**Amtliche Bekanntmachungen der TU Bergakademie Freiberg**

**Nr. 46, Heft 2 vom 15. Oktober 2012**

# Modulbeschreibungen der TU Bergakademie Freiberg für den Masterstudiengang

# International Master of Science in Advanced Mineral Resources Development

## Inhaltsverzeichnis

**Anpassung von Modulbeschreibungen der TU Bergakademie Freiberg**

Zur Anpassung an geänderte Bedingungen können folgende Bestandteile der Modulbeschreibungen der TU Bergakademie Freiberg vom Modulverantwortlichen mit Zustimmung des Dekans geändert werden:

1. „Code/Daten“
2. „Verantwortlich“
3. „Dozent(en)“
4. „Institut(e)“
5. „Qualifikationsziele/Kompetenzen“
6. „Inhalte“, sofern sie über die notwendige Beschreibung des Prüfungsgegenstandes hinausgehen
7. „Typische Fachliteratur“
8. „Voraussetzungen für die Teilnahme“, sofern hier nur Empfehlungen enthalten sind (also nicht zwingend erfüllt sein müssen)
9. „Verwendbarkeit des Moduls“
10. „Arbeitsaufwand“

Die geänderten Modulbeschreibungen sind zu Semesterbeginn durch Aushang bekannt zu machen.

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| **Code/Dates** | SUSGMF .MA.Nr. 083 |
| **Name** | Management and Finance of Mining Operations along the Life Cycle |
| **Responsible** | **Surname** Bongaerts **First Name** Jan C. **Academic Title** Prof. Dr.<br>**Surname** Kunze **First Name** Christian **Academic Title** Dr. |
| **Lecturer(s)** | **Surname First name Academic Title** |
| **Duration** | One month |
| **Competencies** | Environmental remediation projects require careful financial planning and control since their time frame can be often quite long and uncertain and considerable financial means are required from different sources. Public funding institutions and private/corporate sources require that a remediation project be carried out at minimal cost in minimal time. Strong financial skills are absolutely essential for a successful future career of this course's participants.<br>Students will, therefore, be equipped with a sound knowledge and broad overview of general management concepts with special emphasis on project finance, financial control and accounting, cost estimating and forecasting/simulation techniques as well as funding mechanisms. Students will also familiarise themselves with concepts how to handle uncertainty and risk. |
| **Contents** | According to the objectives, the module is structured into two separate but closely linked parts:<br><u>Part A: General management</u><br>▪ Management and strategic thinking<br>▪ Project and team structures, management styles<br>▪ Introduction to structural models of corporations and project teams<br>▪ Fundamentals of human resources management: choosing the right people and structures<br><u>Part B: Financial management</u><br>▪ Fundamentals of finance, basic concepts: balance sheets, profit/loss statements, cash-flow reports, ratio analysis<br>▪ Using conceptual models for financial planning: fundamentals and practical use of soft-ware tools<br>▪ Cost-estimating techniques for large-scale remediation projects<br>▪ Cash-flow planning in remediation projects<br>▪ Dealing with uncertainties in financial forecasts<br>▪ Cost control and reporting<br>▪ Sources of finance: public, corporate, foundations. Their role and specific expectations/requirements to spending money and reporting<br>▪ Incorporating the potential after-use and redevelopment scenarios of remediated site into the planning and evaluation of remediation projects<br>▪ Communication of financial information at different levels<br>The subjects will be presented using overview texts and summary texts, and graphs. The students will receive numerous handouts that not only contain the content of the lectures and case studies but will also serve for future reference. Students will be encouraged to participate actively in the presentation to solicit ideas as well as individual situations experienced and integrate these in the structured presentation. Where appropriate real-life situations will be simulated.<br>A wide range of software tools for simulation of financial processes will be presented in the context of case studies to demonstrate their application to practical situations.<br>Presentation of small group projects and case studies forms an essential part of the module in order to train communication skills. |

