified to explain scientifically reclamation measures, plan technical measures and calculate the financial expenses.
Languages of instruction	English

Teaching and learning method	Lecture (3 SWS), exercise (2 SWS), practical application (1 SWS). The workload is 180h. It is the result of 90h attendance and 90h self-studies. Self-study includes autonomous and instructed preparation and performance of follow-up course work and examination preparation.
Assessment	For the award of credit points, it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 21 students or more) [MP minimum 30 min / KA 60 min] PVL: Submission and positive evaluation of module exercises PVL: Participation in 2 excursions of the chair Surface-Mining PVL have to be satisfied before the examination. The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]
Further information	
Recommended reading	• Pflug (Hrsg.), 1998, Braunkohlentagebau und Rekultivierung, Springer Verlag • Olschowy, Bergbau und Landschaft, 1993, Paray Verlag • Gilscher, Bruns, 1999, Renaturierung von Abbaustellen, Verlag Eugen Ulmer Stuttgart

2. 2 Restricted Electives

Deutsch A1/2. Semester

Course Nb	DEU A1/ 2. Sem. BA. Nr. 949
Credits	4
Type	Lecture/Practical
Lecturer	Polanski
Course description	
Content	Orientierung in der Stadt beziehungsweise in der Firma, öffentliche Verkehrsmittel, Wegbeschreibung, Berufe und Arbeitsalltag, Körper und Gesundheit, Wohnungssuche und -einrichtung, Lebenslauf, Kleidung; Grammatik: zum Beispiel Präpositionen, Frageartikel, Modalverben, Possessivartikel, Perfekt, Konjunktionen, Demonstrativpronomen, Graduierung und Komparativ
Previous knowledge expected	Deutsch A1/ 1. Semester, 2015-08-26 oder äquivalente Sprachkenntnisse
Objective (expected results of study and acquired competences)	Im Kurs werden Grundlagen in Phonetik, Orthographie, Grammatik und Lexik vermittelt. Die Teilnehmer erwerben Grundkenntnisse und Grundfertigkeiten im Hören, Sprechen, Lesen und Schreiben auf der Basis der Allgemein-sprache sowie landeskundliche Kenntnisse.
Languages of instruction	Deutsch
Teaching and learning method	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium.
Assessment (Exam Method and Evaluation)	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst:

	KA [90 min] PVL: Aktive Teilnahme am Unterricht (mindestens 80%) PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden. Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): KA [w: 1]
Further information	
Recommended reading	• Begegnungen A1+, Schubert Verlag

Deutsch A2/ 2. Semester

Course Nb	DEUA/2. Sem BA.Nr. 951
Credits	4
Type	Lecture/Practical
Lecturer	Polanski
Course description	
Content	• Freizeitaktivitäten (Sport, Vereine) • Arbeit und Arbeitssuche • Politik in Deutschland • Städte (Leipzig, Berlin) • Verkehr und Verkehrsmittel, • Medien, Fernsehen in Deutschland • Kulturelle Unterschiede • Grammatik: z.B. Indefinita, Relativsätze, Nebensätze mit bevor, bis, als, deshalb, wenn, Konjunktiv II,
Previous knowledge expected	Deutsch A2/ 1. Semester, oder äquivalente Sprachkenntnisse
Objective (expected results of study and acquired competences)	Die Teilnehmer erweitern ihre Kenntnisse zu Grundlagen der deutschen Grammatik sowie ihren allgemeinsprachlichen Wortschatz und führen Gespräche zu verschiedenen Themen des Alltags.
Languages of instruction	Deutsch
Teaching and learning method	Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium.
Assessment	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min]

	PVL: Erfolgreiche aktive Teilnahme an mind. 80% d. Unterrichts PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden. Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): KA [w: 1]
Further information	
Recommended reading	• Begegnungen A2+, Schubert Verlag

Deutsch B1/ 2. Semester

Course Nb	DEUB1/2. Sem. 953
Credits	4
Type	Exercise
Lecturer	Polanski
Course description	
Content	Zusammenleben der Menschen in Deutschland (Wohn- und Lebensformen, Vorstellungen über berufliche Entwicklung und Freizeitgestaltung, Konsumverhalten, Beziehung zur Natur)
Previous knowledge expected	• Deutsch B1/ 1. Semester, 2015-08-26 • oder äquivalente Sprachkenntnisse
Objective (expected results of study and acquired competences)	Die Teilnehmer bauen die in dem Modul Deutsch b1/1.Semster erworbenen sprachlichen Kenntnisse und Fertigkeiten unter besonderer Berücksichtigung der mündlichen Kommunikation aus. Sie wiederholen und erweitern ihren Wortschatz. Auf der Basis aktueller und historischer Texte erhalten die Teilnehmer landeskundliche Informationen über die Bundesrepublik Deutschland.
Languages of instruction	Deutsch
Teaching and learning method	Übung (4 SWS) Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium.
Assessment (Exam Method and Evaluation)	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: KA [90 min] PVL: Aktive Teilnahme an mind. 80% d. Unterrichts

	PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.
Further information	
Recommended reading	Begegnungen B1+, Schubert Verlag

Deutsch B2/ 2. Semester

Course Nb	B2.2 BA. Nr.
Credits	4
Type	Exercises
Lecturer	Polanski
Course description	
Content	Schriftliches und mündliches Zusammenfassen von Texten; informelle/formelle E-Mails schreiben; Grafikinterpretation; in einer Diskussion Tatsachen, Meinungen und Argumentation erkennen, auf Redebeiträge eingehen und eigene Redebeiträge halten; Grammatik und Wortschatz gemäß Lehrmaterial (u.a. Textzusammenhang; Partizipien als Adjektiv, indirekte Rede, Konjunktiv I & II, Modalsätze; Passiversatz; Wortbildung; Nomen-Verb-Verbindungen)
Previous knowledge expected	• Deutsch B2/ 1. Semester, 2016-04-04 • oder äquivalente Sprachkenntnisse
Objective (expected results of study and acquired competences)	Die Teilnehmer bauen ihre sprachlichen Kenntnisse und Fertigkeiten auf dem Niveau B2.2 aus. Mithilfe handlungsorientierter Aufgaben und Aktivitäten entwickeln die Teilnehmer ihre Kenntnisse zu Lernstrategien, Grammatik, Wortschatz, Landeskunde und interkulturellen Aspekten weiter. Die Teilnehmer verstehen den Hauptinhalt komplexer, authentischer Texte. Sie können längeren Redebeiträgen folgen und sich spontan und fließend verständigen. Sie können sich zu einem breiten Themenbereich klar und detailliert

	ausdrücken, ihren Standpunkt erläutern und die Vor- und Nachteile verschiedener Möglichkeiten angeben.
Languages of instruction	Deutsch
Teaching and learning method	Übung (4 SWS) Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium. Letzteres umfasst die Vor- und Nachbereitung von Lehrveranstaltungen sowie die Vorbereitung der Aufgaben und der Prüfungsleistung.
Assessment (Exam Method and Evaluation)	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: AP: Portfolioprüfung bestehend aus 4 Teilen zum Nachweis aller Sprachfertigkeiten (Hörverstehen, Leseverstehen, Sprechen, Schreiben) AP: Aufgaben und aktive Teilnahme an mind. 80% d. Unterrichts
Further information	
Recommended reading	Kompass DaF B2.2 (Klett Verlag)

European Values and Culture

Course Nb	EURVAL. BA.Nr.
Credits	5
Type	Lecture/Seminar
Lecturer	Bongaerts, Drebenstedt
Course description	
Content	The origins of European values from Antiquity and Early Christianity through Renaissance, the Enlightenment and the French Revolution to postwar European political initiatives and modern-day trends. Insights in the relevance of European values for the development of public administrations and society, the advancement of education and research and the management of business operations of all kinds. Potential threats to Europe by “competing” value systems. Applications to specific areas of technology innovation with a reflection of the respective Sustainable Development Goals. Examples include technologies and systems for mobility, agriculture and food production, IT and data management, intergenerational equity and the circular economy, health, safety and job satisfaction.
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
Objective (expected results of study and acquired competences)	Students learn to understand the origins and the development of European values within the European cultural context. They understand

	the relevance and importance of European Values for technology development and for management processes at all levels. They understand how to integrate European Values into the value creation of business and other organizations.
Languages of instruction	English
Teaching and learning method	Lectures (2 SWS), Seminar (1 SWS) The workload is 150h. It is the result of 45h attendance and 105h self-studies.
Assessment (Exam Method and Evaluation)	For the award of credit points, it is necessary to pass the module exam. The module exam contains: AP: Presentation with Questions and Answers [45 min] AP: term paper (minimally 12 pages)
Further information	
Recommended reading	• Halman, L., Reeskens, T., Sieben, I., & Zundert, M. van. (2022). Atlas of European Values. Open Press TiU. DOI: 10.26116/p8v-tt12 • Soboleva, N. (2022), “The determinants of the link between life satisfaction and job satisfaction across Europe”, International Journal of Sociology and Social Policy, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/IJSSP-06-2021-0152

Geomodelling – Geostatistics for Natural Resource Modelling

Course Nb	GM MA.
Credits	5
Type	Lecture/Practical
Lecturer	Benndorf
Course description	
Content	Importance of Resource Modelling and Estimation in the Value Chain of Mining, Uni-variate and Multi-variate Explorative Data Analysis, Analysis of Spatial Continuity, the Spatial Random Function Model, Model Assumptions of Stationarity and Ergodicity, Inference of a Spatial Random Function using unbiased Estimators, Dealing with Preferential Sampling, Variography and Variogram Modeling, Simple Methods for Spatial Estimation including the Polygon Method, Triangulation, Inverse Distance Power and Polynomial Regression, Geostatistical Methods for Spatial Estimation including Simple Kriging, Ordinary Kriging and Universal Kriging, Integrating Secondary Information into Spatial Modeling using Techniques of Co-Kriging, other methods including Indicator Kriging and Block Kriging, Introduction in Modeling spatial Uncertainty using Conditional Simulation, the Method of Sequential, Gaussian Simulation, Geostatistical Considerations in Estimating Reserves in Terms of Volume-Variance Relationship for defining Smallest Minable Units and Grade Tonnage Curves, Applications in Mining Cases,

