Karlsruher Institut für Technologie

Module Handbook
Applied Geosciences Master 2021 (Master of Science (M.Sc.))

SPO 2021

Winter term 2022/23

Date: 12/09/2022

KIT DEPARTMENT OF CIVIL ENGINEERING, GEO AND ENVIRONMENTAL SCIENCES

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1. Admission Requirements for the Master in Applied Geosciences at KIT

The Admission requirements for the Master Program Applied Geosciences at KIT are as follows:
(Excerpt from the "Statutes for the admission in the Master program in Applied Geosciences at the Karlsruhe Institute of Technology (KIT)" official announcement number 60, dated November 24, 2020:
https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2020_AB_060.pdf)

1.1. §5 (1) An outstanding Bachelor's degree in Applied Geosciences or a related scientific field. The completed study program needs to include a minimum of 180 ECTS.

1.2. §5 (2) Necessary ECTS in the following fields need to be included in the completed study program

- Geosciences: min. 60 ECTS, geoscientific subjects like structural geology, mineralogy, petrology, hydrogeology, engineering geology, geochemistry, paleontology, geophysics, geological field exercises and geological mapping
- Chemistry: min. 10 ECTS,
- Mathematics or Physics: min. 15 ECTS,
- Furthermore min. 20 ECTS in mathematical-scientific or geoscientific fields.

1.3 §5 (4) Language skills:

- German Skills according to the KIT admission and enrollment regulations https://www.intl.kit.edu/istudies/9074.php
- or English Skills according to the Statutes for the Admission in the Master Program in Applied Geoscience at KIT:
  Overview (translated from the original in German language):
  Very good proficiency in the English language corresponding to level B2 of the Common European Framework of Reference for Languages (GER), as confirmed by the
  - Test of English as a Foreign Language (TOEFL), with a result of at least 90 points
  - International English Language Testing Service (IELTS), with a result of at least 6.5 points and no partial examination worse than 5.5 points
  - University of Cambridge Certificate in Advanced English (CAE) or University of Cambridge Certificate of Proficiency in English (CPE)
  - UNIcert at least level II.

  For the following cases the proof of the B2 proficiency can be omitted:
  - A university degree of a studies program with English as the only teaching language (documented in the Diploma Supplement, the Transcipt of Records or a final certificate)
  - The University Entrance Qualification Certificate with the English course having been attended by the applicant for at least five years until graduation and the final or average grade of the last two years of the language class corresponding at least to the German grade 4 (sufficient) or at least 5 points.

For other questions relating the application of international students please refer to the International Department of KIT.
https://www.intl.kit.edu/english/index.php
For study requirements and University entrance qualification: https://www.intl.kit.edu/istudies/3167.php
For Tuition Fees for International Students: http://www.intl.kit.edu/istudies/12606.php

If you have any questions regarding modules or exams (partial achievements) please contact:

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2. Qualification Goals of the "Applied Geosciences" Master's Degree Program at KIT

Applied Geosciences have continuously contributed to the development of KIT's research and teaching activities since its establishment in 1825. At the oldest technical university in Germany, we focus on the sustainable utilization of georesources on and below the Earth's surface.

You at KIT!

You are welcome to join Applied Geosciences at KIT University of Excellence, one of the few Institutes in Germany that reach top positions in international rankings. Here at one of the largest technical research institutions in Europe, you are offered excellent training and will get to know your lecturers in person. Karlsruhe, one of the sunniest cities in Southwest Germany, offers you a high quality of life in one of the economically strongest regions in Europe.
Applied Geosciences contribute to the applied themes of energy, storage, groundwater and raw materials. The innovative environment of KIT enables you to progress your career in industry and research.
Together we develop sustainable solutions for global challenges!

Profiles of the Master's Degree Program of Applied Geosciences @KIT

Our Applied Geosciences MSc degree program offers three profiles: Sustainable Energy-Resources-Storage (ERS), Engineering Geology and Hydrogeology, as well as Mineralogy and Geochemistry. The complete ERS profile is offered in English.

Our MSc Profile of Sustainable Energy-Resources-Storage ERS

The students of the ERS profile deal with the sustainable use of geoenergy, georesources and raw materials, and acquire a deep understanding of major infrastructure developments such as geological storage systems. Students can supplement their broad geoscientific knowledge in ERS with in-depth knowledge in the field of groundwater and tunneling. You acquire applied specialist knowledge with strong practical relevance, at the same time you learn to deal with unknown problems.

We teach what we research and research what we teach:

• in geoenergy for the generation of geothermal energy, use of fossil and chemical energy sources such as hydrogen for the expansion of climate-friendly energy sources,

• in raw materials to increase security of supply and transparency of raw materials (metals, minerals and water) for the expansion of renewable energies, battery storage systems and industrial products,

• in large infrastructures such as geostorage systems for heat, cold, chemical energy sources, hydropower, greenhouse gases (CCS), repositories and other subsurface systems.

Sustainable energy, raw material and storage is required for modern life and future development.
Therefore our graduates are able to

• analyse and evaluate the Earth system in order to provide sustainable supply of energy and raw materials,

• develop sustainable solutions for the energy transition, future raw material supply and critical storage infrastructure

• perform in an international and interdisciplinary environment

The MSc profile Engineering Geology and Hydrogeology

The courses in this profile are held in German.

Karlsruhe is the most traditional location for engineering and hydrogeology in Germany and offers currently a wide range of practical courses on the topics of groundwater, engineering geology and near-surface geothermal energy. The students deal with the sustainable use of groundwater, geoenergy and georesources, in harmony with the ecosystems.

The profile includes the fundamentals, applications and methods of engineering and hydrogeology, from sampling and data acquisition in the field to the latest laboratory analysis and test techniques to numerical modeling of groundwater flow, heat and pollutant transport as well as mass movements and underground structures. The application of artificial intelligence in water, environmental and geological research is one of our new focuses in research and teaching.

The diverse research projects at home and abroad as well as the intensive cooperation with institutions from professional practice enable students to do a variety of exciting and professionally qualifying master's theses. Our graduates work in engineering offices, consulting companies, construction companies, offices, state and federal authorities in the fields of applied geology, water, construction and the environment, as well as in development cooperation, with water suppliers and in research, both in Germany and internationally.

Qualification goals:

• The students master relevant methods of sampling, on-site analysis and data collection in the field.

• The students are able to independently carry out and evaluate marking experiments, hydraulic and thermal tests and other relevant experimental techniques in hydrogeology and engineering geology as well as near-surface geothermal energy.

• The students can assess groundwater resources in terms of quantity and quality and know the most important approaches for the sustainable management of these water resources.

• The students are familiar with the essential methods of laboratory analysis of water and soil samples and can critically assess analysis results, including errors and uncertainties.

• The students know and master the most important numerical models for the simulation of groundwater flow, heat and material transport and geomechanics in the subsurface.

• The students know the coupled processes and mechanisms of mass movements, geohazards and final disposal and can quantitatively assess the associated risks.

• The students are familiar with the thermal use of groundwater and other forms of use of near-surface geothermal energy and can dimension the corresponding systems.

• The students can evaluate pollutants in soil and groundwater and know the most important exploration and remediation methods.

The MSc profile Mineralogy and Geochemistry

The courses in this profile are held in German.

In the mineralogy and geochemistry profile, students deal in depth with the fundamentals of the earth, such as minerals, rocks and soils as well as their structural structure and chemical composition. Research-based teaching focuses on the processes and mechanisms that lead to the formation and overprinting of minerals, rocks, soils and fluids / water. Therefore, the students analyze endogenous and exogenous material flows and processes that cause mineralogical and geochemical changes and are of great relevance for the environment, climate and society. The students can deepen their broad geoscientific knowledge with practical exercises in the laboratories. The students gain deep insights into modern analytics and the functioning of measurement methods, such as X-ray diffraction, X-ray fluorescence or mass spectrometry. The mineralogy and geochemistry profile offers strong practical relevance:

• Analysis: The students have knowledge of the functionality and handling of common analysis devices and the development of new analysis methods. You will identify problems, develop solutions, gain knowledge of quality assurance and be able to work directly on the devices.

• Applied mineralogy: The students get to know the use of minerals and rocks, e.g. cement and concrete as well as possible substitutes (such as geopolymers), zeolites for e.g. water treatment or other industrial minerals such as fluorite or barite for special technical applications.

• Environmental mineralogy: The students examine scenarios for the flow of elements in and between the Pedo-, Hydro-, Bio-, Atmo- and Anthroposphere and the effects on the environment and humans,

• Hydrogeochemistry and hydrobiogeochemistry: Above all, the students acquire knowledge of the analysis of the processes of redox-sensitive elements and stable isotopes. They deal with the contamination of ground and surface waters in a practical manner and also deal with the composition of geothermal waters that can cause precipitation or corrosion in power plants and thus influence the economic viability and technical feasibility of this alternative energy source, but are also used as a source of raw materials can.

• Sediment Petrology: The students acquire in-depth knowledge of the structure, formation, distribution and use of recent and fossil sediment systems, which are of great importance as reservoirs and storage locations for energy, pollutants and climate-relevant gases.

Your Future

Your commitment and our practice-oriented approach qualify you for jobs in industry, the service sector, in public administration, and for a scientific career (doctorate). The University of Excellence KIT, its excellent research infrastructure in the Helmholtz Association, and our affiliation to the KIT Department of Civil Engineering, Geo-, and Environmental Sciences will enable you to shape your future.

3. About this Handbook – Notes and Rules

3.1 Structure of the MSc Program

Our two-year MSc program is associated with a work expenditure of 120 credits (ECTS), usually 30 credits per semester. Choose one of the three profiles (i) Sustainable Energy-Resources-Storage (ERS), (ii) Engineering Geology and Hydrogeology, (iii) Mineralogy and Geochemistr. In addition to your courses in the amount of 90 credits, you will write your master's thesis of 30 credits at the end of your studies. One credit corresponds to about 30 working hours and covers both courses with your attendance and self-studies. The program consists of a compulsory part of 20 credits and an elective part of 50+20 credits. The modules consist of assigned courses with the credits corresponding to the respective workload.

This handbook provides information on the profile Sustainable Energy-Resources-Storage (ERS). The language of instruction of this MSc-profile is English. Please refer to the German handbook for further information of the profiles Engineering Geology and Hydrogeology and Mineralogy and Geochemistry.

3.2 Course Types

The master's degree program covers the following types of teaching and learning:

- Lectures (V)
- Exercises (Ü)
- Seminars and field exercises (S and GEL)
- Internships (P)
- Project study, job internship, colloquia, tutorials (TU), master’s thesis

In lectures, contents are mainly conveyed through presentations by the lecturers. In practical exercises, students apply the knowledge acquired in case studies with intensive support by the lecturers. In seminars, knowledge is imparted to small groups of students. This also includes geological seminars in rough terrain. The seminars focus on presentations by students and discussions of special scientific topics. Internships serve to deepen previously acquired theoretical knowledge in practical application or to gain new experience and skills through practical work individually or as member of a group. Field exercises are educational trips to selected destinations, such as company visits. Colloquia are special events often held by academic guests, which consist of a lecture and a discussion and in which the students are supposed to take part. In the project study, the students work on a geoscientific problem either individually or in a group under the guidance by lecturers.

In the master's thesis, the specialist knowledge acquired is applied to a geoscientific problem. The work is supervised by lecturers, but is intended to demonstrate the student’s ability to independently work on, present, and solve geoscientific problems.

3.3 The Module Handbook

The module handbook describes the modules of the study program. It covers

- the courses of each of the modules (partial achievements),

- the size of the modules (in credits),
- interdependencies of the modules,
- qualification goals of the modules,
- types of examination, and
- calculation of the grade for a module.

The module handbook does not replace the university calendar which provides information about the variable dates of courses (e.g. time and venue of the course) in every semester

3.3.1. Beginning and Completion of a Module

Each module and each course (partial achievement) within a module can only be chosen once. The student's performance is proven by a module examination or by examinations/controls of success in courses within the module. Successful completion of a module or course is reflected by either a passed examination (graded or ungraded) or an ungraded coursework with the student's participation. A module is completed or passed, if the module examination has been passed (grade at least 4.0). The following applies to modules that are completed by examinations in several courses: The module is completed when all required courses (partial achievements) of a module have been passed. The module grade is determined by weighting the predefined credits for each course (partial achievement) within the module. An exception is the master's thesis module, the credits of which are weighted by a factor of 1.5 when calculating the total grade.

3.3.2. Modules and Partial Achievements

A new module or a new partial achievement results, when the contents or credits of modules / new courses change. Legitimate expectations of all students, who already have successfully completed a course, are protected, which means that they can complete the old module under the conditions, under which they registered (exceptions are governed by the examination board). The decisive factor is the time when the "binding declaration" about the choice of module is made by the student according to Article 5 (2) of the Studies and Examination Regulations. This binding declaration is made when a student registers for the first exam in this module. At the written request of the student to the examination board, the choice of the module or its assignment to the regular curriculum can be changed afterwards. In the current module handbook, the modules and courses are presented in their current version. The version number is given in the module description. Older module versions are available in the previous module manuals at https://www.agw.kit.edu/11368.php

3.3.3. First Use

The so-called "first use" (EV) indicates from / until when a course or module version can be selected in the study schedule. Modules with a date of first use are highlighted in the chapter "Structure of the Course."

3.3.4. General and Partial Examinations

Module examinations may be general or partial examinations. If the module examination is offered as a general examination, examination covers the entire content of the module. If the module examination is subdivided into partial examinations, the module examination consists of individual examinations (partial achievements) in the respective courses. Register for the respective exams online on the Campus Management Portal at https://campus.studium.kit.edu.

3.3.5. Types of Examinations

- Graded exams: Written exams, oral exams, and examinations of another type (e.g. reports, seminar presentations, or the submission of a laboratory or field book).
- Ungraded coursework: Can be repeated several times. The result is indicated as "passed."

3.3.6. Repetition of Exams

Anyone who does not pass a written exam, oral exam, or examination of another type can repeat the exam once. If the repeated examination (in case of written exams, an additional oral exam is carried out) is not passed as well, the entitlement to the examination for the respective module in the study program is lost. The application for a second re-examination (hardship claim) has to be submitted to the examination board in writing within two months after the entitlement is lost at the latest.