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| **Literature** | Peter Attril & Eddie McLaney: Financial Accounting for decision makers, Fourth edition, Pearson education, 2004; Kenneth Merchant, Wim Van der Stede; Management Control Systems, Performance Measurement, Evaluation and Incentives, 2nd Edition , Pearson education, 2007; Rudolf Volkart: Corporate Finance |
| **Types of Teaching** | 30 hours lecture, 30 hours tutorial |
| **Pre-requisites** | No previous knowledge of management is required. |
| **Applicability** | Masterstudiengänge „Sustainable Mining and Remediation Management“<br>International Master of Science in Advanced Mineral Resources Development |
| **Frequency** | The module order is fixed yearly. |
| **Requirement for Credit Points** | Written exam (KA, 120 minutes) and home assignment (PVL) |
| **Credit Points** | 6 |
| **Grade** | The grade earned in the written exam determines the overall grade for the cluster. |
| **Workload** | The total time budgeted for the cluster is set at 180 hours (60 (academic) hours are spent in class and 120 hours are spent on self-study). |

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| **Code/Dates** | SUSPCM .MA.Nr. 084 |
| **Name** | Project and Contract Management |
| **Responsible** | **Surname** Bongaerts **First name** Jan C. **Academic Title** Prof. Dr.<br>**Surname** Ruhrmann **First name** Gerhard **Academic Title** Dr. |
| **Lecturer(s)** | **Surname First name Academic Title** |
| **Duration** | One month |
| **Competencies** | The objectives of the module are to convey principal elements of project and contract management.<br>Project Management: The student will be able to identify, analyze and structure the issues involved in a large scale environmental remediation project. On the basis of this skill, the student will be in a position to set up, organise, and control a project and its components including the procurement of outside services. He/she will be capable of managing the tendering of con-tracts, identifying critical paths, setting up financial controlling, initiating technical controlling as well as establishing quality assurance and control.<br>Contract Management: The student will be able to identify the various types of contracts required to manage large scale environmental remediation projects. In particular, he/she will be in a position to compile information required to generate contracts, formulate draft contracts, expedite the execution of contracts, and to establish the organizational structures to facilitate the storage and retrieval of crucial information by project personnel. |
| **Contents** | Project management is a set of principles, practices, and techniques applied to lead project teams and control project schedule, cost, and performance risks. The basic elements of project management are<br>▪ Project integration including the establishment of life cycle phases ending in milestones, producing a set of project documents and preparing a project management plan,<br>▪ Project scope definition including the definition of requirements, breaking down the work into single components, establishing cost and schedule baselines,<br>▪ Time management using automated scheduling systems, conducting critical path analysis,<br>▪ Cost management covering the preparation of cost estimates, tracking costs at the work package level,<br>▪ Quality management by defining goals and stating methods to achieve quality assurance, implementing quality measurement and continuous quality improvement,<br>▪ Risk management composed of risk analysis and implementing measures for risk avoidance and mitigation<br>▪ Human Resources management entailing the establishment of clear goals, maintaining channels of communication, and instruments to resolve conflicts,<br>▪ Communications, including internal project team communication and external public relations,<br>▪ Procurement.<br>Contract management covers aspects that are part of project management such as Procurement.<br>Although contract management is an integral part of project management it deserves particular attention due to its legal implication during the execution of a project and the potential to preserve knowledge in spite of long-term staff attrition. Therefore, contract management is fo- |

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| | cused on further by discussing<br>▪ Life Cycle of contracts<br>▪ Contract types, e.g. expert opinions, services, supplies<br>▪ Contract structures<br>▪ Parties involved in designing contracts<br>▪ Contract elements, e.g. risks, occupational health and safety, conflicts of interest, ownership and tights to the use of intellectual property, dispute resolution, regulatory controls)<br>▪ Contract negotiations<br>▪ Cost and price analysis<br>▪ Elements of contract administration<br>The subjects will be presented using overview texts and summary texts, graphs, software demonstration and case studies.<br>Students will be encouraged to participate actively in the presentation to solicit ideas as well as individual situations experienced and integrate these in the structured presentation. Where appropriate, real-life situations will be simulated.<br>▪ Presentation of small group projects and case studies forms an essential part of the module in order to train communication skills. |
| **Literature** | Johanna Rothman, Successful Project Management, The Pragmatic Programmers, 2007; Tom de Marco: The Deadline: A Novel About Project Management, B& T Publishing, 1997 |
| **Types of Teaching** | 45 h lecture and 75 hours practical training. |
| **Pre-requisites** | No previous knowledge of management is required. |
| **Applicability** | Masterstudiengänge „Sustainable Mining and Remediation Management“<br>International Master of Science in Advanced Mineral Resources Development |
| **Frequency** | The module order is fixed yearly. |
| **Requirement for Credit Points** | Written exam (KA, 120 minutes) and presentation of results of practical training (PVL) |
| **Credit Points** | 6 |
| **Grade** | The grade earned in the exam determines the overall grade. |
| **Workload** | The total time budgeted for the cluster is set at 180 h (120 (academic) hours are spent in class and 60 hours are spent on self-study). |