	Introduction to CRIRSCO-based International Reporting standards (example JORC Code).
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1) • Angewandte Statistik, 2021-11-22
Objective (expected results of study and acquired competences)	After successful completion of the course, students are able to: • Explain the theoretical foundation of spatial data analysis, geostatistical model building and estimation • Apply geostatistical methods in the context of estimating natural resources/reserves, • Critically evaluate model assumptions of different estimation and simulation method and choose suitable methods for specific applications, • Discuss the critical character of the SMU-size to recoverable reserves, • Conduct a resource/reserve estimation in a simple case study.
Languages of instruction	English
Teaching and learning method	Lecture (2 SWS), practical (2 SWS) The workload is 150h. It is the result of 60h attendance and 90h self-studies.
Assessment (Exam Method and Evaluation)	For the award of credit points, it is necessary to pass the module exam. The module exam contains: KA [90 min] AP: Assignments and Practical Report
Further information	
Recommended reading	• M. Armstrong: “Basic Linear Geostatistics”, Springer Verlag

	• J. Benndorf: „Angewandte Geodatenanalyse und –Modellierung: Eine Einführung in die Geostatistik für Geowissenschaftler und Geoingenieure“, Springer Verlag • A. G. Journel, and C.J. Huijbregts: Mining Geostatistics, Academic Press • P. Goovaerts: “Geostatistics for Natural Resource Evaluation“, Oxford University Press • T. Schafmeister: “Geostatistik für die hydrogeologische Praxis“, Springer Verlag

Responsible Consumption

Course Nb	RESPCON. BA. Nr.
Credits	5
Type	Lecture/Seminar
Lecturer	Bongaerts
Course description	
Content	• Consumer economics: the rational neo-classical consumer model, consumer models of behavioral economics, psychological models of the learning consumer, sociological consumer models, ecological consumer models • Consumer law, consumer education and information, standards, guidelines and labels for product development, manufacturing, distribution and recycling • Marketing tools and techniques • Measurement and evaluation systems for the assessment of products and services: Life Cycle Analysis, CO2 footprint, ecological handprint and others • Development (by engineers) of enabling technologies and management practice for responsible consumption: recyclable materials, design for recycling, durability of product use, human health and animal welfare etc. • Case studies
Previous knowledge expected	• Good English skills (Minimum: CEF Level B1)
Objective (expected results of study	Students learn the essence and the significance of responsible consumption, both from the side

and acquired competences)	of consumers and of producers in their function as enablers through appropriate product design, materials selection, ethically correct production conditions and respect for the environment. Students learn the potentials of consumers to behave responsibly and the opportunities of producers to enhance these potentials.
Languages of instruction	English
Teaching and learning method	Lectures (2 SWS), seminars (1 SWS) The workload is 150h. It is the result of 45h attendance and 105h self-studies.
Further information	
Recommended reading	• Arto O. Salonen: Responsible Consumption, in: Samuel O. Idowu, Nicholas Capaldi, Liangrong Zu, Ananda Das Gupta (Eds): Encyclopedia of Corporate Social Responsibility, Springer, 2013, DOI: https://doi.org/10.1007/978-3-642-28036-8_119 • Journal of Cleaner and Responsible Consumption (Elsevier Open Access)

Russian AMRD

Course Nb	RU AMRD. BA. Nr. 3450
Credits	4
Type	Practical
Lecturer	Seidel-Bachmann
Course description	
Content	Alltags- und studienbezogene Themen Vorbereitung auf Studium in Dnepropetrvsk
Previous knowledge expected	Vorkenntnisse aus dem Anfängerkurs in Leoben
Objective (expected results of study and acquired competences)	Der Teilnehmer erwirbt ausbaufähige Grundkenntnisse und Fertigkeiten der mündlichen und schriftlichen Kommunikation, wobei besonderer Wert auf Kommunikation zu Alltagsthemen gelegt wird.
Languages of instruction	Deutsch
Teaching and learning method	Übung (4 SWS) Der Zeitaufwand beträgt 120h und setzt sich zusammen aus 60h Präsenzzeit und 60h Selbststudium. Letzteres umfasst die Vor- und Nachbereitung von Lehrveranstaltungen sowie die Vorbereitung auf die Klausur.
Assessment (Exam Method and Evaluation)	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): KA [w: 1]
Further information	
Recommended reading	Russisch für Anfänger Jasno (Lehrbuch und Arbeitsbuch) sowie Zusatztexte und -materialien aus verschiedenen Medien (Presse, Prospekte, Internet)