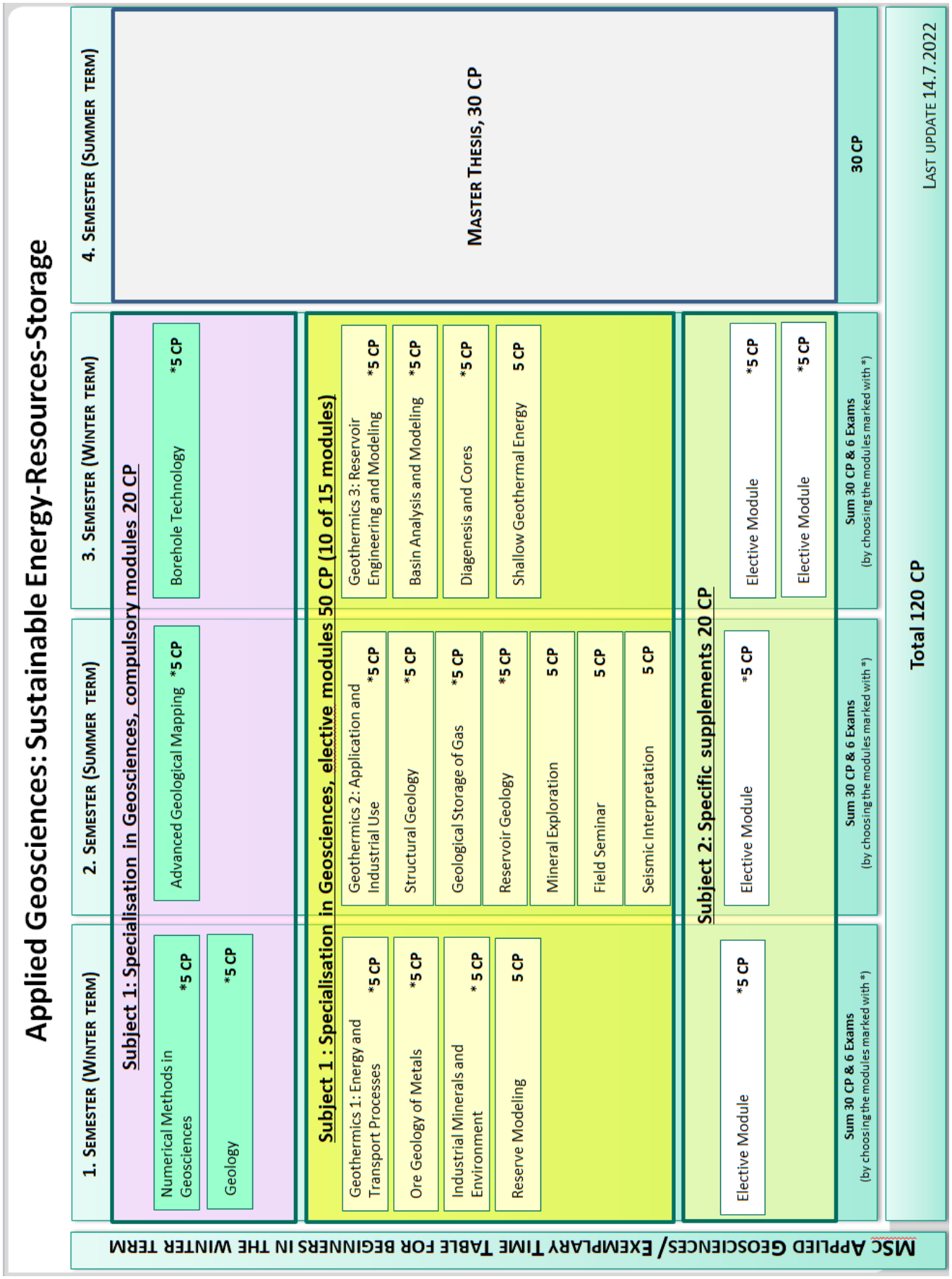
3.3.7. Additional Modules and Courses

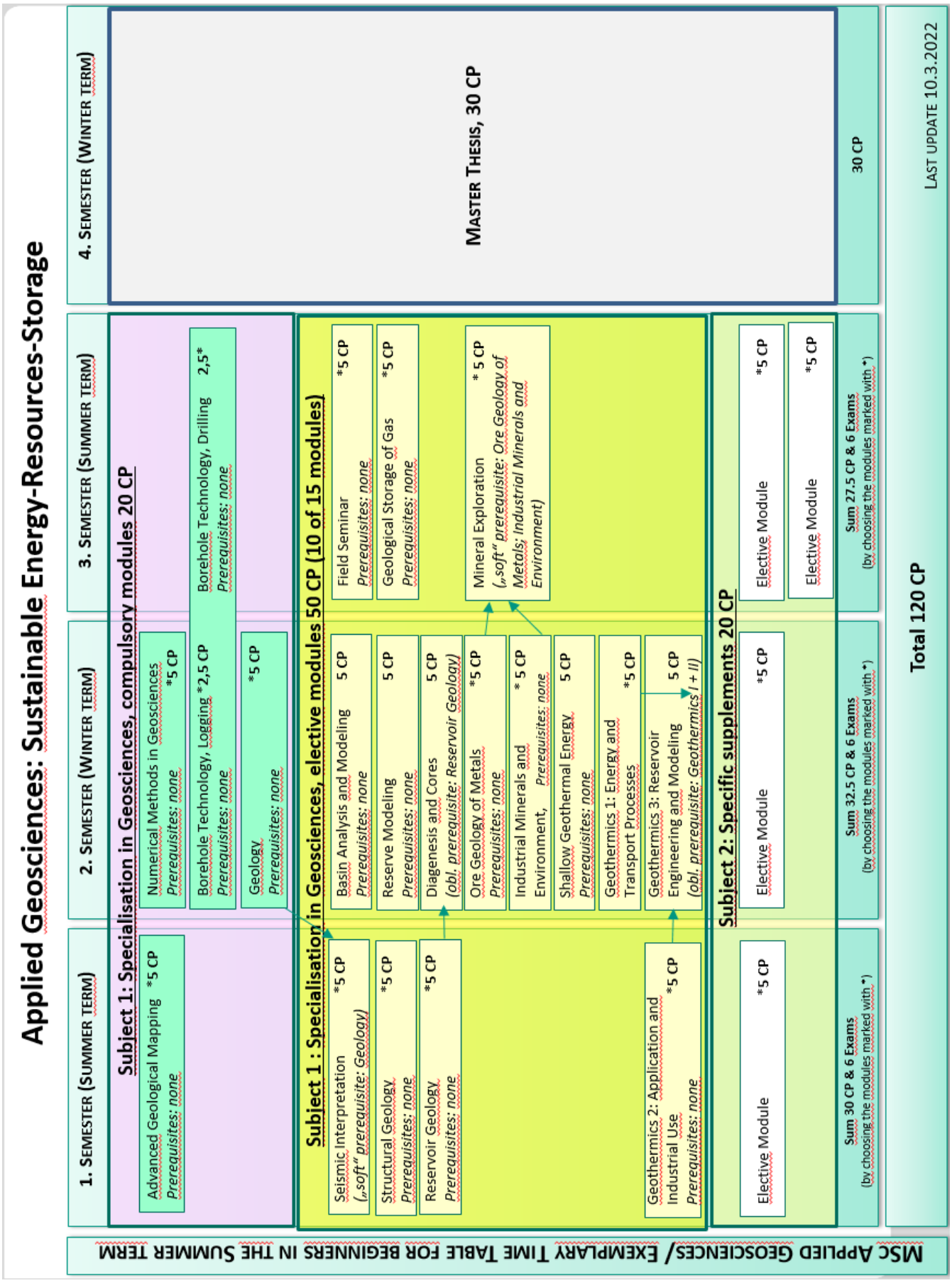
Students can attend voluntary, additional modules or courses with a maximum of 30 credits from all lectures and courses offered by KIT. Such modules or courses can be included in the certificate at the request of the student to the examination board. The result of the additional modules or courses is not taken into account when completing the degree program or calculating the total grade. When students register for an exam in this additional module or course, they can declare the latter to be an additional achievement. At the written request of the student to the examination board, this can be changed afterwards.

3.4. Further Information

All information about the legal and official conditions for your studies is given in the relevant Studies and Examination Regulations for the respective degree program. This legally binding information is available under the official announcements of KIT
https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2016_AB_010.pdf

4. Overview of the MSc profile Sustainable Energy-Resources-Storage (ERS)




Applied Geosciences: Sustainable Energy-Resources-Storage
1. Semester (Summer term)
2. Semester (Winter term)
3. Semester (Summer term)
4. Semester (Winter term)
Subject 1: Specialisation in Geosciences, compulsory modules 20 CP
Advanced Geological Mapping *5 CP
Prerequisites: none
Numerical Methods in Geosciences *5 CP
Prerequisites: none
Borehole Technology, Logging *2,5 CP
Prerequisites: none
Geology *5 CP
Prerequisites: none
Borehole Technology, Drilling 2,5*
Prerequisites: none
Master Thesis, 30 CP
Subject 1 : Specialisation in Geosciences, elective modules 50 CP (10 of 15 modules)
Seismic Interpretation *5 CP
(„soft" prerequisite: Geology)
Structural Geology *5 CP
Prerequisites: none
Reservoir Geology *5 CP
Prerequisites: none
Geothermics 2: Application and Industrial Use *5 CP
Prerequisites: none
Basin Analysis and Modeling 5 CP
Prerequisites: none
Reserve Modeling 5 CP
Prerequisites: none
Diagenesis and Cores 5 CP
(obl. prerequisite: Reservoir Geology)
Ore Geology of Metals *5 CP
Prerequisites: none
Industrial Minerals and Environment, * 5 CP
Prerequisites: none
Shallow Geothermal Energy 5 CP
Prerequisites: none
Geothermics 1: Energy and Transport Processes *5 CP
Geothermics 3: Reservoir Engineering and Modeling 5 CP
(obl. prerequisite: Geothermics I + II)
Field Seminar *5 CP
Prerequisites: none
Geological Storage of Gas *5 CP
Prerequisites: none
Mineral Exploration * 5 CP
(„soft" prerequisite: Ore Geology of Metals; Industrial Minerals and Environment)
Subject 2: Specific supplements 20 CP
Elective Module *5 CP
Elective Module *5 CP
Elective Module *5 CP
Elective Module *5 CP
Sum 30 CP & 6 Exams
(by choosing the modules marked with *)
Sum 32.5 CP & 6 Exams
(by choosing the modules marked with *)
Sum 27.5 CP & 6 Exams
(by choosing the modules marked with *)
30 CP
Total 120 CP
MSc Applied Geosciences/ Exemplary Time Table for Beginners in the Summer Term
Last update 10.3.2022

			D - German, E - English, L - Lecture, P - Practical, S - Seminar, FS- Field Exercise/Seminar, TU - Tutorial, EXC - Excursion										
			FB - submission of field book, N -No Exam, OE - Oral Exam, PR - Presentation, P+R Presentation & Written Report, WE - Written Exam, WR -Written Report										
			Module Name								**Module responsible**		**Module number**
			Courses (bricks)								**Course responsible**		**Course (brick) number**
summer term	**winter tem**	**recommended semester**	**Lecture series, events, lab courses, field courses**	**language of instruction**	**type**	**contact hrs (SWS)**	**CP Modul**	**CP exam or course**	**self-study time (hr)**	**type of exam**	**lecturer**		**number lecture, lab ocurse, event, field course**
(A) Master Thesis													
			Module Master Thesis				30						**M-BGU-103726**
			Master Thesis										**T-BGU-107516**
x		4	Master thesis (duration: 6 months)	E						WR	any		
Profile: Sustainable Energy, Raw Materials and Storage													
(B) Subject 1: Specialisation in Geosciences													
Specialisation in Geosciences: Compulsary Modules (20 CP have to be completed))													
			Numerical Methods in Geosciences				5				Gaucher		**M-BGU-105739**
			Numerical Methods in Geosciences					**5**			Gaucher, Kohl		**T-BGU-111456**
	x	**1**	**Numerical Methods in Geoscience**	**E**	**LP**	**4**			**90**	WE	**Gaucher, Kohl**		6339078
			Geology				5				Hilgers		**M-BGU-105744**
			Geology										**T-BGU-111470**
	x		Analysis of Geological Structures	E		3				WE	Hilgers		6339080
	x		Depositional Systems	E		1					Hilgers		6339086
			Borehole Technology				5				Kohl		**M-BGU-105745**
			Borehole Technology										**T-BGU-111471**
x		2	Borehole Technology: Drilling	E	LP	2		3	60	WE	Kohl, Gaucher		6310426
	x	1	Borehole Technology: Logging	E	LP	2		2	30		Kohl, Gaucher		6339095
			Advanced Geological Mapping				5				Drüppel		**M-BGU-105736**
			Advanced Geological Mapping					**5**					**T-BGU-111455**
x		2	Advanced Geological Mapping (field course)	D, E	FS			5	80	WR	Drüppel, Tomašević		6310401
Specialisation in Geosciences Elective modules (50 CP have to be completed)													
			Geothermics I: Energy and Transport Processes				5				Kohl		**M-BGU-105741**
			Energy and Transport Processes										**T-BGU-111466**
	x	1	Energy Budget of the Earth	E	L	2		1,5	15	WR	Schilling		6339196
	x	1	Transport of Heat and Fluids	E	L	2		3	60	WE	Kohl		6339091
			Geothermics in the Rhine Graben – Field exercise										**T-BGU-111467**
	x	1	Geothermics in the Rhine Graben – Field exercise	E	EXC	1		0,5	0	WR	Kohl		6339092
			Industrial Minerals and Environment				5				Kolb		M-BGU-103993
			Industrial Minerals and Environment										T-BGU-108191
	x	1	Industrial Minerals	E	LP	2		2	30	WR	Kolb, Patten, Walter		6310124
	x	1	Field Seminar Industrial Minerals (2.5 days)	E	FS	2		2	30	WR	Kolb, Eiche, Patten, Walter, industry		6310125
			Reserve Modeling				5				Walter		**M-BGU-105759**
			Reserve Modeling										**T-BGU-111499**
	x	1//3	Reserve Modeling - Feasibility Study of Mining Projects (2 days)	E	S	2		2	35	WR	Winter term 22/23 oral exam Steinmüller		6320101
	x	1//3	Economic- and Risk Evaluation (3 Days)	E	S	2		3	65	PR	Winter term 22/23 oral exam Frenzel		6320104
			Geothermics II: Application and Industrial Use				5				Kohl		**M-BGU-105742**
			Application and Industrial Use								Kohl		**T-BGU-111468**
x		2	Application and Industrial Use	E	LP	2		4	90	WE			6310425
			Geothermal Exploitation – Field Exercise								Kohl		**T-BGU-111469**
x		2	Geothermal Exploitation – Field Exercise (2 days)	E	FS	1		1	15	WR			6310427
			Geological Storage				5				Schilling		**M-BGU-102445**
			Geological Storage										**T-BGU-104841**
x		3	Geological Storage of Gas	E	L	2		2	30	PR	Schilling		6339093
x		3	Fundamentals of Reservoir Geomechanics	E	LP	2		3	60		Schilling, Müller		6339094

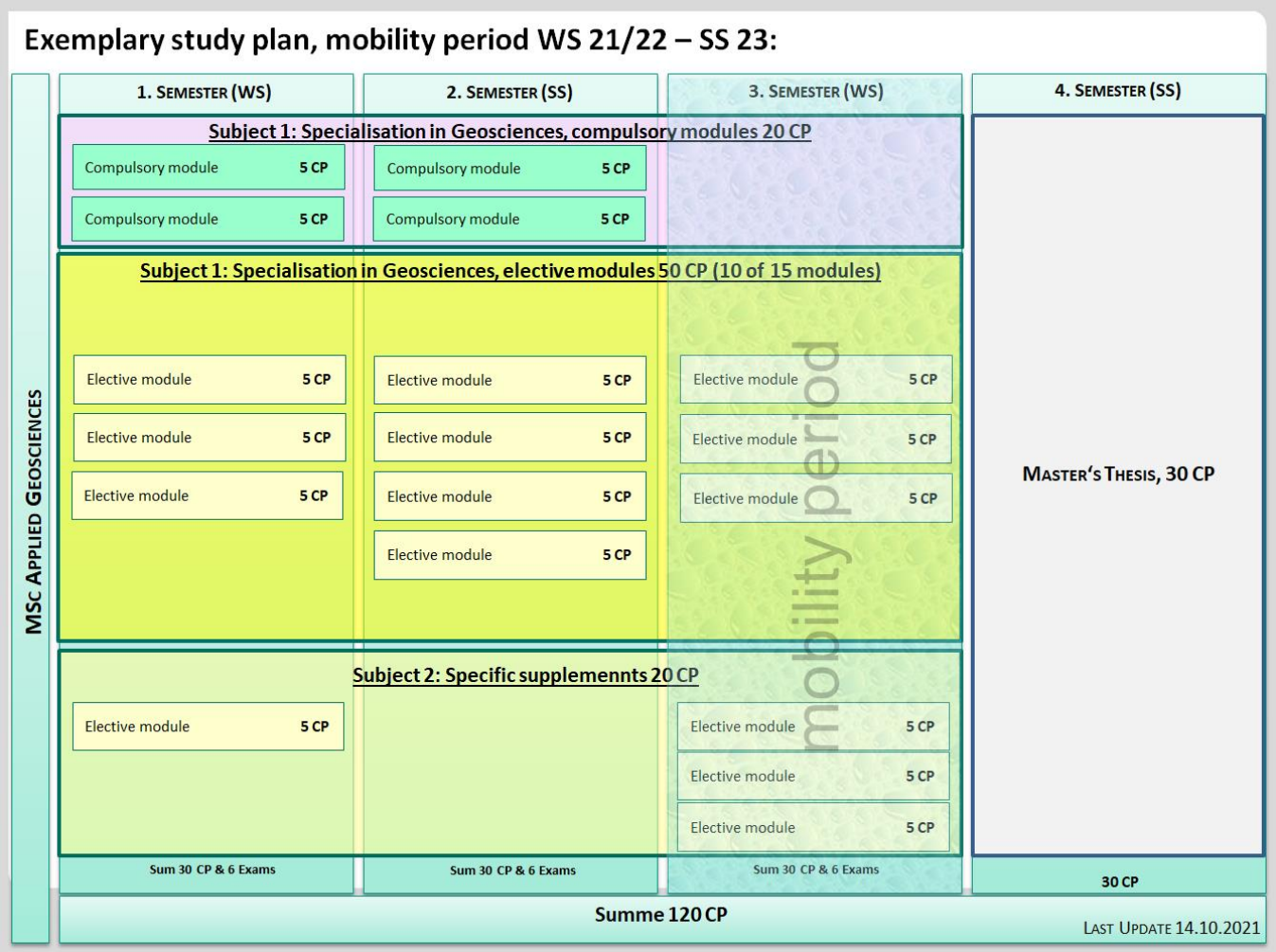
			Reservoir Geology				5				Hilgers	M-BGU-103742
			Reservoir Geology									T-BGU-107563
x		2	Reservoir-Geology	E	LP	2		2	30	WE	Hilgers, Busch	6310600
x		2	Field Seminar Reservoir-Geology (e.g. England, 5 days)	E	FS	4		3	30		Hilgers	6310601
			Structural Geology				5				Kontny	**M-BGU-102451**
			Microstructures									**[T-BGU-107507]**
x		2	Microstructures	E	LP	2		2	30	PR	Kontny	6339085
			Field Course Applied Structural Geology									**[T-BGU-107508]**
x		2	Field Seminar (e.g. Pyrenees, Spain, 5 days)	E	FS	4		3	30	FB + PR	Kontny	6310406
			Field Seminar				5				Zeh	**M-BGU-105746**
			Field Seminar									**T-BGU-111472**
x	x	3 or 2	Field trip, ~10 days	E	FS	8		5	30	WR	varying	6310460
			Ore Geology of Metals				5				Kolb	**M-BGU-103994**
			Ore Geology of Metals									**T-BGU-109345**
	x	3	Ore-forming processes	E	L	1		1	15	OE	Kolb, Patten, Walter	6339099
	x	3	Ore Microscopy and Ore Analysis	E	P	2		2	30		Kolb, Patten, Walter	6339097
	x	3	Field Seminar Ore Geology (2.5 days)	E	FS	2		2	30	WR	Kolb, Patten, Walter	6339096
			Geothermics III: Reservoir Engineering and Modeling				5				Gaucher, Kohl	**M-BGU-105743**
			Reservoir Engineering and Modeling Exercises				5				Gaucher, Kohl	**T-BGU-111523**
	x	3	Reservoir Engineering and Modeling Exercises	E	LP	2		3	60	WE + OP	Gaucher, Kohl, Grimmer, Nitschke	6339117
	x	3	Case Studies - Seminar	E	S	2		2	30		Gaucher, Kohl, Grimmer, Nitschke	6339118
			Seismic interpretation				5				Tomašević	**M-BGU-105777**
			Introduction to Reflection Seismics					3			Thomas Bohlen	T-BGU-111952
x		2	Introduction to Reflection Seismics	E	L	1				tbc	Hertweck, Bohlen	4060431
x		2	Exercises to Introduction to Reflection Seismics	E	P	1				tbc	Hertweck, Bohlen	4060432
			Seismic & Sequence Stratigraphy					2			Nevena Tomašević	T-BGU-111720
x		2	Seismic & Sequence stratigraphy (4 days)	E	P	2,5				WR, PR	Klaus Fischer (industry)	6339014
			Diagenesis and Cores				5				Hilgers	**M-BGU-103734**
			Diagenesis									**T-BGU-107559**
	x	3	Diagenesis (3 days)	E	S	2		3	60	WR	Busch, Felder, Hilgers	6339070
			Reservoir-Analogs and Core Description									**T-BGU-107624**
	x	3	Reservoir-Analogs and Core Description (5 days)	E	FS	4		2	0	WR	Schmidt, Busch, Hilgers	6339071
			Mineral Exploration				5				Patten	**M-BGU-105357**
			Mineral Exploration									**T-BGU-110833**
x		2	Mineral Exploration (divided into 3 blocks, see below)								Patten, Walter	6321410
			Geochemical Analysis, 5 days	E	LP	2,5		2	22,5	P+R		
			Geochemical Field Analysis and Sampling Techniques, 2 day	E	FS	0,5		1	22			
			Geochemical Core Analysis and Lab Techniques, 3 days	E	P	1		2	45			
			Shallow Geothermal Energy				5				Blum	**M-BGU-105730**
			Shallow Geothermal Energy									**T-BGU-111447**
	x	1//3	Thermal Use of Groundwater	E		2		3		WR +	Blum	6339115
	x	1//3	Exercises to Shallow Geothermal Energy	E		1		2		OE	Blum	6339116
			Basin Analysis and Modeling				5				Tomašević	**M-BGU-105773**
			Basin Modeling & Coding									**T-BGU-111543**
	x	3	Basin Analysis and Modeling	E	P	4				WR	Tomašević	6339072
(C) Subject 2: Specific Supplements												
Elective modules (20 CP have to be completed)												
Please refer to the alphabetic list "Specific Supplements", chapter xx in the module handbook												

Last update 21.07.2022

6. Mobility period for a stay abroad in MSc Applied Geosciences

A possible period for a stay abroad is in the 3rd semester, since depending on the choice the 4 compulsory modules from subject 1 can be completed by then. It is possible to have comparable achievements from abroad recognized in the elective areas of the Specialisation in Geoscience and the Specific supplements.