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| **Code/Dates** | MINEWAT.MA.Nr.2085 |
| **Name** | Mine water: Chemistry and treatment |
| **Responsible** | **Surname** Merkel **First name** Broder **Academic Title** Prof. Dr. |
| **Lecturer(s)** | **Surname First name Academic Title** |
| **Duration** | One month |
| **Competencies** | Participants will improve their basic chemistry knowledge with respect to water chemistry and in particular mining water problems and mine water treatment. Participants will be able to handle simple and complex water quality problems and decide which treatment technique is appropriate for a given problem. |
| **Contents** | Basics of chemical thermodynamics (ionic strength, calculation of activity, saturation index) dissolution, precipitation, redox- reactions, ion exchange, sorption, dissolution of gas in water, calcite carbon dioxide equilibrium. Knowledge on chemical properties of important elements, Basic exercises concerning thermodynamics with PHREEQC. Basic of water treatment: Precipitation, flocculation, biological techniques, membrane and ion exchange methods, sorption, sludge-management as well the most important passive treatment techniques incl. constructed wetlands. Pros and cons of passive and active treatment. |
| **Literature** | Langmuir (1997): Aqueous environmental geochemistry, Prentice Hall. Appelo & Postma (1993): Geochemistry, groundwater and pollution, Balkema. Merkel & Planer-Friedrich (2005): Groundwater Geochemistry - A practical guide to modeling of natural and contaminated systems. Springer; Younger, Banwart & Hedi (2002): Mine Water: Hydrology, Pollution, Remediation, Kluwer Academic Publishers |
| **Types of Teaching** | 2 weeks course with exercises (lecture 40h, practical training 40h) |
| **Pre-requisites** | Basic knowledge on chemistry and process engineering |
| **Applicability** | Masterstudiengänge „Sustainable Mining and Remediation Management“<br>International Master of Science in Advanced Mineral Resources Development, Further Training |
| **Frequency** | Schedule for duty courses during the 1. and 2. semester will be regulated by the academic commission together with the lecturer before the beginning of the 1 semester. |
| **Requirement for Credit Points** | Writen exams about course topics (120 minutes), 2 reports related to the exercises (RP1, RP2) and one homework |
| **Credit Points** | 6 |
| **Grade** | The grade for his module is taken from non weighted average of the written exams and the two reports |
| **Workload** | Work load is 180 hours, comprising 80 hours course time and 100 hours working at home. The latter comprises time for preparation and homework as well as preparation for exams. |

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| **Code/Daten** | SUSGIS .MA.Nr. 086 |
| **Modulname** | Geoscience Information Systems and Geomonitoring |
| **Verantwortlich** | **Name** Schaeben **Vorname** Helmut **Titel** Prof. Dr.<br>**Name** Niemeyer **Vorname** Irmgard **Titel** Prof. Dr. |
| **Dozent(en)** | **Name Vorname Titel** |
| **Dauer Modul** | 1 month |
| **Qualifikationsziele/Kompetenzen** | Participants learn to apply geoscience information systems (GIS) and to analyse remote sensing data to gain insight in and foster understanding of spatial phenomena, to characterize and predict them, to detect changes, and thus to support decision processes. |
| **Inhalte** | The lecture introduces the practice of geoinformation systems. The objectives are<br>- provide a basic knowledge how GIS works and how it can be applied to practical problems which involve analysis and modelling of spatial data.<br>- provide a basic understanding on the utilisation of remote sensing data (both airborne and satellite-based) within GIS in order to analyse and visualise spatial phenomena and processes.<br>Hands-on exercises are mandatory and offered in groups with no more than 15 participants in each group. Participants are instructed in the use of a GIS software (ArcGIS) and taught to apply methods to real-world data and interpret the results.<br>Topics: Introduction of geographic information systems; basics of remote sensing, image processing and interpretation; introduction to geomonitoring, models of spatial data; structures of spatial data; input of spatial data; spatial data fusion; visualisation and query of spatial data; transformation of spatial data; tools for single map analysis; tools for pairwise map analysis; tools for multiple map analysis. |
| **Typische Fachliteratur** | Bonham-Carter, G.F., Geographic Information Systems for Geoscientists: Pergamon; Konencny, G., Geoinformation. Remote sensing, photogrammetry a. geographic information systems, Taylor & Francis 2003. |
| **Lehrformen** | 15 lectures (2h), 15 guided exercises (2h), 2 days (8h) assisted exercise on project, preferentially with own data |
| **Voraussetzung für die Teilnahme** | None |
| **Verwendbarkeit des Moduls** | Masterstudiengänge „Sustainable Mining and Remediation Management“<br>International Master of Science in Advanced Mineral Resources Development |
| **Häufigkeit des Angebotes** | The module order is fixed yearly. |
| **Voraussetzung für Vergabe von Leistungspunkten** | Oral exam (MP, 30 minutes) and project report (PVL) |
| **Leistungspunkte** | 6 |
| **Note** | The grade earned in the oral exam determines the overall grade for the cluster. |
| **Arbeitsaufwand** | The total time budgeted for the cluster is set at 180 hours, of which 76 hours are spent in class and 104 hours are spent on self-study. |