The following is an example of a study plan with mobility in the 3rd semester.



Last update 14.07.2021

6. Recognition of study and examination achievements within and outside the higher education

The examination regulations of the programs in Applied Geosciences at KIT stipulate that the achievements required in the curriculum of the respective program can also be proven by the recognition of external achievements. A distinction is made between achievements

- within the higher education system (worldwide, all credits earned at a recognised higher education institution in an accredited degree program);
- outside the higher education system (achievements proven at institutions with a standardised quality assurance system)

The prerequisite for recognition is the determination of the equivalence of the acquired competences by expert examiners. This involves comparing the qualification goals in the KIT goal module and the external performance and determining whether they essentially correspond. The scope and depth of external performance should be equivalent.

Reasons for refusal (i.e. an externally provided service is not considered equivalent) for the subject examiners may include

- if there is no equivalence of competences
- if the topicality is no longer given
- if equivalence cannot be determined due to missing documents

The request may be made:

- Applicants for higher semesters (change of study programme or change of location).

  Please note: In addition to any applications for recognition that may have been submitted, a current grade sheet with all passed and failed grades must be submitted with the application.

- Students on the KIT study program (First semester students who want to have their academic achievements from previous courses of study recognised or students returning from international time studies)

  Please note: For study programs abroad, it is strongly recommended to discuss the possibility of recognition of the intended courses with the respective KIT representative. On this occasion, further recognition details will be determined, e.g. whether a grade will be awarded (standard default) or not. The agreement reached is recorded in writing. Should there be any changes in the program on site later, these should be clarified immediately with the KIT Institute, e.g. by e-mail. In case of Erasmus, the Learning Agreement must be drawn up in advance with the Erasmus coordinator at KIT.

Form of application:

1. Applications must be submitted within the 1st semester after enrolment.
2. Compare your external performance with the local, scheduled performance via the module handbook.
3. Contact the responsible subject examiners (usually those responsible for the module) and clarify which documents are required for recognition.
4. Print and complete the application form:
   a) Application form (for services *outside the* Erasmus+ programme)
   b) Application form (for services provided during an *Erasmus+ stay*)
5. A separate application must be made for each benefit for which recognition is sought
6. Fill in page 1 of the form completely and copy it according to the number of services to be recognised
7. Please complete page 2 of the application for each achievement you wish to have recognised.
8. For each achievement, attach a copy of the first page and the completed page 2 of the achievement to be recognised and enclose with each application all documents required for recognition (e.g. copy of the certificate, transcript of records, extracts from the module handbook), on which the examination achievements on which recognition is based are documented. For documents that are not available in German or English, an officially certified translation may be required.
9. Submit all documents to the examiner as agreed. If equivalence exists with regard to the acquired competences (qualification objectives), this will be confirmed by the examiner with a stamp and signature.
   The final recognition is made by the examination board on the basis of the opinion of the responsible subject examiner. Please hand in the completed and signed application form to the examination secretariat (Ms. Lohkamp-Schmitz).
10. Enclose a copy of the confirmation of the service provided.
11. The examination board will inform you about the decision by e-mail.

12. The achievements are usually entered a few weeks later by the Studiengangservice Bau-Geo-Umwelt or the Prüfungssekretariat Angewandte Geowissenschaften.
13. Please check whether the achievements have been entered correctly.

7 Field of study structure

Mandatory	
Master's Thesis	30 CR
Specialisation in Geosciences (Election: 1 item)	
Specialisation in Geoscience: Sustainable Energy-Resources-Storage	70 CR
Specialisation in Geoscience: Mineralogy and Geochemistry	70 CR
Specialisation in Geoscience: Engineering Geology and Hydrogeology	70 CR
Mandatory	
Specific Supplements	20 CR

7.1 Master's Thesis

Credits
30

Mandatory		
M-BGU-105845	Module Master's Thesis	30 CR

7.2 Specialisation in Geoscience: Sustainable Energy-Resources-Storage

Credits
70

Mandatory		
M-BGU-105739	Numerical Methods in Geosciences	5 CR
M-BGU-105744	Geology	5 CR
M-BGU-105745	Borehole Technology	5 CR
M-BGU-105736	Advanced Geological Mapping	5 CR
Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules (Election: at least 50 credits)		
M-BGU-105741	Geothermics I: Energy and Transport Processes	5 CR
M-BGU-103993	Industrial Minerals and Environment	5 CR
M-BGU-105759	Reserve Modeling	5 CR
M-BGU-105742	Geothermics II: Application and Industrial Use	5 CR
M-BGU-102445	Geological Storage of Gas	5 CR
M-BGU-103742	Reservoir Geology	5 CR
M-BGU-102451	Structural Geology	5 CR
M-BGU-105746	Field Seminar	5 CR
M-BGU-103994	Ore Geology of Metals	5 CR
M-BGU-105743	Geothermics III: Reservoir Engineering and Modeling	5 CR
M-BGU-103734	Diagenesis and Cores	5 CR
M-BGU-105357	Mineral Exploration	5 CR
M-BGU-105730	Shallow Geothermal Energy	5 CR
M-BGU-105777	Seismic Interpretation	5 CR
M-BGU-105773	Basin Analysis and Modeling *First usage possible from 10/1/2022.*	5 CR

7.3 Specialisation in Geoscience: Mineralogy and Geochemistry

Credits
70

Mandatory		
M-BGU-103995	Geochemical Processes and Analytical Methods	5 CR
M-BGU-102430	Applied Mineralogy: Geomaterials	5 CR
M-BGU-105747	Geochemical and Petrological Modeling	5 CR
M-BGU-105765	Mineralogical Analytics	5 CR
Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules (Election: at least 50 credits)		
M-BGU-102444	Applied Mineralogy: Clay Science	5 CR
M-PHYS-103760	Electron Microscopy I	5 CR
M-PHYS-103761	Electron Microscopy II	5 CR
M-BGU-103733	Sedimentary Petrology	5 CR
M-BGU-102452	Petrology	5 CR
M-BGU-105357	Mineral Exploration	5 CR
M-BGU-105222	Introduction to Ceramics	6 CR
M-BGU-105223	Structural Ceramics	4 CR
M-CHEMBIO-104581	Physical Chemistry for Applied Geosciences	15 CR
M-BGU-105784	Petrophysics	5 CR
M-BGU-102455	Environmental Geology: Radio- & Chemotoxic Elements	5 CR
M-BGU-105736	Advanced Geological Mapping	5 CR
M-BGU-102453	Mineral Materials	5 CR
M-BGU-105766	Environmental Geochemistry	5 CR
M-BGU-102451	Structural Geology *First usage possible from 5/31/2022.*	5 CR
M-BGU-105746	Field Seminar *First usage possible from 5/31/2022.*	5 CR
M-BGU-103993	Industrial Minerals and Environment *First usage possible from 5/31/2022.*	5 CR
M-BGU-103994	Ore Geology of Metals *First usage possible from 5/31/2022.*	5 CR
M-BGU-106025	Isotope Geochemistry and Geochronology *First usage possible from 10/1/2022.*	5 CR
M-BGU-105963	Raw Materials and Environment *First usage possible from 10/1/2022.*	5 CR

7.4 Specialisation in Geoscience: Engineering Geology and Hydrogeology

Credits
70

Mandatory		
M-BGU-105505	Geospatial Data Analysis I – Programming and Geostatistics	5 CR
M-BGU-105731	Engineering Geology: Laboratory and Field Methods	5 CR
M-BGU-105793	Applied and Regional Hydrogeology	5 CR
Internship or Project Study (Election: 1 item)		
M-BGU-103996	Internship	5 CR
M-BGU-102438	Project Study	5 CR
Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules (Election: at least 50 credits)		
M-BGU-102442	Engineering Geology: Mass Movements and Modelling	5 CR
M-BGU-105790	Karst Hydrogeology	5 CR
M-BGU-105506	Current Research Topics in Hydrogeology and Engineering Geology	5 CR
M-BGU-105634	Geodata Analysis II – Big Data and Machine Learning	5 CR
M-BGU-105713	Applied Mapping and Processing of Geospatial Data	5 CR
M-BGU-102441	Hydrogeology: Field and Laboratory Methods	5 CR
M-BGU-105726	Hydrogeology: Hydraulics and Isotopes	5 CR
M-BGU-105730	Shallow Geothermal Energy	5 CR
M-BGU-102439	Hydrogeology: Groundwater Modelling	5 CR
M-BGU-105729	3D Geological Modelling	5 CR
M-BGU-100069	Rock Mechanics and Tunneling	6 CR
M-BGU-103995	Geochemical Processes and Analytical Methods	5 CR
M-BGU-105741	Geothermics I: Energy and Transport Processes	5 CR

7.5 Specific Supplements

Credits
20

Compulsory Elective Modules Specific Supplements (Election: at least 10 credits)		
M-BGU-105729	3D Geological Modelling	5 CR
M-BGU-101053	Advanced Analysis in GIS	4 CR
M-BGU-105506	Current Research Topics in Hydrogeology and Engineering Geology	5 CR
M-BGU-102430	Applied Mineralogy: Geomaterials	5 CR
M-BGU-102444	Applied Mineralogy: Clay Science	5 CR
M-BGU-105793	Applied and Regional Hydrogeology	5 CR
M-BGU-105713	Applied Mapping and Processing of Geospatial Data	5 CR
M-BGU-103996	Internship	5 CR
M-BGU-105745	Borehole Technology	5 CR
M-BGU-103734	Diagenesis and Cores	5 CR
M-PHYS-103760	Electron Microscopy I	5 CR
M-PHYS-103761	Electron Microscopy II	5 CR
M-BGU-100068	Earthworks and Foundation Engineering	6 CR
M-BGU-100069	Rock Mechanics and Tunneling	6 CR
M-BGU-105746	Field Seminar	5 CR
M-BGU-103995	Geochemical Processes and Analytical Methods	5 CR
M-BGU-105747	Geochemical and Petrological Modeling	5 CR
M-BGU-105505	Geospatial Data Analysis I – Programming and Geostatistics	5 CR
M-BGU-105634	Geodata Analysis II – Big Data and Machine Learning	5 CR
M-BGU-102445	Geological Storage of Gas	5 CR
M-BGU-105736	Advanced Geological Mapping	5 CR
M-BGU-105744	Geology	5 CR
M-BGU-103698	Geotechnical Engineering	11 CR
M-BGU-105741	Geothermics I: Energy and Transport Processes	5 CR
M-BGU-105742	Geothermics II: Application and Industrial Use	5 CR
M-BGU-105743	Geothermics III: Reservoir Engineering and Modeling	5 CR
M-BGU-100073	Ground Water and Earth Dams	6 CR
M-BGU-102441	Hydrogeology: Field and Laboratory Methods	5 CR
M-BGU-102439	Hydrogeology: Groundwater Modelling	5 CR
M-BGU-105726	Hydrogeology: Hydraulics and Isotopes	5 CR
M-BGU-105731	Engineering Geology: Laboratory and Field Methods	5 CR
M-BGU-102442	Engineering Geology: Mass Movements and Modelling	5 CR
M-BGU-105790	Karst Hydrogeology	5 CR
M-BGU-105222	Introduction to Ceramics	6 CR
M-BGU-105357	Mineral Exploration	5 CR
M-BGU-103994	Ore Geology of Metals	5 CR
M-BGU-102453	Mineral Materials	5 CR
M-BGU-105765	Mineralogical Analytics	5 CR
M-BGU-103993	Industrial Minerals and Environment	5 CR
M-BGU-105739	Numerical Methods in Geosciences	5 CR
M-BGU-102452	Petrology	5 CR
M-BGU-105784	Petrophysics	5 CR
M-CHEMBIO-104581	Physical Chemistry for Applied Geosciences	15 CR
M-BGU-102438	Project Study	5 CR
M-BGU-105759	Reserve Modeling	5 CR
M-BGU-103742	Reservoir Geology	5 CR
M-BGU-103733	Sedimentary Petrology	5 CR
M-BGU-105777	Seismic Interpretation	5 CR
M-BGU-105730	Shallow Geothermal Energy	5 CR
M-BGU-102451	Structural Geology	5 CR
M-BGU-105236	Structural and Phase Analysis	4 CR

M-BGU-105223	Structural Ceramics	4 CR
M-BGU-105766	Environmental Geochemistry	5 CR
M-BGU-102455	Environmental Geology: Radio- & Chemotoxic Elements	5 CR
M-BGU-100079	Environmental Geotechnics	6 CR
M-CIWVT-103753	Water Chemistry and Water Technology	10 CR
M-BGU-103360	Water and Energy Cycles	6 CR
M-BGU-105773	Basin Analysis and Modeling *First usage possible from 10/1/2022.*	5 CR
M-BGU-106025	Isotope Geochemistry and Geochronology *First usage possible from 10/1/2022.*	5 CR
M-BGU-105963	Raw Materials and Environment *First usage possible from 10/1/2022.*	5 CR

8 Modules

M 8.1 Module: 3D Geological Modelling [M-BGU-105729]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German/English	5	1

Mandatory			
T-BGU-111446	3D Geological Modelling	5 CR	Blum

Competence Certificate
Written Report (approx. 15 Pages)

Prerequisites
none

Competence Goal
The students will have the required qualification to create an own 3D geological model and get an overview on available software and recent developments of these programmes. For the control of success, the students will create their own 3D geological model, which will be marked in form of a written report.

Content
The course deals with the theory and application of various software programmes for 3D geological modelling. Furthermore, an overview of various software programmes and their applications and possibilities is provided. The course will be complemented by practical exercises using a suitable software for 3D geological modelling (3 SWS in winter term).

In addition to the two courses, the students create their own 3D geological models using an available case study and document their results in a final report.

Module grade calculation
The grade of the module is the grade of the written report.

Annotation
none

Workload
45h attendance time, 105 h self-study time

Recommendation
keine

Learning type
Lecture, exercise, report and self-study

Base for
none

M 8.2 Module: Advanced Analysis in GIS (GEOD-MPEA-3) [M-BGU-101053]

Responsible: Dr.-Ing. Norbert Rösch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
4	Grade to a tenth	Each summer term	1 term	German/English	4	3

Mandatory			
T-BGU-101782	Advanced Analysis in GIS	4 CR	Rösch

Competence Certificate
The assessment consists of an oral exam (about 20 min.)

Prerequisites
None

Competence Goal
The students explain the advanced concepts of spatial analysis and 2D interpolation procedures. Especially the different aspects of statistical reasoning are analyzed. They can categorize all analysis problems with spatial background and estimate possible solutions.

Content
After an introduction to analysis in GIS in general, this lecture is dealing with the specific approaches of statistical analysis of spatial data. Among them, in particular, the different methods of pattern analysis. This also encompasses the test strategies inherent to the aforementioned methods. Another topic is data mining, which is introduced as an extension of the point pattern analysis. Furthermore the 2D interpolation procedures are discussed (e. g. Natural Neighbor Interpolation, Kriging, …).

Module grade calculation
The grade of the module is the grade of the oral exam in T-BGU-101782 Advanced Analysis in GIS.

Workload
Contact hours: 30 hours

- courses plus course-related examination

Self-study: 90 hours

- consolidation of subject by recapitulation of lectures
- processing of exercises
- consolidation of subject by use of references and by own inquiry
- preparations for exam

M 8.3 Module: Advanced Geological Mapping [M-BGU-105736]

Responsible: apl. Prof. Dr. Kirsten Drüppel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (mandatory)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German/English	4	1

Mandatory			
T-BGU-111455	Advanced Geological Mapping	5 CR	

Competence Certificate
The assessment consists of an examination of another type, including field work, preparation of a geological mal and a mapping report.

Prerequisites
none

Competence Goal
The students are able to carry out a geological investigation of an unknown area independently and to create a geological map using GPS data. They can interpret the data and use it to evaluate the potential of possible geological resources.

Content
Introduction to the geology of the mapping area

Instructions for mapping of sedimentary, igneous and metamorphic rocks and analysis of their structural features

Drawing of geological profiles

Interpretation of a geological map

Assessment of the potential of existing georesources

Production of a digital geological map

Assessment and analysis of geodata with a geological background

Management of geospatial data according to established standards

Module grade calculation
The grade of the “examination of another type” is the module grade

Annotation
The practical part of this course is carried out face-to-face. The field exercises are essential for the participants' progress in their studies.

Workload
70h fieldwork and 80h self studying time

Literature
Walter Maresch, Hans-Peter Schertl, Olaf Medenbach (2012): Gesteine: Systematik, Bestimmung, Entstehung. Schweizerbart, 359 S.

M 8.4 Module: Applied and Regional Hydrogeology [M-BGU-105793]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-111593	Applied and Regional Hydrogeology	5 CR	Goldscheider

Competence Certificate
Oral examination (30 minutes)

Annotation
It is mandatory to choose the module "Applied and Regional Hydrogeology" as a requirement for the modules "MBGU-102439 – Hydrogeology: Groundwater Modelling" and "M-BGU-102441 - Hydrogeology: Field and Laboratory Methods, since it addresses their theoretical and practical background".

Workload
150 h, of which 50 h attendance time and 100 h self-study time

M 8.5 Module: Applied Mapping and Processing of Geospatial Data [M-BGU-105713]

Responsible: Dr. rer. nat. Nadine Göppert
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-111444	Applied Mapping	4 CR	Göppert
T-BGU-111445	GIS Cartography	1 CR	Menberg

Competence Certificate
The assessment consists of an examination of another type, consisting of:
- the geological map
- a report of 15 pages
- an oral presentation of results of 15 minutes duration,
and four unmarked exercise sheets for GIS cartography.

Prerequisites
Study profile Engineering and Hydrogeology

Competence Goal
The students are able to perform geological mapping campaigns in an unknown area and generate a geological map based on GPS data and GIS. The students can answer hydrogeological questions with respect to the mapped field site. They are able to interpret the data.

Content

- Geological introduction to the mapping area
- Mapping of the geology and structure, as well as the hydrogeological features
- Geological cross-sections
- Introduction to GIS-based processing of hydrogeological questions
- Guidance for producing digital geological maps
- Evaluation and analysis of geodata with geological background

Module grade calculation
The module grade is the grade of the examination of another type.

Workload
150 h, of which 55 h attendance time, 95 h self-study time

Learning type
Field Exercises, Exercises

M 8.6 Module: Applied Mineralogy: Clay Science [M-BGU-102444]

Responsible: apl. Prof. Dr. Katja Emmerich
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	2 terms	German/English	4	2

Mandatory			
T-BGU-104839	Clay Mineralogy Introduction	2 CR	Emmerich
T-BGU-104840	Advanced Clay Mineralogy	3 CR	Emmerich

Competence Certificate
The assessment consists of a written ungraded test (Clay Mineralogy Introduction, 90 min. To pass 70 % of 100 % must be correct) and an examination of another type (Advanced Clay Mineralogy, graded report, ca. 12 pages, submission till 4 weeks after the end of the lecture period).

Prerequisites
None

Competence Goal
The students are able to classify clays and clay minerals and to identify processes and process parameters in (geo)technical systems.
Students are able to plan and perform clay mineralogical analyses. They are able to evaluate the results, present them in a structured way and critically evaluate them with regard to consistency.

Content

- Building blocks and ideal structure of 1:1 and 2:1 layer silicates, types of clays
- Real structure (layer charge, polytypes, interstratifications) of clay minerals.
- Analytical methods: X-ray diffraction, thermal analysis (with examples to learn how to evaluate the measurement curves), methods for determination of cation exchange capacity and layer charge, infrared spectroscopy, electron microscopy, methods for the determination of surfaces, complex phase analysis
- Material properties and process variables in technical and geotechnical applications of clays are discussed using examples of current research
- Analytical methods are applied to real samples in the laboratory

Module grade calculation
grade of the module is the grade of the T-BGU-104840 Advanced Clay Mineralogy

Annotation
Depending on the auditorium, this module is held in German or English

The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Workload
contact hours: 60

self study time: 90

M 8.7 Module: Applied Mineralogy: Geomaterials [M-BGU-102430]

Responsible: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	5	3

Mandatory			
T-BGU-104811	Applied Mineralogy: Geomaterials	5 CR	Danisi, de la Flor Martin, Schilling

Competence Certificate
The assessment consists of an examination of another type (worksheets).

To pass the worksheets, at least 50% of the points must be achieved.

Prerequisites
keine

Competence Goal
The students are qualified to apply basic mineralogical approaches to describe and targeted use of geomaterials.

The students have knowledge of basic methods of applied mineralogy:

- about the basics of crystallography, this includes the detailed consideration from point to space groups.
- to describe and visualise the structures of relevant geomaterials.
- to analyse group-subgroup relationships and phase transitions of different geo-materials.

They master basic crystallographic methods and are able to apply these to a technically important group of minerals, the zeolites. The students have:

- a deep understanding of the crystal chemistry of microporous mineral phases.
- advanced knowledge of framework structures and their physico-chemical properties.
- basic knowledge of modern functional materials with key applications in industry.
- the competence to investigate and characterize materials using diffraction techniques.

Content
Modern geoscientific materials research focuses on the relationship between structure and (thus mostly) anisotropic material behaviour. Therefore, a profound understanding of symmetry and structure relationships is the focus of the course, in addition to a detailed process understanding of the mode of action of one of the most important geomaterials - zeolites. These nanoporous materials are of fundamental importance in many technical processes which cannot be imagined without them (from the food industry to petrochemistry).

- Crystallography: from point groups to space groups
- Crystal structures descriptions
- Symmetry relations between crystal structures
- group-subgroup relationships
- phase transitions of different geo-materials
- Zeolite and zeolite-like framework structures
- Industrial applications: molecular sieves, catalysts and ion exchangers.
- Fundamentals of diffraction: Theory and Praxis
- Structural determination of microporous mineral phases

Module grade calculation
The module grade is the average of the scores of the worksheets.

Annotation
Enthusiasm and commitment to mineralogical questions are expected

The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Workload
60 hours attendance time and 90 hours self-study

Recommendation
Openess for new ideas and things

Learning type
- Lectures
- Exercises
- Laboratory Exercises
- Self-study
- Discussions

Literature
Will be discussed during the lectures

M 8.8 Module: Basin Analysis and Modeling [M-BGU-105773]

Responsible: TT-Prof. Dr. Nevena Tomašević
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules) (Usage from 10/1/2022)
Specific Supplements (Usage from 10/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	5	1

Mandatory			
T-BGU-111543	Basin Analysis and Modeling	5 CR	Tomašević

Competence Certificate
The assessment consists of an end-term examination of another type (graded written report up to 10 pages, submitted 4 weeks after the end of the lecture period and a final oral presentation (and discussion). Each of the two components weighs 50 %.

Prerequisites
Requirements for participation in the module exam: the timely submission of all exercises, 80% of them correct.

Competence Goal
The course aims at providing an in-depth understanding of the sedimentary basin evolution by considering external and internal forcing factors, and economically important geo-resources. This course will advance students' knowledge and experiences in analysis and interpretation of geological and geophysical data leading toward building numerical models required to predict and qualitatively assess sedimentary features (e.g., grain size distribution, thickness maps, key stratigraphic surfaces, porosity, permeability, etc.).

At the end of the course, students will: (1) have a physical understanding of the long- and short-term processes operating in the sedimentary basins; (2) be able to conceptualize sedimentary basin-related problems and turn them into modeling strategies; (3) learn how to use and develop parts of numerical models, and (4) critically evaluate their results to respond to specific scientific and industry-related questions.The course will rely on active student involvement, where exercises using geological software and/or open-source codes (e.g., Petrel incl. GPM, landlab) and assignments will be prioritized over lectures. It is meant for students interested in combining numerical modeling and sedimentary basin analysis.

Content
In this module, students will learn about the mechanisms controlling the sedimentary basin architecture and how these can be studied by analyzing available geophysical (2D and 3D seismic lines, well logs) and geological data combined with numerical modeling techniques. The special focus will be on the rift and foreland basins as the most common hosts of ore deposits, hydrocarbons, water, and geothermal and storage sites. During the course, each student will receive an individual assignment linked to the specific case study.

Module grade calculation
The grade of the module is the grade of the examination of another type.

Annotation
The language of instruction is English. This is a third-semester module, the students are expected to have successfully passed the modules Geology (M-BGU-105744), Seismic Interpretation (M-BGU-105777), and Numerical Methods in Geosciences (M-BGU-105739).

The practical part of this course is carried out in the presence. It requires a computer laboratory with the necessary hard- and software.

Workload
contact hours: 60

self study time: 90

Literature
Basin Analysis: Principles and Application to Petroleum Play Assessment
By: Philip A. Allen and John R. Allen, ISBN: 978-0-470-67377-5 August 2013 Wiley-Blackwell 632 Pages

Mathematical Modeling of Earth's Dynamical Systems
By: Slingerland, Rudy and Kump, Lee. Princeton University Press, 2011. ISBN: 978-0-691-14513-3

Seismic Data Analysis
By: Yilmaz, Oz, 2001, Freely available at: https://wiki.seg.org/wiki/Seismic_Data_Analysis

M 8.9 Module: Borehole Technology [M-BGU-105745]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each term	2 terms	English	4	1

Mandatory			
T-BGU-111471	Borehole Technology	5 CR	Kohl

Competence Certificate
The assessment consists of a written exam (90 min) according to §4 (2) of the examination regulations. The oral presentation in the seminar is included in the grade of the written exam.

Prerequisites
none

Competence Goal
- The students are able to characterize reservoirs from logging data.
- The students are able to explain the basics of different drillhole technologies and are able to present results graphically and to evaluate and present them scientifically.

Content
Logging (winter term)
Summary Petrophysics: Density / Porosity / Saturation
Electr. properties of rocks
Electrical survey - Resistivity distribution around Hydrocarbon / geothermal wells
Electrical survey - SP-Log
Electrical survey - Resistivity & Induction
Nuclear logs: Gamma Log
Nuclear logs: Density Log
Nuclear logs: Neutron Log
Image-Logs
Sonic-Logs
Logging software - introduction
Logging software - practical application

Driling (summer term)
Introduction Drill Rig
Blow-out Preventer
Gas Kick
Mud circuit
ROP / Mudlog
Drilling Fluid
Pressure Profile
Drill bit
Directional drilling
Rotary / downhole motor,
BHA Bottom Hole Assembly,
MWD & LWD
Casing design

Module grade calculation
The overall module grade is the grade of the written exam, in which the oral presentation in the seminar is included.

Workload
regular attendance: 60h

seld study including exam: 90h

M 8.10 Module: Current Research Topics in Hydrogeology and Engineering Geology [M-BGU-105506]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	pass/fail	Each term	2 terms	German	4	1

Mandatory			
T-BGU-111067	Current Research Topics in Hydrogeology and Engineering Geology	5 CR	Goldscheider

Competence Certificate
Attendance at current lecture series, field exercise report(s) (1 page/day), presentation (20 min)

Prerequisites
none

Competence Goal
The students can name and explain current research topics in hydro- and engineering geology. They are able to analyze, discuss and present current research topics. They can recognize relevant phenomena and processes in the field

Content

- Selected lectures on current research topics in hydro- and engineering geology (e.g. Geologisches Fachgespräch, Karst Lecture, International Distinguished Lectures)
- Changing field exercises to current research regions
- Review of a current research topic on the basis of literature, presentation and discussion, accompanying mentoring program

Module grade calculation
not marked

Workload
150 h, of which 70 h attendance time and 80 h self-study time

M 8.11 Module: Diagenesis and Cores [M-BGU-103734]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	5	2

Mandatory			
T-BGU-107559	Diagenesis	3 CR	Hilgers
T-BGU-107624	Reservoir-Analogs and Core Description	2 CR	Hilgers

Competence Certificate
The assessment is a marked written report and an unmarked written report

1. Diagenesis: The assessment is based on a marked written report (10 pages) describing and interpreting a given thin section by independent practical microscopy over 4h on the day after completion of the course. This covers petrographic description of a sedimantary rock in thin section, its interpretation plus thin section images and raw data in the enclosure. Submission of report: 2 weeks after the end of the course.

2. Reservoir-Analogs and Core Description: The assessment is based on a passed report of 2 pages plus digital and hand-written enclosures of a core description (passed/not passed). Submission of report: 2 weeks after the end of the course.

Prerequisites
Entrance to the module examination requires the submission of homework (100%) within the given deadline, of which 80% are passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-103742 - Reservoir Geology must have been passed.

Competence Goal
After this module, students will be able to apply basic industry standard analyses of sedimentary petrology and diagenesis, and core analysis for reservoir quality assessments.

Course 1: After this course students will be able to apply a industry-standard workflow of petrographic analyses of clastic sediments (description, quantification etc.), sandstone- and carbonate classification, evaporites, provenance, to derive diagenetic processes, evaluate reservoir characteristics and assess resevoir quality. They can critically assess data for sampling campaigns.

Course 2: After this course students are enabled to describe reservoir rocks in the field and in cores according to industry standards. They derive facies models and integrate data into state-of the art software

Content
detrital compenents, authigenic components, provenance assessment, point counting, reservoir quality assessment (geothermal, transitional hydrocarbons)

Module grade calculation
The grade of the module is the grade of the exam.

Annotation
Course 1 Diagenesis: You will work with thin sections from real reservoir rocks and understand the difference between analogs and reservoirs. The course considers to involve an industry expert.

Course 2 Reservoir Analogs and Cores: You will work on real reservoir cores which we obtained from wells in the North Sea and elsewhere.

The practical part of this course is carried out in presence. The attendance is obligatory. The microscopy exercises as well as the field course are essential for the study progress of the participants.

Workload
5CP (150h)

contact time: 45h (3SWS)

self-study time: 105h

Recommendation
The student shall have a basic knowledge of reservoir geology

Literature
• Stonecipher, S.A. 2000. Applied sandstone diagenesis - practical petrographic solutions for a variety of c ommon exploration, development, and production problems. SEPM Short Course No. 50
• Nader, F.H. 2020. Multi-scale Quantitative Diagenesis and Impacts on Heterogeneity of Carbonate Reservoir Rocks. Springer.
• Boggs, S. 2010. Petrology of sedimentary rocks. Cambridge Univ Press

M 8.12 Module: Earthworks and Foundation Engineering (bauiM5P2-ERDGB) [M-BGU-100068]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-100068	Earthworks and Foundation Engineering	4 CR	Stutz
T-BGU-100178	Student Research Project 'Earthworks and Foundation Engineering'	2 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-100178 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100068 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

Prerequisites
none

Competence Goal
With regard to geotechnical constructions the students are able to select and apply appropriate methods for exploration, modelling, dimensioning, realization and control in the case of complex requirements on average. They can apply this knowledge to earthworks and embankment engineering, can identify all geotechnically relevant problems occurring with dams and can apply self-reliantly design and dimensioning rules in outline. They gained geotechnical competence in solving problems for all kind of constructions in and with unconsolidated rocks, also with respect to the managerial organization, expense budgeting, use of documents and presentation of results.

Content
The module deepens the safety concepts in earthworks and foundation engineering and the project design for foundation problems by means of several examples (foundations on soft soil, variants of construction pit supporting system, stabilization and drainage of embankments, slope stabilization, retaining structure, underpinning) and explains the observation method. Basics of earthworks and foundation engineering are presented such as building materials for dams, design requirements, construction of dams, sealing and stability of filled dams. Further basics are computation of seepage and the evaluation of erosion, suffosion, piping, colmatation and joint erosion.

Module grade calculation
grade of the module is grade of the exam

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Foundation Types lecture/exercise: 30 h
- Basics in Earthworks and Embankment Dams lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Foundation Types: 10 h
- preparation and follow-up lecture/exercises Basics in Earthworks and Embankment Dams: 10 h
- preparation of student research project: 60 h
- examination preparation: 40 h

total: 180 h

Recommendation
basic knowledge of Soil Mechanics and Foundation Engineering;

compilation and submission of student research project as examination preparation until examination date

Literature

[1] Witt. K.J. (2008), Grundbau-Taschenbuch, Teil 1,
[2] Ernst & S. Smoltczyk, U. (2001), Grundbau-Taschenbuch, Teil 2-3,
[3] Ernst & S. Schmidt, H.G. & Seitz, J. (1998), Grundbau , Bilfinger & Berger
[4] Striegler (1998), Dammbau in Theorie und Praxis, Verlag für Bauwesen Berlin
[5] Kutzner (1996), Erd- und Steinschüttdämme für Stauanlagen, Enke Verlag Stuttgart

M 8.13 Module: Electron Microscopy I [M-PHYS-103760]

Responsible: TT-Prof. Dr. Yolita Eggeler
Organisation: KIT Department of Physics
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German/English	4	1

Mandatory			
T-PHYS-107599	Electron Microscopy I	5 CR	Eggeler

M 8.14 Module: Electron Microscopy II [M-PHYS-103761]

Responsible: TT-Prof. Dr. Yolita Eggeler
Organisation: KIT Department of Physics
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German/English	4	1

Mandatory			
T-PHYS-107600	Electron Microscopy II	5 CR	Eggeler

M 8.15 Module: Engineering Geology: Laboratory and Field Methods [M-BGU-105731]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	2 terms	German	4	1

Mandatory			
T-BGU-111448	Engineering Geologie: Laboratory and Field Methods	5 CR	Blum

Competence Certificate
The assessment consists of an oral exam (20 min) and two non-assessed reports (Laboratory and field methods).