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| **Code/Dates** | BBREKL .MA.Nr. 2087 |
| **Name** | Reclamation |
| **Responsible** | **Surname** Drebenstedt **Given Name** Carsten **Academic Title** Prof. Dr. |
| **Lecturer(s)** | **Surname** Drebenstedt **Given Name** Carsten **Academic Title** Prof. Dr. |
| **Duration** | 1 month |
| **Competencies** | 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. |
| **Contents** | Impacts of mining and its effects, legal requirements for permission, scientific fundamentals of reclamation (soil, ground water balance,…), concepts, utilization requirements and realization in the post-mining landscaping (agriculture, forestry, waterbodies, nature protection, recreation, miscellaneous), case studies |
| **Literature** | 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 |
| **Types of Teaching** | lecture (45 h), exercise (30 h), practical training (15 h) |
| **Pre-requisites** | mathemathic-scientific fundamentals |
| **Applicability** | Masterstudiengänge „Sustainable Mining and Remediation Management“<br>International Master of Science in Advanced Mineral Resources Development |
| **Frequency** | The sequence of the compulsory modules in the 1st and 2nd semester will be defined before beginning of term by the committee for study affairs after clearance with the professor. |
| **Requirements for Credit Points** | Preconditions for module examination: submission and positive evaluation of module exercises, participation in 2 excursions of the chair Surface-Mining.<br>Module examination: oral, duration: 30 minutes (MP). |
| **Credit Points** | 6 |
| **Grade** | Module grade is equivalent to the grade of oral module examination |
| **Workload** | Time effort is 180 h and consist of 90 h presence time and 90 h self-study (self-study includes autonomous and instructed preparation and performance of follow-up course work and examination preparation. |

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| **Code/Dates** | SUSLSE .MA.Nr. 088 |
| **Name** | Licensing, stakeholder involvement and expectation management |
| **Responsible** | **Surname** Bongaerts **First name** Jan C. **Academic Title** Prof. Dr.<br>**Surname** Jakubick **First name** Alexander **Academic Title** Dr. |
| **Lecturer(s)** | **Surname** Bongaerts **First name** Jan C. **Academic Title** Prof. Dr.<br>**Surname** Jakubick **First name** Alexander **Academic Title** Dr. |
| **Duration** | One month |
| **Competencies** | Upon completion of industrial activity at a given site (e.g., mining, chemical production), liabilities must be investigated, assessed, and removed/remediated with respect to safe usage in the future. This is an iterative decision process involving many parties, often with conflicting interests and different ways to influence the outcome of this decision process. This module addresses the need to handle public inquiries, concerns, or conflicts on environmental and remediation issues. It shows environmental managers, regulators and public servants in this field, and consultants at industrial facilities how to identify the causes of environmental issues and concerns, create community relations programs to address issues or establish a proactive dialogue to prevent or minimise future environmental conflicts, and handle technical and risk communication in a highly efficient manner.<br>The aspects which have to be observed within such a complex process include (but are not restricted to)<br>▪ legal requirements<br>▪ economic conditions<br>▪ environmental objectives and regional political aims<br>▪ communication, information management and negotiation methods<br>The subjects will be presented using overview texts and summary texts, graphs, and case studies. Discussions among students and between tutors and students will be facilitated by electronic means of communication such as email and a web-based discussion platform.<br>Special emphasis will be laid on presentation of selected cases and discussion of critical parameters like timing cost, communication problems, information handling. Students will be trained in groups and individually. This module will also feature checklists, forms and worksheets as tools for further reference in the daily work. |
| **Contents** | Expectations by the various stakeholders are identified as driving forces within a remediation project. The management of expectations of all involved stakeholders as well as transparent assessment and decision procedures are a core ingredient of this module, and will be discussed using case studies from a great variety of real-world projects and experiences. Students will be encouraged to contribute their personal and professional experiences to the module in order to both focus the content to the specific needs of the audience and to demonstrate the great cultural variety of negotiation and management styles. |
| **Literature** | John D. Leshy: The Mining Law: A Study in Perpetual Motion, Resources for the Future, ISBN: 0915707268, ISBN-13: 9780915707263, 542pp, 1987; Warren Richard Plunkett, Raymond F. Attner, Gemmy Allen: Management: Meeting and Exceeding Customer Expectations, Thomson – South Western, 2005, ISBN 0324259131, 742 pp |
| **Types of Teaching** | 30 h lecture, 10 h seminar |
| **Pre-requisites** | No previous knowledge of management is required. |
| **Applicability** | Masterstudiengänge „Sustainable Mining and Remediation Management“ |