Prerequisites
keine

Annotation
The practical part of this course is carried out in presence. The field courses and laboratory courses are essential for the progress of the participants.

M 8.16 Module: Engineering Geology: Mass Movements and Modelling [M-BGU-102442]

Responsible: Dr. Kathrin Menberg
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	2 terms	German	4	2

Mandatory			
T-BGU-110724	Engineering Geology: Mass Movements	2 CR	Menberg
T-BGU-110725	Engineering Geology: Modelling	3 CR	Blum

Prerequisites
none

M 8.17 Module: Environmental Geochemistry [M-BGU-105766]

Responsible: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	2 terms	German/English	4	1

Mandatory			
T-BGU-111525	Environmental Geochemistry	5 CR	Eiche

Competence Certificate
The assessment consists of an examination of another type (ca. 10 exercise sheets in ILIAS for the lecture, a presentation of 30 min including discussion and a report related to the presentation of 10-20 pages) according to §4 (2) of the examination regulations.

Prerequisites
none

Competence Goal
The students can work out which natural and anthropogenic substance flows are relevant for selected elements. They know how and through which factors and processes the substance flow can change both over time and regionally to globally. They also understand the complex interactions between different spheres and different geochemical processes. They know selected methodological and analytical approaches to characterize substance flow. They are able to apply this knowledge to current environmental geochemical research results and develop well-founded interpretations and solutions. In addition, students can present selected issues of environmental geochemistry in an informative presentation and critically discuss them in a scientifically written seminar paper

Content
- Seminar with annually changing, selected topics that are related to aspects and prob-lems in environmental geochemistry
- Sources, sinks and substance flows of selected environmentally relevant elements such as As, Se, Hg, Cr
- Methods for characterizing the pollutant dynamics in the environment
- Process-oriented interpretation and discussion of current research results with regard to pollutant dynamics, including the development of adapted mitigation measures
- Special features of the pollutant dynamics in estuaries

Module grade calculation
The grade of the “ examination of another type ” is the module grade

Annotation
The course is carried out face-to-face.

Workload
150 h

Learning type
lecture and exercises

Literature
Alexandre, P. 2021. Practical Geochemistry. Springer Textbooks in Earth Sciences, Geography and Environment. Springer Nature Switzerland AG. https://doi.org/10.1007/978-3-030-72453-5
Holland, H.D., Turekian, K.K. 2014. Treatise on Geochemistry (Vol. 14) – Environmental Geochemistry. Elsevier Science.
Ryan, P. 2014. Environmental and Low Temperature Geochemistry. John Wiley & Sons, Incorporated.
Adriano, D.C. 2001. Trace elements in terrestrial environments: biogeochemistry, bioavailability, and risks of metals. 2nd edition. Springer New York, Berlin, Heidelberg.

M 8.18 Module: Environmental Geology: Radio- & Chemotoxic Elements [M-BGU-102455]

Responsible: Dr. Frank Heberling
Dr. Volker Metz

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	2 terms	German/English	5	3

Mandatory			
T-BGU-107560	Environmental Geology: Radio- & Chemotoxic Elements	3 CR	Heberling
T-BGU-107623	Radiogeochemical Field Excercise and Seminar	2 CR	Heberling

Competence Certificate
The assessment consists of

- a written exam (90 min) about the lecture and

- an ungraded coursework: Seminar as preparation for field excercise (15 min presentation) and report (15-20 pages, submission till 2 months after the excercise)

Prerequisites
None

Annotation
Depending on the auditorium, this module is held in German or English

The practical part of this course is carried out in presence. The field courses and laboratory courses are essential for the progress of the participants.

M 8.19 Module: Environmental Geotechnics (bauiM5S09-UMGEOTEC) [M-BGU-100079]

Responsible: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100084	Landfills	3 CR	Bieberstein
T-BGU-100089	Brownfield Sites - Investigation, Evaluation, Rehabilitation	3 CR	Bieberstein

Competence Certificate
- 'Teilleistung' T-BGU-100084 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100089 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can describe the legal guidelines regarding the disposal of wastes and the permitted threshold value for brownfields. They can outline the geotechnical concerns in the construction of landfill sites depending on the particular landfill classification, landfill elements, their relevant requirements and necessary certifications. They are able to interlink interdisciplinarily the chemical, mineralogical, biological, hydraulic and geotechnical aspects dealing with brownfileds. They can choose reasonably between the relevant remediation technologies and assess their limits of applications and risks.

Content
The module covers geotechnical techniques in dealing with waste and brownfields. The environmental engineering, scientific and legal basics are discussd. Working steps of project planning, building materials, ways of construction and proofs are presented. Techniques for burning and immobilisation are explained as well as different microbiological, electrokinetic, hydraulic and pneumatic soil remediation methods.

Module grade calculation
grade of the module is CP weighted average of grades of the partial exams

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Landfills lecture/exercise: 30 h
- Brownfield Sites - Investigation, Evaluation, Rehabilitation lecture: 30 h
- Excursion: 10 h

independent study:

- preparation and follow-up lecture/exercises Landfills: 25 h
- examination preparation Landfills (partial exam): 30 h
- preparation and follow-up lectures Brownfield Sites - Investigation, Evaluation, Rehabilitation: 25 h
- examination preparation Brownfield Sites - Investigation, Evaluation, Rehabilitation (partial exam): 30 h

total: 180 h

Recommendation
none

Literature
DGGT, GDA-Empfehlungen – Geotechnik der Deponien und Altlasten, Ernst und Sohn, Berlin
Drescher (1997), Deponiebau, Ernst und Sohn, Berlin
Reiersloh, D und Reinhard, M. (2010): Altlastenratgeber für die Praxis, Vulkan-V. Essen

M 8.20 Module: Field Seminar [M-BGU-105746]

Responsible: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 5/31/2022)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	English	5	1

Mandatory			
T-BGU-111472	Field Seminar	5 CR	Zeh

Competence Certificate
The assessment is the participation of a 10 day (often international) field trip, taking notes in a geological field book, and depending on the respective lecturer a preliminary seminar, daily minutes during the trip, final report or some similar reporting.

Prerequisites
None

Competence Goal
After this module, the student can document and analyse new geological regions, and transfer knowledge.

Content
- Introduction to the geology of the region
- Recognition of rocks and their structures for the assessment of georeservoirs and georesources
- Derivation of geological processes

Module grade calculation
The grade of the module is the grade of the written report.

Annotation
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
Contact time: 100h
Self-study time: 50h

Recommendation
Students are requested to take this module in their final year.

Literature
• Tucker M 2011. Sedimentary rocks in the field. The Geological Field Guide Series.
• Lisle, R. et al 2011. Basic Geological Mapping. The Geological Field Guide Series.
• Jerram D, Petford N 2011. The field description of igneous rocks. The Geological Field Guide Series.
• Fry, N. 1991. The field description of metamorphic rocks. Geol.Soc.Lond.Prof. Handbook Series
• McClay, K. 1991. The mapping of geological structures. Geol.Soc.Lond.Prof. Handbook Series

M 8.21 Module: Geochemical and Petrological Modeling [M-BGU-105747]

Responsible: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German/English	4	1

Mandatory			
T-BGU-111473	Geochemical and Petrological Modeling	5 CR	Drüppel, Eiche, Heberling, Zeh

Competence Certificate
The assessment consists of an oral examination (30 minutes duration)

Prerequisites
none

Competence Goal
The students have knowledge about fundamental principles of equilibrium thermodynamics and their application in geoscience. They are able to calculate phase diagrams in P-T-X space, and to model ionic speciations, mineral dissolution and -precipitation processes and mineral surface processes by applying appropriate thermodynamic software. Furthermore, the students will be enabled to evaluate calculation results in a geochemical-petrological context.

Content
(Part1) Introduction into geochemical thermodynamics

The components of Gibbs equation (H, S , V), equilibrium constant, excess energy, activity, fugacity, a-X relations, standard state, chemical potential, internally consistent thermodynamic datasets

Calculation of different kinds of thermodynamic equations: (i) simple mineral reactions, (ii) reactions with solid-solutions, (iii) reactions including fluid phases, (iv) Ionar reactions; (v) redox reactions, (vi) surface reactions with fluids

Basis of Gibbs minimization

Basics and terminology of phase diagram calculations

(Part 2) calculation of phase diagrams for petrological applications with software THERMOCALC, THERIAK-DOMINO and PERPLE-X

Basics and differences of the three programs, calculation of T-X diagrams and P-T pseudosections for complex systems comprising volatiles and melts, practical applications

(Part 3) calculation of equilibrium reactions between solids, liquids, and gases at low-T conditions with the software PHREEQC, with application to actual research problems

Module grade calculation
The grade of the “oral examination” is the module grade

Annotation
This module will be held for the first time in the winter term 2022/23.

The course is carried out face-to-face.

Workload
Contact Hours: Approx. 50 hours lectures and exercises

Self studying time:100 hours

Recommendation
none

Learning type
Lectures (1/3) and exercises (2/3)

Literature

1. Darrell Kirk Nordstrom, James L. Munoz (1985). Geochemical Thermodynamics.

Blackwell Scientific Publications

2. Powell, R. (1978). Equilibrium Thermodynamics in Petrology. An Introduction. Joanna Cotler Books.

3. Holland, T.J.B. & Powell, R. (1999). An internally consistent thermodynamic data set for phases of petrological interest. Journal of Metamorphic Geology, 16, 309-343.

M 8.22 Module: Geochemical Processes and Analytical Methods [M-BGU-103995]

Responsible: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (mandatory)
Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	2 terms	German	5	3

Mandatory			
T-BGU-108192	Geochemical Processes and Analytical Methods	5 CR	Eiche

Competence Certificate
The assessment consists of an examination of another type (ca. 10 exercise sheets in ILIAS for the lecture, a short presentation on one analysis method and a 30-45 min presentation in groups of two or three on a given laboratory project for the practise).

Prerequisites
none

Annotation
The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Recommendation
none

M 8.23 Module: Geodata Analysis II – Big Data and Machine Learning [M-BGU-105634]

Responsible: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-111268	Geodata Analysis II – Big Data and Machine Learning	5 CR	Liesch

Competence Certificate
Other kind: Independent development of a given problem

Prerequisites
Choice of the profile Hydrogeology and Engineering Geology. To register for the exam, the module Geodata Analysis I - Programming and Geostatistics must have been passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-105505 - Geospatial Data Analysis I – Programming and Geostatistics must have been passed.

Competence Goal
The students can handle large geospatial data sets (e.g. satellite data, climate data). They master basic machine learning methods and are able to program simple application cases independently.

Content

- Advanced programming
- Big data analysis (z.B. Satellitendaten, Klimaprojektionen)
- Google Earth Engine (Programming in Java Script)
- Fundamentals of Machine Learning (Supervised and Unsupervised Learning, Learning Algorithms, Classification and Regression)
- Neural Network Basics (Types on ANN, Learning Algorithms, Training, Validation, Testing, Over- and Underfitting)
- Feature Engineering
- Hyperparameter Tuning, Regularization, Ensembles
- Application Examples (Python)

Workload
50 h attendance time and 100 h self-study time

Learning type
Combined lecture and computer exercises

M 8.24 Module: Geological Storage of Gas [M-BGU-102445]

Responsible: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German/English	5	2

Mandatory			
T-BGU-104841	Geological Storage of Gas	5 CR	Schilling

Competence Certificate
The assessment consists of an examination of another type (presentation).

Prerequisites
none

Module grade calculation
Module grade ist the grade of the examination of another type.

Annotation
Depending on the auditorium, this module is held in German or English

Workload
60 h contact time

90 h self studying time

Recommendation
The student shall have a basic knowledge of reservoir geology, mathematics and physics

Literature
IPCC Report zur CO2-Speicherung

EU Richtlinie zur CO2 Speicherung

Jaeger & Cook: Fundamentals of Rock Mechanics. Wiley-Blackwell ISBN 978-0-632-05759-7, 488 S.
Zoback: Reservoir Geomechanics, Cambrige University Press, ISBN 978-0-521-14619-7, 461 S.

M 8.25 Module: Geology [M-BGU-105744]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	5	1

Mandatory			
T-BGU-111470	Geology	5 CR	Hilgers

Competence Certificate
The assessment is a marked written exam over 120 minutes

Prerequisites
Entrance to the module examination requires the submission of homework (100%) within the given deadline, of which 80% are passed.

Competence Goal
After this module, student can apply structural geology using real world examples. Students will be trained to link rocks and depositional systems in different regional settings.

Content
Applied Structural Geology:
• Stress, Strain & Drilling
• Fractures and Mohr Circle
• Joints, Veins & Effective Stress
• Normal faults & Allen-Diagram
• Thrust faults & Balanced Cross Sections
• Strike slip fault & Scaling
• Inversion & Fault Reactivation
• Strain measurements
• Diapirs & Creep Laws
• Folds & Saddle Reefs
• Cleavage & Shear Zones
• Creep from Microstructures
• Maps / Structural Analysis

Depositional Systems of regions:
• Sea level change
• Sequence stratigraphy
• Overview, description of sediments
• Eolian systems
• Glacial Systems
• Fluvial systems
• Estuaries and incised valleys
• Deltas & Clastic Shorelines
• Evaporites
• Clastic shelves
• Reefs and platforms
• Submarine fans and Turbidites

Module grade calculation
The grade of the module is the grade of the written exam

Annotation
We consider to have one field practical near Karlsruhe.

Workload
60 h attendance time and 90 h self-study time

Literature

• Ameen M.S. 2018. Operational Geomechanics EAGE
• Fossen, H. 2016. Structural Geology. Cambridge Univ Press
• Jackson, M.P.A., Hudec, M.R. 2017. Salt Tectonics, Cambridge Univ Press
• Reading, H.G. 2012. Sedimentary Environments. Blackwell
• James, N.P., Dalrympie, R.W. 2010. Facies Models 4. Geol. Ass. of Canada.
• Boggs, S. 2010. Petrology of sedimentary rocks. Cambridge Univ Press

M 8.26 Module: Geospatial Data Analysis I – Programming and Geostatistics [M-BGU-105505]

Responsible: Dr. Kathrin Menberg
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis
M-BGU-105634 - Geodata Analysis II – Big Data and Machine Learning

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-111066	Geospatial Data Analysis I – Programming and Geostatistics	5 CR	Menberg

Competence Certificate
Student research project: programming of a code for data analysis, written documentation (ca. 5 pages)

Prerequisites
Assignment of the profile Hydrogeology and Engineering Geology

Competence Goal
Students can use the Python programming language to apply methods for statistical analysis to different geospatial datasets, prepare the results graphically, and discuss and summarize them.

Content
The course is divided into a lecture (1 SWS) and an exercise (2 SWS). The lecture teaches theoretical basics of programming in Python (program structures, database structures, data ethics & licenses, etc.), as well as methods for geostatistical analysis (regression analysis, uncertainty analysis, etc.) of spatial datasets.

The exercise covers the practical aspects of programming, data analysis, visualization and interpretation.

Workload
45 h attendance time and 105 h self-study time

Recommendation
This module should be attended and completed before the module Geodata Analysis II that builds on it

Learning type
Lecture and exercise, student research project

Base for
Geodata Analysis II – Big Data and Machine Learning

M 8.27 Module: Geotechnical Engineering (bauiBFP7-GEOING) [M-BGU-103698]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
11	Grade to a tenth	Each summer term	2 terms	German	3	1

Mandatory			
T-BGU-107465	Geotechnical Engineering	11 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-107465 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students have a scientifically sound understanding of the building material 'soil' with respect to its appearance and mechanical behaviour. They are able to describe the latter on base of soil mechanical and soil hydraulic models, to classify and to analyse respective field and laboratory tests.Because of their knowledge in usual geotechnical construction methods they can self-dependently select, design and describe the construction process for standard applications, such as building foundations, construction pit linings and tunnels adapted to the respective ground and groundwater conditions. Further, they are able to proof self-dependently ultimate limit states and serviceability limit states of those geotechnical constructions and natural slopes and to evaluate the results critically.

Content
The module imparts theoretical principles of soil behavior and demonstrates their practical application in designing of the most common geotechnical constructions. This covers:

- standards, codes and safety concepts in foundation engineering
- subsoil investigation, soil classification, soil properties and soil parameters
- permeability, seepage and groundwater management
- stress distributions in the subsoil, compression behavior and consolidation
- shear resistance of soils, stability of slopes and foundations
- design and settlement calculation of shallow foundations
- earth pressure and earth resistance, design of retaining structures and retaining walls for excavations
- pile foundations, deep foundations and caisson foundations in open water
- methods for soil improvement
- introduction to tunneling

Module grade calculation
grade of the module is grade of the exam

Annotation
Tutorials are offered accompanying to the lectures, the participation is strongly recommended. Preparation and follow-up of the lectures can be done by ones-own in terms of working on a student research project.

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Basics in Soil Mechanics lecture, exercise, tutorial: 90 h
- Basics in Foundation Engineering lecture, exercise, tutorial: 90 h

independent study:

- preparation and follow-up lectures, exercises Basics in Soil Mechanics: 30 h
- preparation and follow-up lectures, exercises Basics in Foundation Engineering: 30 h
- examination preparation: 90 h

total: 330 h

Recommendation
The not graded accomplishment Geology in Civil Engineering [T-BGU-103395] shall be passed.

The attendance of the lecture accompanied tutorials (6200417, 6200517) is recommended. Likewise, the preparation of voluntary term papers is absolutely recommended as follow-up and preparation for the examination.

Literature
Gudehus, G (1981): Bodenmechanik, F. Enke

Grundwissen "Der Ingenieurbau" (1995) Bd. 2: Hydrotechnik – Geotechnik, Ernst u. Sohn

Lang, H-J, Huder, J, Amann, P, Puzrin A.M. (2011): Bodenmechanik und Grundbau, Springer Verlag

Kolymbas, D.: Geotechnik, Springer-Verlag 5. Auflage

Triantafyllidis, Th.: Übungsblätter Bodenmechanik und Übungsblätter Grundbau

M 8.28 Module: Geothermics I: Energy and Transport Processes [M-BGU-105741]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements
Prerequisite for: M-BGU-105743 - Geothermics III: Reservoir Engineering and Modeling

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-111466	Energy and Transport Processes	5 CR	Kohl, Schilling
T-BGU-111467	Geothermics in the Rhine Graben – Field Exercise	0 CR	Kohl

Competence Certificate
The assessment consists of a written exam (45 min) according to §4 (2) of the examination regulations and a non-assessed coursework (participation in field exercise and report) according to §4 (3) of the examination regulations.

Prerequisites
none

Competence Goal
- The students obtain knowledge in the field of geothermics and are able to integrate relevant physical processes into the subject field
- The students are able to apply methods for geothermal subsurface investigations and to make calculations with the obtained data

Content
- Heat budget of the Earth (influence of the sun, humans, stored heat, heat production)
- Heat transport in rocks (phonons, photons, elektrons, advective heat transport)
- Physical understanding of underlying mechanisms and processes
- Introduction into Geothermics, relations and boundaries to other related disciplines
- Energy conservation, thermal and petrophysical properties of rocks, temperature field of the Earth, influence of topography and climate on temperature distribution, Fourier law, stationary/instationary heat conduction, heat ransport in continental and oceanic crust, advection by flow (Darcy law), Kelvin problem, Gauss error function
- Introduction into methods and applications in geothermics: Bullard plot interpretation, measurement, Bottom Hole Temperature data
- Introduction into geophysical geodynamics

Module grade calculation
The grade of the module is the grade of the written exam

Annotation
The date for the excursion and the closing date for the field exercise report will be promptly announced.

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
45 hours regular attendance
105 hours field exercise, report and self study time

M 8.29 Module: Geothermics II: Application and Industrial Use [M-BGU-105742]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements
Prerequisite for: M-BGU-105743 - Geothermics III: Reservoir Engineering and Modeling

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-111468	Application and Industrial Use	4 CR	Kohl
T-BGU-111469	Geothermal Exploitation – Field Exercise	1 CR	Kohl

Competence Certificate
The assessment consists of a written exam (45min) according to §4 (2) of the examination regulations and a non-assessed coursework (participation in field trip and report), see §4 (3) of the examination regulations.

Prerequisites
none

Competence Goal
- The students develop shallow and deep geothermal projects with cost estimates
- The students are able to explicate examples and case studies in theory and practice

Content
- Introduction into geothermal utilization
- Hydrothermal and enhanced (or engineered) geothermal systems (EGS)
- Stimulation methods
- Geothermal Exploration
- Thermodynamics and power plant processes
- Shallow geothermics
- Examples

Module grade calculation
The grade of the module is the grade of the written exam.

Annotation
The date for the field exercise and the closing date for the field exercise report will be promptly announced.

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
30 hours regular attendance,

2 days field exercise (30 hours),

90 hours self studying time

M 8.30 Module: Geothermics III: Reservoir Engineering and Modeling [M-BGU-105743]

Responsible: Dr. Emmanuel Gaucher
Prof. Dr. Thomas Kohl

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	4	2

Mandatory			
T-BGU-111523	Reservoir Engineering and Modeling Exercises	5 CR	Gaucher, Kohl

Competence Certificate
The assessment consists of a written exam (90 minutes), where an oral presentation is beeing considered as part of the grade.

Prerequisites
See modeled conditions

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-105741 - Geothermics I: Energy and Transport Processes must have been passed.
2. The module M-BGU-105742 - Geothermics II: Application and Industrial Use must have been passed.

Competence Goal
- The students will be able to compare and to analyze geothermal systems.
- The students will be able to assess and discuss geothermal systems.
- The student will be able to acquire and to present in front of their peers specific knowledge of geothermal systems from the literature and to discuss.

Content
The content of this course contains basics, technologies, and exploration methods of geothermal systems.
- Introduction into geothermal reservoir engineering
- Reservoir geology of crystalline and sedimentary rocks
- Geothermal exploration
- Geothermometry of thermal water
- Scalings
- Induced seismicity
- Seismic monitoring
- Numerical reservoir modelling
- Well testing

Module grade calculation
The overall grade of the module is the grade of the written examination

Annotation
1. Often you will hear the Name "Geothermie III" for this module.

2. Starting from the winter term 2021/2022 this is the new name for the former module

- M-BGU-105136 - Geothermal Reservoir Engineering

and even for the older module

- M-BGU-102448, Topics of Geothermal Research

Workload
regular attendance: 4 SWS, 60 hours

self study 90 hours

M 8.31 Module: Ground Water and Earth Dams (bauiM5S04-GWDAMM) [M-BGU-100073]

Responsible: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100091	Ground Water and Earth Dams	6 CR	Bieberstein

Competence Certificate
- 'Teilleistung' T-BGU-100091 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can describe the deepened knowledge about different geotechnical groundwater problems. They can dimension dewatering under very different boundary conditions and demonstrate geohydraulic relationships by example calculations. They are able to develop own solution approaches for dam construction problems, to evaluate construction techniques and to conduct the requested geotechnical proofs.

Content
The module discusses the investigation of the groundwater conditions in laboratory and field. Geohydraulic fundamentals are extended with respect to anisotropy, saturation fronts, air permeability and groundwater drawdown under specific boundary conditions. The construction of flow nets is applied to seepage problems and the underseepage of dams. The hydrologic hydraulic and geotechnical design of dams is deepened. Hereby, the design of artificial sealings and filters is linked to the geo-mechanical proofs such as sliding, spread and uplift stability, deformation and earthquake design. Buried auxiliary structures, dams designed for overtopping as well as metrological monitoring of dams are mentioned, too.

Module grade calculation
grade of the module is grade of the exam

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Geotechnical Ground Water Problems lecture/exercise: 30 h
- Embankment Dams (Advanced) lecture/exercise: 30 h
- field trips: 10 h

independent study:

- preparation and follow-up lecture/exercises Geotechnical Ground Water Problems: 25 h
- preparation and follow-up lecture/exercises Embankment Dams (Advanced): 25 h
- examination preparation: 60 h

total: 180 h

Recommendation
module 'Earthworks and Foundation Engineering'

Literature
[1] Cedergren, H.R. (1989), Seepage, Drainage, and Flow Nets, 3. Aufl. Wiley
[2] Herdt, W. & Arndts, E. (1985), Theorie und Praxis der Grundwasserabsenkung, 2. Aufl. Ernst & S.

M 8.32 Module: Hydrogeology: Field and Laboratory Methods [M-BGU-102441]

Responsible: Dr. rer. nat. Nadine Göppert
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-104834	Hydrogeology: Field and Laboratory Methods	5 CR	Göppert

Competence Certificate
The assessment consists of an examination of another type (graded presentation in seminar).

Prerequisites
Students according to SPO 2016 are strongly recommended to attend the module M-BGU-102433 Hydrogeology: Methods and Applications.
Students according to SPO 2021 are strongly recommended to attend the module M-BGU-105793 Applied and Regional Hydrogeology.

Annotation
For organizational reasons, the number of participants must be limited to a maximum of 20. The registration takes place via ILIAS. Priority will be given to students from Applied Geosciences, Water Science and Engineering, then Geoecology and others. The allocation will be done considering the study progress. The practical portion of this course is done in presence. The field exercises are mandatory for the study progress of the participants.

Recommendation
Students according to SPO 2016 are strongly recommended to attend the module M-BGU-102433 Hydrogeology: Methods and Applications.
Students according to SPO 2021 are strongly recommended to attend the module M-BGU-105793 Applied and Regional Hydrogeology.

M 8.33 Module: Hydrogeology: Groundwater Modelling [M-BGU-102439]

Responsible: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-104757	Hydrogeology: Groundwater Modelling	5 CR	Liesch

Competence Certificate
The assessment consists of an examination of another type (working on a problem, submission ca. mid-February and a ca. 15min poster-presentation).

Prerequisites
none

M 8.34 Module: Hydrogeology: Hydraulics and Isotopes [M-BGU-105726]

Responsible: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German	5	1

Mandatory			
T-BGU-111402	Hydrogeology: Hydraulics and Isotopes	5 CR	Liesch

Competence Certificate
Written exam (90 min)

Competence Goal
The students are able to independently apply methods for the evaluation of hydraulic experiments and discuss their results. They can explain and apply relevant isotope methods in hydrogeology.

Content
- Advanced pump test evaluation
- Slug test, water pressure test
- Isotope methods in theory and practice

Annotation
The choice of the module "Hydrogeology: Hydraulics and Isotopes" as well as the active participation in it is a prerequisite for the choice/occupation of the modules Hydrogeology: Groundwater Modelling [M-BGU-102439] and Hydrogeology: Field and Laboratory Methods [M-BGU-102441], as it forms the theoretical and practical basis for them.

Workload
150 h, of which 38 h attendance time and 112 h self-study time

Learning type
Lectures with Exercises

M 8.35 Module: Industrial Minerals and Environment [M-BGU-103993]

Responsible: Prof. Dr. Jochen Kolb
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 5/31/2022)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-108191	Industrial Minerals and Environment	5 CR	Kolb

Competence Certificate
The assessment consists of an examination of another type (graded module report incl. field seminar report)

Prerequisites
none

Competence Goal
The students know the fundamental characteristics of industrial mineral deposits. They know the different possibilities of industrial application and quality requirements of the respective raw material. They are able to describe samples from industrial mineral deposits, recognize the relevant structure, fabric, texture and mineral assemblage. They can use their observations to make interpretations regarding mineral deposit formation and ore deposit quality. The students know the principle ore deposit models and can use this knowledge in order to interpret their sample set. They are able to decide, which mineral exploration method would be required for exploration of the various deposits and they are able to make basic assumptions about the economy of the deposit. They know how to translate geological observations into key parameters for mineral exploration.

The students know how to analyze short scientific papers and are able to understand and present the main message. They can relate the message in the paper to own observations in the samples and present a joint interpretation.

The students know how to apply their theoretical knowledge in the field. They make interpretations at various scales (thin section, sample, outcrop, deposit, district). They know, how to make meaningful sketches and how to present their observations and interpretation in written and oral formats. They are able to analyze, interpret and discuss their data in conjunction with published ore deposit models and can decide on the style of mineralization and the way of mineral exploration.

The students know different environmental risks related to the extraction of metal ores, industrial minerals and energy resources and assign them to the respective stage (exploration, extraction, processing etc.). They are able to derive the potential environmental hazards of individual types of resources and propose suitable reclamation measures based on a sound knowledge of their geochemical and mineralogical characteristics. They can assess the positive and negative effects of extraction, processing and use of different resources on humans and the environment in a differentiated manner and are thus able to critically evaluate their own behaviour in the context of sustainable use of resources.

Content
The combined lectures and practicals start with an introduction into the industrial minerals raw material market and mineral deposit evaluation. The following lessons combine a lecture about the fundamental processes of deposit formation and the relationship to mineral exploration and quality of the industrial mineral resource with practical study of representative samples. In addition, scientific papers will be read and interpreted in some lessons.

During two days of field work the theoretical and practical skills will be applied in the field in selected industrial mineral deposits. Standard methods of geological field work will be applied and directed towards interpretation of the respective deposit.

It will be looked at different environmental impacts of ore extraction and processing like acid mine drainage, cyanide leaching, amalgamation or oil spillage with specific focus on the hydrosphere, pedosphere, atmosphere, human beings and society. Furthermore, different strategies on how to minimize environmental impacts will be discussed and different examples on renaturation and reclamation will be presented. Also legal aspects of mineral resources exploration and extraction will be addressed.

Module grade calculation
The grade of the module is the grade of the module report incl. field seminar report

Annotation
Students should be aware of harsh conditions during field work and should let the responsible person know, if they would have problems to work underground in old mines.

Depending on the auditorium, the course "Environmental Aspects of Mining" is held in German or English

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
67.5 hours lectures and practicals and 82.5 self-study time

Learning type
lecture, exercises, field seminar

Literature
Kesler, S.E. & Simon, A.C. (2015): Mineral Resources, Economics and the Environment. Cambrigde University Press, Cambridge, 434 pp.

Harben, P. (most recent edition): The Industrial Minerals HandyBook, a guide to markets, specifications and prices. Industrial Minerals Division, Metal Bulletin PLC, London.

Bewertungskriterien für Industrieminerale, Steine und Erden. Geologisches Jahrbuch Reihe H. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart. Different publications of various authors; in German with English abstract.

Publications of the Geological Surveys: BGR, DERA, BGS, USGS, etc.

Brown, M., Barley, B., Wood, H. 2002. Mine Water Treatment: technology, application and policy. IWA publishing

Lottermoser, B.G. 2003. Mine wastes. Springer Verlag

M 8.36 Module: Internship [M-BGU-103996]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Internship or Project Study) Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Irregular	1 term	German/English	4	2

Mandatory			
T-BGU-108210	Internship	5 CR	

Competence Certificate
The assessment consists of

- submission of an internship certificate from the employer with information about the internship, duration and the field of activity

- an examination of another type (graded internship report ca. 10-20 pages, equivalent to the report of the project study, and ca. 20 min presentation).

Prerequisites
The student is responsible for the acquisition and organization of the internship.
The following requirements apply to recognition:

- Before starting the internship, the student has to choose independently a lecturer from the AGW (in in case of doubt, the chairman of the examination board), who

1. confirms the geoscientific relevance based on the submission of a working plan (content, timeframe) which was planned with the company / institution and is responible for the grading of the final report.
2. The submission of an internship certificate from the internship office stating the completed internship, duration and field of activity is mandatory.

Competence Goal
• Students are able to use the skills they have acquired during their studies under realistic conditions.
• You are capable of applying and further developing technical and interdisciplinary skills such as project management in a professional environment.

Content
• Varies depending on the internship position.
• It should essentially be independent work.

Module grade calculation
The grading is done by the lecturer who approved the internship.

Annotation
The premises for the recognition of a professional internship are explained in the requirements.
The professional internship that requires approval can be chosen as one of 2 modules (project study or professional internship).

Workload
At least 4 weeks of full-time internship and preparation of an internship report.

M 8.37 Module: Introduction to Ceramics [M-BGU-105222]

Responsible: Prof. Dr. Michael Hoffmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-MACH-100287	Introduction to Ceramics	6 CR	Hoffmann

Competence Certificate
The assessment consists of an oral exam (30 min) taking place at a specific date.

The re-examination is offered at a specific date.

Workload
180 h

M 8.38 Module: Isotope Geochemistry and Geochronology [M-BGU-106025]

Responsible: Dr. Aratz Beranoaguirre
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 10/1/2022)
Specific Supplements (Usage from 10/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-112211	Isotope Geochemistry and Geochronology	5 CR	Beranoaguirre

Competence Certificate
The assessment consists of a written exam (multiple choice, ~45min, ~30 questions).

Prerequisites
none

Competence Goal
At the end of the course the student will be able to I) collect and prepare samples independently; II) identify the appropriate isotopic system to use depending on the case of study; and III) evaluate and interpret the data.

Content
The course will provide the student with the knowledge of stable and radiogenic isotopes, which are powerful tools to track natural processes within the different Earth reservoirs. Likewise, the course also aims to allow the student to understand (and apply some of) the most used techniques for the geochronology of rock and minerals. Additionally, good lab practices will also be adquired.

Module grade calculation
The grade of the module is the grade of the written exam.

Annotation
This module will start in the summer term of 2023, the courses will be added to the course catalog by then.

Workload
150 h: 60 hours of presence time (lecture, field and laboratory work), 90 hours of personal work (sample preparation, analysis, evaluation)

M 8.39 Module: Karst Hydrogeology [M-BGU-105790]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	2 terms	German	4	2

Mandatory			
T-BGU-111592	Karst Hydrogeology	3 CR	Goldscheider
T-BGU-110413	Field Trip Karst Hydrogeology	2 CR	Goldscheider

Competence Certificate
The assessment consists of a written exam (60 min) and a non-assessed coursework (non-assessed field exercise report).

Prerequisites
none

Competence Goal

- The students are able to understand and explain the hydrogeological characteristics of karst aquifer systems and recognize them in the field.
- They are familiar with the relevant investigation methods in karst hydrogeology for scientific research and professional practice.
- They can evaluate the vulnerability of karst groundwater resources and develop concepts for their sustainable management.

Content

- Geomorphology and hydrology of karst landscapes
- Mineralogy, stratigraphy and geologic structure of karst systems
- The carbonate equilibrium, calcite dissolution, karstification and speleogenesis
- Groundwater flow in karst aquifers
- Modeling approaches in karst hydrogeology
- Vulnerability and contaminant transport in karst
- Springs, wells and other drinking water abstraction structures in karst aquifers
- Field exercises in karst hydrogeology: Impact of climate change on karst groundwater resources, drinking water abstraction in karst areas

Annotation
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

M 8.40 Module: Mineral Exploration [M-BGU-105357]

Responsible: Dr. Clifford Patten
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	English	5	1

Mandatory			
T-BGU-110833	Mineral Exploration	5 CR	Patten

Competence Certificate
The students will need to provide a report (~10 pages) on the specific project they have been assigned to. They need to show that they know the right methods of exploration. Deadline for the report is individually scheduled. The first version of the report has to be improved if necessary.