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| | International Master of Science in Advanced Mineral Resources Development |
| **Frequency** | The module order is fixed yearly. |
| **Requirement for Credit Points** | Written exam (KA, 120 minutes) + home assignment (PVL) |
| **Credit Points** | 6 |
| **Grade** | The grade earned in the written exam determines the overall grade for the cluster. |
| **Workload** | The total time budgeted for the cluster is set at 180 h (40 (academic) hours are spent in class and 140 hours are spent on self-study). |

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| **Code/Dates** | MWGEOMO.MA.Nr.2089 |
| **Name** | Mine water: Hydrogeology and Modeling |
| **Responsible** | **Surname** Merkel **First name** Broder **Academic Title** Prof. Dr. |
| **Lecturer(s)** | **Surname First name Academic Title** |
| **Duration** | One month |
| **Competencies** | The student will improve his knowledge on Hydrogeology and in particular in the field of groundwater flow and transport with special emphasis on mining and rehabilitation and remediation of mining related problems. He will be able to understand basic and complex mining related groundwater problems and to evaluate numerical groundwater models. |
| **Contents** | Basic of hydraulic subsurface flow in granular and fractured rocks. Basic of transport of contaminants in seepage and groundwater,. Basic of water balance in particular in mining environments. Analytical and numerical modeling. Pros and cons of FD and FE models. Setting up a 3d steady state flow and transport model, discretization, parameterization, defining boundary conditions, defining sinks and sources. Manual and inverse calibration, sensivity analysis. Special aspects of dewatering open pit and deep mines, groundwater recovery and mine flooding. |
| **Literature** | Domenico & Schwartz (1996): Physical and Chemical Hydrogeology, Wiley & Sons, Anderson & Woessner (1992): Applied Groundwater modeling - Simulation of flow and advective transport, Academic Press. |
| **Types of Teaching** | 2 weeks course with exercises (lecture 40h, practical training 40h) |
| **Pre-requisites** | Basic knowledge of physics, geology, and hydrogeology. |
| **Applicability** | Masterstudiengänge „Sustainable Mining and Remediation Management“ International Master of Science in Advanced Mineral Resources Development |
| **Frequency** | Schedule for duty courses during the 1. and 2. semester will be regulated by the academic commission together with the lecturer before the beginning of the 1 semester. |
| **Requirement for Credit Points** | Writen exams about course topics (120 minutes), 2 reports related to the exercises (RP1, RP2) and one homework |
| **Credit Points** | 6 |
| **Grade** | The grade for his module is taken from non-weighted average of the written exams and the two reports |
| **Workload** | Work load is 180 hours, comprising 80 hours course time and 100 hours working at home. The latter comprises time for preparation and homework as well as preparation for exams. |

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| **Code/Dates** | SUSBFR .MA.Nr. 090 |
| **Name** | Brownfield Revitalisation |
| **Responsible** | **Surname** Klapperich **First name** Herbert **Academic Title** Prof. Dr. |
| **Lecturer(s)** | **Surname** Klapperich **First name** Herbert **Academic Title** Prof. Dr. |
| **Duration** | 1 month |
| **Competencies** | Participants will get the qualification to gain knowledge and Methods to evaluate contaminated sites – soil and groundwater contaminations. They also learn to apply the interdisciplinary approach by focussing technique, economy, ecology and environmental law. The ovals issue is a Brownfield Manager. |
| **Contents** | • Technology of disposal sites and tailings: Geotechnical aspects related to the construction of disposal sites and tailings; site survey, investigations and characteristics; transport mechanisms of contaminants in the underground<br>• Contaminated sites - investigation assessment and reusing (Lifecycle): Environmental legislation relevant to contaminated sites; Quality control of sampling on contaminated sites, analytics of site contaminations, reclamation process and monitoring; Assessment of water, soil and air pollution level (risk assessment); Overview of reclamation methods and geotechnical securing measures; Safety of operation in dealing with contaminated sites; Aspects and concepts of site revitalisation (innercity areas/landscaping)<br>• Cost-benefit considerations, case studies: Comparing various remediation strategies and selecting best option,<br>• Developing and assessing successful after-use scenarios: Risk assessment, marketing studies, cost benefit analysis |
| **Literature** | Handbuch: Altlastensanierung und Flächenmanagement, Franzius/ Wolf/ Brandt/ Altenbockum; TA Abfall/ Siedlungsabfall; Arbeitshilfen Altlasten, Sustainable Brownfield Regeneration: CABERNET Network Report; Proceedings ECI Conferences „Green Brownfields“ |
| **Types of Teaching** | Lecture (60h), Practical training (30h) |
| **Pre-requisites** | B.Sc. in Geosciences or Geo-Engineering; Basic Knowledge of Geosystems |
| **Applicability** | Masterstudiengänge „Sustainable Mining and Remediation Management“<br>International Master of Science in Advanced Mineral Resources Development |
| **Frequency** | The module order is fixed yearly. |
| **Requirement for Credit Points** | Written or oral exam (90 minutes) and project report (AP). |
| **Credit Points** | 6 |
| **Grade** | The module-grade results from the weighted mean of grade earned in the written exam (KA) or oral examination (MP) (Predetermination by the lecturer) and project report (AP).<br>Content of KA/MP (weighting 2): Technology of disposal sites and tailings, Contaminated sites - investigation assessment and reusing.<br>Content of AP (weighting 1): Cost-benefit considerations, developing and assessing successful after-use scenarios. |
| **Workload** | The total time budgeted for the cluster is set at 180 hours (90 hours are spent in class and 90 hours are spent on self-study). |

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| **Code/Dates** | SUSRAD.MA.Nr. 2091 |
| **Name** | Radioactivity |
| **Responsible** | **Surname** Weyer **First name** Jürgen **Academic Title** Dr.-Ing. |
| **Lecturer(s)** | **Surname** Weyer **First name** Jürgen **Academic Title** Dr.-Ing. |
| **Duration** | 1 month |
| **Competencies** | Basic knowledge of radioactive decay, measurement of radiation, units, technique of sampling, Decontaminations techniques, ventilation |
| **Contents** | Radioactive decay, special consideration of $Rn^{222}$ 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 |
| **Literature** | ICRP publications, especially ICRP 43 and 65, conference proceedings |
| **Types of Teaching** | Lectures (75h), seminars and practical training, excursions to rehabilitation sites (15h) |
| **Pre-requisites** | Fundamentals in engineering and natural science |
| **Applicability** | Masterstudiengänge „Sustainable Mining and Remediation Management“<br>International Master of Science in Advanced Mineral Resources Development |
| **Frequency** | The module order is fixed yearly. |
| **Requirements for Credit Points** | Oral exam (MP, 30 minutes) and project report (PVL). |
| **Credit Points** | 6 |
| **Grade** | The grade earned in the oral exam determines the overall grade for the cluster. |
| **Workload** | The total time budgeted for the cluster is set at 180 hours, of which 90 hours are spent in class and 90 hours are spent on self-study (incl. industrial placement). |