Prerequisites
Students need detailed knowledge on ore forming processes of metallic and non-metallic mineral resources. They also need detailed background in geochemistry and geochemical analytics. Basic knowledge of geophysical exploration methods will be expected.

Competence Goal
The students know the different geochemical methods applied to mineral resources exploration. They can choose the best-suited methods at the different stages of exploration for optimizing ore deposits discovery. They also know which exploration methods to use for specific ore deposit types.
The students know how to interpret geochemical data and how to correlate them with field and sample observations. They know how to write an exploration report.
The students will have the qualifications required for working in the ore mineral industry.

Content
-Theory for mineral exploration at regional, district, area, target and deposit scale (scientific approach, economics…).
-Geochemical distribution of metals and element of interests in the primary environment (i.e. during magmatism, metamorphism and alteration processes…).
-Geochemical dispersion of metals and element of interests in the secondary environment (i.e. soil, gossans, till, laterites…).
-Greenfield methods for exploration such as stream sediments, soil, rock and water survey.
-Brownfield methods for exploration at deposit scale with specific focus on drill core logging.
-Field sampling and laboratory data acquisition.
-Data interpretation from study cases and from data personally acquired by the stu-dents.

Module grade calculation
Grade of the report is the module grade.

Annotation
The course is held in 3 blocks (1. Block short course, 2. Block short course and project preparation, 3. Block data interpretation). See university calendar / course catalogue.

In the summer term 2022 the course Mineral Exploration 6321410 will take place from September 26th to September 30th.

Workload
40h Lectures, 2-3 field work or sample selection (ca. 25h), ca. 25h laboratory work, 60h self-study (report) = 150 h

Recommendation
The students should have done the course of “Ore Geology of Metals” and “Industrial Minerals and Environment” or have background knowledge in ore geology.

Learning type
Lecture, literature research, fieldwork and labwork, report

Literature
Papers presented in lectures

M 8.41 Module: Mineral Materials [M-BGU-102453]

Responsible: Dr. Matthias Schwotzer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each term	2 terms	German	4	1

Mandatory			
T-BGU-104856	Mineral Materials	5 CR	Schwotzer

Competence Certificate
The assessment consists of an oral exam (30 min).

Prerequisites
None

Annotation
The practical part of this course is carried out in presence. The laboratory courses are essential for the progress of the participants.

M 8.42 Module: Mineralogical Analytics [M-BGU-105765]

Responsible: apl. Prof. Dr. Kirsten Drüppel
Prof. Dr. Frank Schilling

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (mandatory)
Specific Supplements

Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-111524	Mineralogical Analytics	5 CR	Drüppel, Schilling

Competence Certificate
The assessment consists of an examination of another type, including colloquia and short reports for the laboratory exercises and a written examination.

Prerequisites
none

Module grade calculation
The grade of the “examination of another type” is the module grade.

Annotation
The course is carried out face-to-face

Recommendation
none

Learning type
Lectures (1/3) and exercises (2/3)

M 8.43 Module: Module Master's Thesis [M-BGU-105845]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	Grade to a tenth	Each term	1 term	German	4	1

Mandatory			
T-BGU-111758	Master's Thesis	30 CR	Blum

Competence Certificate
The assessment consists of the Master's Thesis and a presentation. The maximum processing time for the Master's Thesis is six months. The presentation should take place within 8 weeks after the submission of the Master's Thesis.

Prerequisites
The prerequisite for admission to the master's thesis module is that the student has successfully passed module examinations for 70 CP, of which at least 10 CP are from the compulsory modules of the choosen profile in the subject “Geoscientific Specialization”.

Modeled Conditions
The following conditions have to be fulfilled:

1. You have to fulfill one of 3 conditions:
    1. You have to fulfill 2 of 5 conditions:
        1. The module M-BGU-105505 - Geospatial Data Analysis I – Programming and Geostatistics must have been passed.
        2. The module M-BGU-105731 - Engineering Geology: Laboratory and Field Methods must have been passed.
        3. The module M-BGU-105793 - Applied and Regional Hydrogeology must have been passed.
        4. The module M-BGU-102438 - Project Study must have been passed.
        5. The module M-BGU-103996 - Internship must have been passed.
    2. You have to fulfill 2 of 4 conditions:
        1. The module M-BGU-103995 - Geochemical Processes and Analytical Methods must have been passed.
        2. The module M-BGU-102430 - Applied Mineralogy: Geomaterials must have been passed.
        3. The module M-BGU-105747 - Geochemical and Petrological Modeling must have been passed.
        4. The module M-BGU-105765 - Mineralogical Analytics must have been passed.
    3. You have to fulfill 2 of 4 conditions:
        1. The module M-BGU-105739 - Numerical Methods in Geosciences must have been passed.
        2. The module M-BGU-105744 - Geology must have been passed.
        3. The module M-BGU-105745 - Borehole Technology must have been passed.
        4. The module M-BGU-105736 - Advanced Geological Mapping must have been passed.
2. You need to have earned at least 70 credits in your course of studies.

M 8.44 Module: Numerical Methods in Geosciences [M-BGU-105739]

Responsible: Dr. Emmanuel Gaucher
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-111456	Numerical Methods in Geosciences	5 CR	Gaucher

Competence Certificate
The assessment consists of a written exam (90 min) according to §4 (2) of the examination regulations.

Prerequisites
none

Competence Goal
- The students are able to apply basic statistical analysis of geoscientific data
- The students are able to code simple programs in Matlab to process and plot data
- The students know the numerical methods used to solve partial differential equations
- The students have performed the pre-processing, processing and post-processing steps of a numerical simulation

Content
- Basic of algorithmic and programming
- Introduction to Matlab programming language and basic coding to apply knowledge
- Statistical analysis of geoscientific data
- Physical mechanisms and processes in geosciences
- Numerical methods to solve complex coupled processes (finite differences, finite elements, coupling)
- Numerical simulation (pre-processing, processing and post-processing) of several case studies
- Borehole simulation of pressure & temperature fields after Thiem (extension of Theis)
- Reservoir simulation

Module grade calculation
The module grade is the grade of the written exam.

Annotation
Homework required

The practical part of this course is carried out in presence. The exercises are partly conducted in the computing lab and are essential for the progress of the participants.

Workload
regular attendance 60 hours

self study time 90 hours

Recommendation
Own laptop/PC

M 8.45 Module: Ore Geology of Metals [M-BGU-103994]

Responsible: Prof. Dr. Jochen Kolb
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 5/31/2022)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	5	1

Mandatory			
T-BGU-109345	Ore Geology of Metals	5 CR	Kolb

Competence Certificate
The assessment consists of an oral exam (30 min). A report on the field seminar has to be handed in before the oral exam..

Prerequisites
none

Competence Goal
The students know the fundamental approach of describing samples from ore deposits (hand specimen, drill core) and thin and polished sections. They can analyze the samples and relate them to the specific ore deposit type. They know the specific textures and are able to discuss them in order to develop a model for the mineralization or hydrothermal alteration processes.

The students know the principle ore deposit models and can use this knowledge in order to interpret their sample set that comes from different parts or zones of an ore deposit. They understand the different scales that are involved in ore deposit formation and are able to use their observations to interpret and discuss the scale-dependent processes involved in mineralization.

The students know the principle methods of mineral exploration and are able to translate geological observations into key parameters for mineral exploration.

The students know how to analyze short scientific papers and are able to understand and present the main message. They can relate the message in the paper to own observations and present a joint interpretation.

The students know how to apply their theoretical knowledge in the field. They make interpretations at various scales (thin section, sample, outcrop, deposit, district). They know, how to make meaningful sketches and how to present their observations and interpretation in written and oral formats. They are able to analyze, interpret and discuss their data in conjunction with published ore deposit models and can decide on the style of mineralization and the way of mineral exploration.

Content

- Detailed processes of ore deposit formation, including modern research advances.
- Ore petrology on sample, drill core, thin section and polished section.
- Reading and interpretation of short papers on ore deposit geology.
- Orthomagmatic Ni-PGE-Cu-Au deposits.
- Podiform Chromite deposits.
- Magmatic REE-Nb-Ta deposits.
- Copper Porphyry deposits.
- Epithermal Au-Ag deposits.
- Skarn deposits.
- VMS-SEDEX deposits.
- Orogenic Gold deposits.
- Iron Oxide Copper Gold deposits.
- MVT-SSC deposits.
- Fundamentals of recognizing and describing mineralization in the field.

Module grade calculation
The module grade is the grade of the oral exam, including the report on the field seminar.

Annotation
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
67.5 hours lectures and practicals and 82.5 self-study time

Recommendation
Students should have a basic level of understanding of ore-forming processes from a previous Economic Geology course.

Learning type
Lecture / Practicals / Field Seminar

(VÜ)

Literature
Books:

Robb, L., 2005: Introduction to Ore-Forming Processes. Blackwell Publishing, Oxford, 373 pp.
Ridley, J., 2013: Ore Deposit Geology. Cambridge University Press, Cambridge, 398 pp.
Guilbert, J.M. & Park, C.F., 2007: The Geology of Ore Deposits. Waveland Press, 985 pp.
Pirajno, F., 2009: Hydrothermal Processes and Mineral Systems. Springer, Heidelberg, 1250 pp.

M 8.46 Module: Petrology [M-BGU-102452]

Responsible: apl. Prof. Dr. Kirsten Drüppel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-104854	Petrology	5 CR	Drüppel

Competence Certificate
The assessment consists of an examination of another type (graded homework).

Prerequisites
none

Annotation
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

M 8.47 Module: Petrophysics [M-BGU-105784]

Responsible: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German/English	5	1

Mandatory			
T-BGU-104838	Mineral and Rock Physics	5 CR	Schilling

Competence Certificate
The assessment consists of an Examination of another type (partly based on the protocols of the exercises).

Prerequisites
none

Module grade calculation
The module grade is the grade of the examination of another type

Annotation
Depending on the auditorium, this module is held in German or English

The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Workload
70 hours attendance time and 80 hours self-studying time

Literature
will be communicated in the lecture

M 8.48 Module: Physical Chemistry for Applied Geosciences [M-CHEMBIO-104581]

Responsible: wechselnde Dozenten, siehe Vorlesungsverzeichnis
apl. Prof. Dr. Andreas-Neil Unterreiner

Organisation: KIT Department of Chemistry and Biosciences

Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
15	Grade to a tenth	Each term	2 terms	German	4	2

Mandatory			
T-CHEMBIO-103385	Physical Chemistry	9 CR	
T-CHEMBIO-109395	Laboratory Work in Physical Chemistry	6 CR	

Prerequisites
None

M 8.49 Module: Project Study [M-BGU-102438]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Internship or Project Study) Specific Supplements
Prerequisite for: M-BGU-105845 - Module Master's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Irregular	1 term	German/English	4	3

Mandatory			
T-BGU-104826	Project Study	5 CR	Blum

Competence Certificate
The assessment consists of an examination of another type (Project Study: graded report and presentation).

Prerequisites
none

Competence Goal
- The students are familiar with the basics of project management.
- You can plan time and resources for a given problem in applied geosciences.
- You work on the given problem according to your own plans.
- You work out the results in the form of a written project report.
- You present the most important results in a presentation.

Content
Project study: Working on a problem. This can be designed differently depending on the department.

Module grade calculation
The module grade corresponds to the grade of the project study.

Annotation
The project study takes the form of an independent piece of work in the course of the 2nd and 3rd semester. Topics will be published on time on the institute's website.

Workload
Project study: 150 hours of self-study (project planning, project processing, preparation of the report, preparation of the presentation)

M 8.50 Module: Raw Materials and Environment [M-BGU-105963]

Responsible: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 10/1/2022)
Specific Supplements (Usage from 10/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	2 terms	German/English	4	1

Mandatory			
T-BGU-112118	Raw Materials and Environment	5 CR	Eiche

Competence Certificate
Oral exam (20-30 min) + report on characterization of mine waste deposit.

Prerequisites
none

Competence Goal
The students are able to name the different phases (exploration, mining, processing, etc.) of raw material extraction. They can assign environmental influences to the respective phases and describe them. In this context, they can present possible methods and strategies for minimizing and remediating the environmental impact and compare the individual options. With this knowledge, they are able to point out the advantages and disadvantages of the individual procedures and strategies and, based on this, to derive and justify selection criteria. The same applies to the selection and design of rehabilitation options, which the students can present and weigh against each other. For all phases of raw material extraction, there are legal bases at German and European level, which the students can name and whose relevance they can recognize.
The extraction of raw materials, especially in developing and emerging countries, is always caught between environmental pollution and social and economic benefits. Also, consumers are faced with the ethical question of how they themselves can contribute to minimizing the environmental and social impact of mining. The students are able to classify, discuss and evaluate various viewpoints and alternatives in this context.
The students can independently create a sampling concept to characterize a selected mining site. They can realize this concept independently in the field. They are able to prepare and analyze the samples with high quality. Furthermore, they are able to use the data to develop a risk assessment for the contaminated site with respect to environment and health and to propose suitable remediation concepts.

Content
- Effects of raw material extraction and processing on the hydrosphere, pedosphere, atmosphere as well as humans and society
- Historical mining and its effects
- Exemplary development of strategies for minimizing environmental impacts through raw material extraction and concepts for rehabilitation
- Effects of salt, lignite and uranium mining in Germany as well as measures to secure, remediate and restore
- Social and ethical aspects of raw material extraction
- Legal aspects of raw material extraction
- Geochemical characterization of contaminated sites including sampling, analysis and evaluation (field and laboratory work, changing locations)

Module grade calculation
The module grade is the grade of the oral exam which also covers the report.

Annotation
The course is carried out face-to-face.

Workload
150 h

Learning type
Lectures and Practise

Literature

• slides from lecture (webpage)
• Brown, M., Barley, B. & Wood, H. (2002). Mine Water Treatment: technology, application and policy. IWA publishing.
• Lottermoser, B.G. (2003). Mine wastes. Springer. Berlin
• Kausch, P., Ruhrmann, G. (2001). Environmental Management, Environmental Impact Assessment of Mines. Loga Vertragsbuchhandlung Köln
• Craig, J., Vaughan, D.J., Skinner, B.J. (2010). Earth Resources and the Environment. 4. Auflage. Prentice Hall Verlag.

M 8.51 Module: Reserve Modeling [M-BGU-105759]

Responsible: Dr. Benjamin Walter
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-111499	Reserve Modeling	5 CR	Walter

Competence Certificate
The assessment consists of an oral examination.

Competence Goal
The students know the fundamental principles of resource and reserve estimation in mining. They learn the rules and the basic approach of calculating resources and reserves. They will be introduced into the relevant topics for pre-feasibility and feasibility studies. They know how to write the respective reports and how to collect the relevant data. They can use their knowledge to evaluate the quality of pre-feasibility and feasibility studies. Based on this, students are able to do a basic economic risk evaluation on various exploration and mining projects. They will be taught by skilled persons from industry in block courses.

Content
The students will be taught the basic principles of resource and reserve estimation. They will learn to do this using at least one software package. They will be introduced to the contents of pre-feasibility and feasibility studies. The different international standards of resource estimation (JORC, National Instrument 43-101, etc.) will be presented. Standard methods of economic risk assessment will be tested with examples. The program will be completed in two targeted block courses with invovlment of skilled persons from industry.

Module grade calculation
The module grade is the grade of the the graded module report and presentation

Workload
6320101 Reserve Modeling - Feasibility Study of Mining Projects: 2 days, 35 h self study time

6320104 Economic and Risk Evaluation: 3 days, 65 h self study time

M 8.52 Module: Reservoir Geology [M-BGU-103742]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements
Prerequisite for: M-BGU-103734 - Diagenesis and Cores

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	English	5	1

Mandatory			
T-BGU-107563	Reservoir Geology	5 CR	Hilgers

Competence Certificate
The assessment is a marked written exam over 120 minutes, the participitation in the Field Seminar Reservoir-Geology and the submission of field book.

Prerequisites
Entrance to the module examination requires the submission of homework (100%) within the given deadline, of which 80% are passed.

Competence Goal
After this module, students are enabled to interpret fluid storage and migration in porous and fractured rock in 3D sedimentary bodies and caverns relevant for geothermal energy, renewable energy storage, transitional gas and others. It covers aspects from structural evolution to facies- and porosity-permeability development. Students are enabled to map and characterize sedimentary rocks properties in the field including structural- and petrophysical aspects. They work in teams and critically evaluate own data compared to published literature.

Content
Reservoir conditions from geological maps; methods: petrography, isotopy, microthermometry and cathodoluminescence; burial history and maturation; pore pressures, compaction and water saturation; diagenesis; well correlations; migration and traps; fault seal and top seal; reservoir characterization; reservoir quality prediction; plays and risks. Practical application of reservoir geology in a given field study area with special focus on structure, 3D geometries in sedimentary rocks and diagenesis.

Module grade calculation
The grade of the module is the grade of the written exam.

Annotation
Course Reservoir-Geology: We consider to visit a reservoir in production near Karlsruhe during the lecture.

Field Seminar Reservoir-Geology: The course will be conducted during the semester break, participitation is compulsary. For participants of field seminar Reservoir-Geology: Please mind the visa regulations e.g. if the trip is scheduled to SW-England.

Workload
5 CP =150 h

contact time: 90h (incl. Field seminar)

self-study time: 60h

Recommendation
The student shall have a basic knowledge of sedimentology and structural geology, such as presented in the module Geologie (Geology), MSc 1st semester

Learning type
lectures, exercises and field seminar

Literature
• Bjorlykke, K. 2015. Petroleum Geoscience. From sedimentary environments to rock physics. Springer

• Emery, D. & Robinson, A. 1993. Inorganic geochemistry geosciencece.