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| **Code/Dates** | BIOMIN .MA.Nr. 3043 | Version: 25.09.2009 | Start: SS 2010 |
| **Name** | Biotechnology in Mining | | |
| **Responsible** | **Surname** Schlömann **First Name** Michael **Academic Title** Prof. Dr. | | |
| **Lecturer(s)** | **Surname** Schlömann **First Name** Michael **Academic Title** Prof. Dr.<br>**Surname** Mühling **First Name** Martin **Academic Title** Dr. | | |
| **Institute(s)** | Institute of Biological Sciences | | |
| **Duration** | 1 Semester | | |
| **Competencies** | The students will obtain knowledge about mechanisms of microbial leaching as about applications for the production of metals. They will understand problems related to mine waters and obtain insight into strategies for biotechnological treatment of such waters. In a lab course they will obtain experience with methods and problems related to the cultivation of corresponding microorganisms. In a seminar the students will gain experience with current literature and with reporting about it to other participants | | |
| **Contents** | 1. Basics<br>Concepts of microbial energy metabolism, chemolithotrophic growth, diversity of electron acceptors, microbial redox reactions with Sulphur, iron, manganese, arsenic, uranium.<br>2. Microbial leaching<br>Mechanisms of leaching, microorganisms involved, application of leaching for the production of copper, gold and diamonds, problem of mine waters.<br>3. Biotechnological treatment of mine waters<br>Microbial sulphate reduction for active treatment, microbial iron oxidation, wet lands.<br>4. Lab course<br>Special plating techniques for acidophilic bacteria, anaerobic cultivation techniques, measurement of parameters to follow growth of relevant microorganisms. | | |
| **Literature** | W. Reineke & M. Schlömann Umweltmikrobiologie, Spektrum Akademischer Verlag; D. R. Lovley (Hrsg.): Environmental Microbe-Metal Interactions, ASM Press; D. E. Rawlings & D. B. Johnson (Hrsg.): Biomining, Springer; L. L. Barton & W. A. Hamilton: Sulfate –Reducing bacteria Environmental and Engineered Systems, Cambridge University Press | | |
| **Types of Teaching** | lecture (1 SWS), seminar (1 SWS), lab course (1 SWS), excursion (0,5 SWS) | | |
| **Pre-requisites** | Master-degree applied science and geoecology or in another area of science or engineering. | | |
| **Applicability** | Master Programmes Angewandte Naturwissenschaft, Geoökologie und Chemie | | |
| **Frequency** | Yearly in summer semester | | |
| **Requirements for Credit Points** | PVL: Passed Exercises<br>Written exam over 90 min. | | |
| **Credit Points** | 4 | | |
| **Grade** | The grade results from the written exam. | | |
| **Workload** | The module needs 120 h of time, of which 52 hours are spent in class and the remaining 68 hours are spent on self-study. | | |

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| **Code/Dates** | MASMRM.MA.Nr.2093 |
| **Name** | Master thesis Advanced Mineral Resources Development with colloquium |
| **Responsible** | All involved lecturers of the master course Sustainable Mining and Remediation Management |
| **Duration** | 1 semester |
| **Competencies** | The students should get the ability to solve scientific tasks in the field of advanced mineral resources development. They should be able to prepare a scientific presentation of its work and defend it in front of an audience. Economic aspects also have to be considered in the work.<br>The master thesis is a kind of examination which completes the entire course. The work is the proof, that the students are able to solve scientific problems by their own. |
| **Contents** | Concept of the work schedule; analysis of literature; familiarize with methods, testing equipment, numerical methods; realization and analysis of tests in situ and in the laboratory; realization of calculations and numerical simulations; summary, scientific analysis and generalization of the results (period of four months)<br>Preparation of a scientific work and paper in a colloquium (30 min oral presentation with discussion) |
| **Literature** | Guideline for the preparation of scientific works at TU Bergakademie Freiberg from 27.06.2005, DIN 1422, part 4 (08/1985); Hints for task-specific literature will be given. |
| **Types of Teaching** | Consultations, on demand: instruction in laboratory work and software, colloquium |
| **Pre-requisites** | Proof of the successful conclusion of mandatory and optional modules (see study and examination regulations). |
| **Applicability** | Mandatory module and final part within the master course International Master of Science in Advanced Mineral Resources Development |
| **Frequency** | Every year |
| **Requirement for Credit Points** | Positive assessment of the master thesis (as a rule by two examiners, 1. examiner is the responsible university lecturer, 2. examiner will be determined by the board of examiners, whereby the 1. examiner has the right to propose the second one, the second examiner does not need to be a member of the university); successful defence of the work in a colloquium |
| **Credit Points** | 30 |
| **Grade** | The overall grade for the cluster is computed of the grade for the thesis (weighting 2) and the grade for colloquium (weighting 1). |
| **Workload** | The total time budgeted for the module is set at approximately 900 h (preparation of master thesis and colloquium) |

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| **Modul-Code** | GERBA1B .MA.Nr. 095 |
| **Modulname** | German Basic Level I B |
| **Responsible** | **Surname** Keßler **First Name** Gisela **Academic Titel** Diplom-Lehrerin |
| **Lecturer(s)** | **Surname** Paul **First Name** Sandra **Academic Titel** Diplom-Lehrerin |
| **Institute** | **Fachsprachenzentrum** |
| **Duration** | 1 Semester |
| **Competencies** | Students are imparted the basics of phonetics, orthography, grammar and vocabulary. They acquire basic knowledge of the German language and listening, speaking, reading and writing skills in general language as well as regional and cultural studies. |
| **Contents** | Orientation in a city, a company; public transport; describing directions; jobs and working day, health and sports, accommodation, curriculum vitae/ resume; clothing; grammar: e.g. prepositions, questions, modals, possessive article, the perfect, conjunctions/linkers, comparisons |
| **Literature** | Berliner Platz, volume 1 Langenscheidt |
| **Types of Teaching** | Exercise (60 hours) |
| **Pre-requisites** | Successful completion of the cours German Basic Level 1A or proof of equivalent proficiency in German. |
| **Applicability** | The course is particularly appropriate for exchange students and for international students. Prerequisite for the module German Basic Level 2 A |
| **Frequency** | The course starts in winter term. |
| **Requirements for Credit points** | Successful participation in class (attendance of at least 80%)<br>Passed written exam (90 minutes) at the end of the term |
| **Credit points** | 4 |
| **Grade** | The grade earned in the written exam determines the overall grade. |
| **Workload** | The total time budgeted for the course is set at 120 hours, of which 60 hours (4 SWS) are spent in class and the remaining 60 hours are spent on self-studies. Self-studies include preparing before and after the lessons as well as preparing for examination. |

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| **Code/Dates** | RU AMRD Nr. 3043 | Version: 05.2011 | Start: SS 2013 |
| **Name** | Russisch für internat. Studiengang AMRD | | |
| **Responsible** | **Surname** Seidel **First Name** Birgit **Academic Title** Dipl.-Slaw. | | |
| **Lecturer(s)** | **Surname Seidel First Name Birgit Academic Title Dipl.-Slaw.** | | |
| **Institute(s)** | Institute of Biological Sciences | | |
| **Duration** | 1 Semester | | |
| **Competencies** | Der Teilnehmer erwirbt ausbaufähige Grundkenntnisse und Fertigkeiten der mündlichen und schriftlichen Kommunikation in der Fremdsprache, wobei besonderer Wert auf Konversation zu Alltagsthemen gelegt wird. | | |
| **Contents** | Grundlagen der mündlichen und schriftlichen Kommunikation in Russisch, Konversation zu Alltagsthemen | | |
| **Literature** | Lehrmaterial Russisch für Anfänger (Most 1 Lb und Ab) sowie Zusatztexte und -materialien aus verschiedenen Medien (u.a. Presse, Prospekte, Internet) | | |
| **Types of Teaching** | Übung (Nutzung des Sprachlabors) und Selbststudium | | |
| **Pre-requisites** | Vorkenntnisse aus dem Anfängerkurs der Montanuniversität Leoben | | |
| **Applicability** | International Master Advanced Mineral Resources Development | | |
| **Frequency** | Sommersemester | | |
| **Requirements for Credit Points** | Teilnahme am Unterricht (mind. 80 %)<br>Leistungsnachweis durch Klausur (90 Min.) | | |
| **Credit Points** | 4 | | |
| **Grade** | Modulnote ergibt sich aus der Note der schr. Arbeit (Klausur) | | |
| **Workload** | 60 Stunden Präsenzzeit und 60 Stunden Selbststudium (insgesamt 120 Stunden); Letzteres umfasst die Vor-und Nachbereitung von Lehrveranstaltungen. | | |

Freiberg, 9. Oktober 2012

gez.: Prof. Dr.-Ing. Bernd Meyer

Herausgeber: Der Rektor der TU Bergakademie Freiberg

Redaktion: Prorektor für Bildung

Anschrift: TU Bergakademie Freiberg
09596 Freiberg

Druck: Medienzentrum der TU Bergakademie Freiberg