Base for
This course is required to enroll to the module Diagenesis and Cores M-BGU-103734

M 8.53 Module: Rock Mechanics and Tunneling (bauiM5P3-FMTUB) [M-BGU-100069]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100069	Rock Mechanics and Tunneling	5 CR	Stutz
T-BGU-100179	Student Research Project 'Rock Mechanics and Tunneling'	1 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-100179 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100069 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

Prerequisites
none

Competence Goal
The students understand the essential strength and deformation properties of rock and master the basic analytical methods to solve boundary value problems of surface and underground rock excavation. They can select basic construction methods and constructions in underground tunnel construction and apply self-reliantly the methods of rock mechanics and static calculation and safety assessments. With regard to the assessment of variants, costs, construction operation and safety aspects they gained geotechnical competence in solving problems for all kind of constructions in and with solid rocks.

Content
see German version

Module grade calculation
grade of the module is grade of the exam

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Basics in Rock Mechanics lecture/exercise: 30 h
- Basics in Tunnel Construction lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Basics in Rock Mechanics: 20 h
- preparation and follow-up lecture/exercises Basics in Tunnel Construction: 20 h
- preparation of student research project: 20 h
- examination preparation: 60 h

total: 180 h

Recommendation
basic knowledge of Soil Mechanics and Foundation Engineering (respective topics of the bachelor study progam 'Civil Engineering' are required);

basic knowledge of Engineering Geology;

Literature

[1] Brady, B. H. G. and Brown, E. T., (2004): Rock Mechanics for Underground Mining, 3rd. Edition, Kluwer Academic Publishers.
[2] Kolymbas, D. (1998), Geotechnik - Tunnelbau und Tunnelmechanik, Springer.
[3] Goodmann, R.E., (1989): Introduction to Rock Mechanics, John Wiley & Sons.
[4] Hoek, E., 2007: Practical Rock Engineering, kostenloser Download unter: http://www.rocscience.com/hoek/PracticalRockEngineering.asp.
[5] Jäger, J.C., Cook, N.G.W. and Zimmerman, R.W., 2007: Fundamentals of Rock Mechanics, Blackwell Publishing.
[6] Wittke, W., 1982: Felsmechanik, Springer-Verlag.
[7] Maidl, B. 1997: Tunnelbau im Sprengvortrieb
[8] Müller, L. 1978: Der Felsbau, Bd. 3 Tunnelbau
[9] Wittke, W.: Rock Mechanics Based on an Anisotropic Jointed Rock Model (AJRM), Ernst & Sohn, 2014

M 8.54 Module: Sedimentary Petrology [M-BGU-103733]

Responsible: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German/English	5	1

Mandatory			
T-BGU-107558	Sedimentary Petrology	5 CR	Zeh

Competence Certificate
The assessment consists of a written exam (90 min).

Prerequisites
none

Module grade calculation
grade of the module is grade of the exam

Annotation
Depending on the auditorium, this module is held in German or English

Workload
contact hours: 60h (lecture and exercises)

self study time: 90h incl. exam

M 8.55 Module: Seismic Interpretation [M-BGU-105777]

Responsible: TT-Prof. Dr. Nevena Tomašević
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	English	5	2

Mandatory			
T-BGU-111720	Seismic & Sequence Stratigraphy	2 CR	Tomašević
T-BGU-111952	Introduction to Reflection Seismics	3 CR	Bohlen

Competence Certificate
The assessment consists of a graded written mid-term exam (60-90min) on the brick Introduction to Reflection Seismics, and an end-term ungraded coursework (completed course exercises on the lecture Seismic & Sequence Stratigraphy).
A successful participation requires at least 50% of the total number of points available.

Prerequisites
Requirements for participation in the graded exam: submission of all exercises on time, 80% of them correct.

Competence Goal
The course aims at providing students with the tools and methods required to (1) define architectural elements of the sedimentary basin fill and (2) to be able to predict location and quality of the targeted sedimentary body (e.g., reservoir, source rock, seal).

At the end of the course, students will: (1) understand the fundamental concepts of seismic wave propagation, seismic data acquisition, and seismic data processing/imaging including method limitations and pitfalls; (2) be trained in interpretation of seismic lines; (3) understand fundamental concepts of seismic and sequence stratigraphy, and (4) be able to define system tracts and sequences using the seismic and well log data.

Content
Part 1: Introduction to Reflection Seismics

(50%; Lecturers Thomas Bohlen & Thomas Hertweck): Lecture is followed by practical exercises.

In this part of the course students learn about the reflection seismic method, that means the general approach of generating and using seismic waves in applied geophysics to create an image of the subsurface. In order to achieve this, the course covers on the one hand basic theoretical concepts in physics that are required to understand seismic wave propagation or signal processing. On the other hand, the course deals with many practical aspects such as concepts of marine and land data acquisition, typical sources and receivers used in the field, the most important seismic data processing steps and ways to create a high-quality image of the subsurface.

Part 2: Seismic & Sequence Stratigraphy

(50%; Lecturer Klaus Fischer, Nevena Tomašević): Lecture is followed by practical exercises.

This part of the course provides a link between seismic interpretation and high-resolution sequence analysis. The subject is tackled from a practical point of view with hands-on experience in the form of exercises. Both methods combine different scales of observation. The seismic interpretation is done basin wide, while individual outcrops have been the traditional starting point for high-resolution sequence stratigraphy. There is a considerable overlap of the methods because seismic stratigraphy corresponds more or less to low-resolution sequence stratigraphy. The merger between both methods provides the geoscientist both with concepts and a powerful prediction tool for the amount of geological change between and beyond subsurface calibration points.

Module grade calculation
The grade of the module is the grade of the graded written mid-term exam.

To pass the module, also the ungraded coursework has to be passed.

Annotation
The language of instruction is English. This is a second semester module. The students are expected to have attended the module Geology (old number M-BGU-102431, new number M-BGU-105744), which is offered in the winter term.
The lecture will be accompanied by exercises that help students to understand the various aspects of dealing with seismic data. The practical part of this course is carried out in presence.

Workload
Regular attendance: 60 hours

Self studing time: 90 hours

Literature
· O. Yilmaz, “Seismic Data Analysis”, 2001: Society of Exploration Geophysicists.

· R. E. Sheriff and L. P. Geldart, “Exploration Seismology”, 1995: Cambridge University Press.

· Catuneanu, O. (2006): Principles of Sequence Stratigraphy, Elsevier, Amsterdam, The

Netherlands.

· Vail, P. A. et. al. (1993): Sequence Stratigraphy – A Global Theory for Local Success;

Oilfield Review, 1/93, p. 51-62; Elsevier, Amsterdam, NL.

· Van Wagoner, J. C. et. al. (1990): Siliciclastic Sequence Stratigraphy in Wells, Cores, and Outcrops: Concepts for High-Resolution Correlation of Time and Facies; AAPG Methods in Exploration Series 7; Tulsa, Okl., USA.

M 8.56 Module: Shallow Geothermal Energy [M-BGU-105730]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	English	5	1

Mandatory			
T-BGU-111447	Shallow Geothermal Energy	5 CR	Blum

Competence Certificate
Oral exam (15 min)

Prerequisites
none

Competence Goal
The students will have the qualifications required for working in an environmental and energy consultancy, dealing with shallow geothermal energy. Furthermore, recent case studies will be presented (e.g. visiting a drill site of a ground source heat pump system).

Content
The basic course deals with the theory and application of shallow geothermal energy (2 SWS in winter term).

The basic course will be complemented by laboratory and field exercises for the determination of groundwater temperatures and thermal heat conductivities. In addition, heat transport modelling and energy planning will be performed. (1 SWS in winter term)

Module grade calculation
The grade of the module is the grade of the oral exam

Annotation
none

Workload
45h attendance time, 105h self-study time

Recommendation
The students should also take the course M-BGU-102439 “Hydrogeology: Groundwater Modelling”.

Learning type
Lecture, exercise and self-study

Literature
Stauffer et al. (2014) Thermal Use of Shallow Groundwater

Base for
none

M 8.57 Module: Structural and Phase Analysis [M-BGU-105236]

Responsible: Dr.-Ing. Susanne Wagner
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
4	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-MACH-102170	Structural and Phase Analysis	4 CR	Hinterstein, Wagner

Competence Certificate
The assessment consists of an oral exam (20-30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation).

The re-examination is offered upon agreement.

Competence Goal
The students know the fundamentals of crystallography, the generation and detection of x-rays as well as their interaction with the microstructure of crystalline materials. They have detailed knowledge about the different methods of x-ray diffraction measurements and are able to analyse x-ray spectra using modern methods of x-ray analysis both qualitatively and quantitatively.

Content
The course gives an overview to generation and detection of x-rays as well as their interaction with matter. It provides an introduction to crystallography and describes modern measurement and analysis methods of x-ray diffraction.

It is arranged in the following units:

- Generation and properties of X-Ray's
- Crystallography
- Fundamentals and application of different measuring methods
- Qualitative and quantitative phase analysis
- Texture analysis (pole figures)
- Residual stress measurements

Module grade calculation
The grade of the module is the grade of of the oral examination.

Workload
regular attendance: 30 hours
self-study: 90 hours

Literature
Moderne Röntgenbeugung - Röntgendiffraktometrie für Materialwissenschaftler, Physiker und Chemiker, Spieß, Lothar / Schwarzer, Robert / Behnken, Herfried / Teichert, Gerd B.G. Teubner Verlag 2005
H. Krischner: Einführung in die Röntgenfeinstrukturanalyse. Vieweg 1990.
B.D. Cullity and S.R. Stock: Elements of X-ray diffraction. Prentice Hall New Jersey, 2001.

M 8.58 Module: Structural Ceramics [M-BGU-105223]

Responsible: Prof. Dr. Michael Hoffmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
4	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-MACH-102179	Structural Ceramics	4 CR	Hoffmann

Competence Certificate
Oral examination, 20-30 min

Literature
W.D. Kingery, H.K. Bowen, D.R. Uhlmann, "Introduction to Ceramics", John Wiley & Sons, New York, (1976)

E. Dörre, H. Hübner, "Aluminia", Springer Verlag Berlin, (1984)

M. Barsoum, "Fundamentals of Ceramics", McGraw-Hill Series in Material Science and Enginewering (2003)

M 8.59 Module: Structural Geology [M-BGU-102451]

Responsible: apl. Prof. Dr. Agnes Kontny
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 5/31/2022)
Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	English	4	2

Mandatory			
T-BGU-107507	Microstructures	3 CR	Kontny
T-BGU-107508	Field Course Applied Structural Geology	2 CR	Kontny

Competence Certificate
The success control in this module is carried out:

1. in form of an approx. 20 min graded presentation in the course microstructure at the end of the course.

Content: Geological framework, description of the microstructures and derivation of the deformation history based on exercise thin sections.

2. Participation in the field course (5-6 days) and ungraded presentation of a topic relevant to the geological field area (from literature and your own field data) depending on the location of the field course. The presentation is given either during the field course or approx. 4-6 weeks afterwards. The presentation consists either of a poster presentation or a 5-10 minutes talk with an approx. 8-page report. The revised field book records are necessary to pass the course.

Prerequisites
none

Competence Goal
• Students will be trained in microstructural analysis in order to gain fundamental understanding of rock deformation. They learn to evaluate their own observation in relation to a tectonic context.
• Practical application of structural analysis in a given field study area.

Content
• Microstructures: The students learn to describe and evaluate small scale structures in deformed rocks. They are enabled to describe and interprete rock fabric elements, foliation development, polyphase deformation, deformation mechanisms, porphyroblast growth-deformation relationship and shear zone fabrics.
• Field course Applied Structural Geology: The students learn to describe and interprete large scale structures in the field. They characterize the development of normal faults, folds, thrust systems, unconformities and explain polyphase deformation in space and time in different orogenic belts.

Module grade calculation
Module grade corresponds to grade from course microstructure

Annotation
The practical part of this course is carried out in presence. The field and microscopy exercises are essential for the participants to progress in their studies.

Workload
30h lecture,

50h field work as well as two presentations and report / field documentation

70h self studying time

Recommendation
Knowledge of basics in petrology and optical determination of rock-forming minerals

Literature
Passchier, C.W., Trouw, R.A.J. (2005): Microtectonics, 366 S., Springer.
Vernon, R.H. (2004): A practical guide to rock microstructure, 594 S., Cambridge.

Further references to the field course will be delivered in advance

M 8.60 Module: Water and Energy Cycles (bauiM2P8-WATENCYC) [M-BGU-103360]

Responsible: Prof. Dr.-Ing. Erwin Zehe
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-106596	Water and Energy Cycles	6 CR	Zehe

Competence Certificate
- 'Teilleistung' T-BGU-106596 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students are able to explain the most relevant processes of Hydrology including their feedbacks and limitations. They know the concepts to describe and predict these processes in the context of science and water management. Furthermore are they able to independently apply related computer-based tools for analysis and prediction for standard situations. Students are able to evaluate the required data and to quantify and evaluate the uncertainties related to the simulations and predictions.

Content
This module deepens the fundamentals of the water and energy cycles with particular regard to:

- the soil as the central control element of the water and energy cycle and the interplay of soil water and ground heat balance
- evaporation, energy balance and processes in the atmospheric boundary layer
- runoff and evaporation regimes in different hydro-climates;
- water balance and floods at the catchment scale and statistics for water management
- the interplay between runoff processes and soil water balance, and the soil as filter system
- concepts of hydrological similarity and comparative hydrology
- process-based and conceptual models to simulate water balances and predict flood

Module grade calculation
grade of the module is grade of the exam

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 40 h
- preparation of term paper (examination): 80 h

total: 180 h

Recommendation
course Hydrology (6200511) and module and Engineering Hydrology (6200617);
knowledge of programming with Matlab or another similar progamming language, otherwise the attendance of the course 'Introduction to Matlab' (6224907) is strongly recommended

Literature

Aryan, S. P. (2001): Introduction to Micrometeorology, 2nd Ed., Academic Press
Beven, K. (2004): Rainfall runoff modelling – The primer: John Wiley and Sons
Hornberger et al. (1998): Elements of physical hydrology. John Hopkins University Press
Kraus, H. (2000): Die Atmosphäre der Erde. Vieweg S. P.
Plate, E. J., ,Zehe, E. (2008): Hydrologie und Stoffdynamik kleiner Einzugsgebiete. Prozesse und Modelle, Schweizerbart, Stuttgart, 2008.

M 8.61 Module: Water Chemistry and Water Technology [M-CIWVT-103753]

Responsible: Prof. Dr. Harald Horn
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
10	Grade to a tenth	Each winter term	1 term	German/English	4	1

Mandatory			
T-CIWVT-107585	Water Chemistry and Water Technology	10 CR	Horn

Prerequisites
None

Competence Goal

- Students get familiar with processes in aquatic systems. These include the determination, occurrence and behavior of geogenic and anthropogenic compounds as well as microorganisms in the different parts of the hydrological cycle.
- apart from the questions on the chemical and biological water quality, the focus also lies on technical aspects of water use, water treatment and water technology.

Content
Chemische und physikalische Eigenschaften des Wassers, Wasserkreislauf und Inhaltsstoffe, Kalk-Kohlensäure-Gleichgewicht, Sättigungsindex, Grundwasser, Oberflächenwasser, Umsetzungen, Trinkwasser, Grundlagen der Wasserbeurteilung, analytische Verfahren zur Wasseruntersuchung, wassertechnologische und wasserchemische Verfahren (Flockung, Fällung, Enteisenung, Entmanganung, Adsorption und Ionenaustausch, Gasaustausch, Enthärtung und/oder Entkarbonisierung, Oxidation und Entkeimung), Übungen

Recommendation
None

Literature

- Crittenden et al. (2005): Water Treatment, Principles and design. Wiley & Sons
- Skoog, D., A., Holler, F. J., Crouch, S., R. (2013): Instrumentelle Analytik, Springer Spektrum
- Vorlesungsskripte

9 Courses

T 9.1 Course: 3D Geological Modelling [T-BGU-111446]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105729 - 3D Geological Modelling

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	5	Grade to a third	Each winter term	1 terms	1

Events					
WT 22/23	6339047	3D geologische Modellierung	3 SWS	Lecture	Blum

T 9.2 Course: Advanced Analysis in GIS [T-BGU-101782]

Responsible: Dr.-Ing. Norbert Rösch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-101053 - Advanced Analysis in GIS

Type	Credits	Grading scale	Version
Oral examination	4	Grade to a third	3

Events					
ST 2022	6026208	Advanced Analyses in GIS	2 SWS	Lecture / 🗣	Rösch

Legend: 🖥 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
oral exam with appr. 20 min.

Prerequisites
None

Recommendation
None

Annotation
None

T 9.3 Course: Advanced Clay Mineralogy [T-BGU-104840]

Responsible: apl. Prof. Dr. Katja Emmerich
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102444 - Applied Mineralogy: Clay Science

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each summer term	2

Events					
ST 2022	6310430	Anwendungen von Tonen und Laboreinführung	2 SWS	Lecture / Practice (/	Emmerich

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
none

Annotation
The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Obligation of attendance for the practical laboratory exercises from the beginning to the end of the course

T 9.4 Course: Advanced Geological Mapping [T-BGU-111455]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105736 - Advanced Geological Mapping

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	5	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	6310401	Advanced Geological Mapping (Field Course)	4 SWS	Practice / 🗣	Drüppel

Legend: Online, Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
The assessment consists of an examination of another type, including field work, preparation of a geological mal and a mapping report

Prerequisites
none

Annotation
none

T 9.5 Course: Application and Industrial Use [T-BGU-111468]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105742 - Geothermics II: Application and Industrial Use

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	4	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	6310425	Application and Industrial Use	2 SWS	Lecture / Practice (/	Kohl

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of a written exam (45min) according to §4 (2) of the examination regulations.

Prerequisites
none

T 9.6 Course: Applied and Regional Hydrogeology [T-BGU-111593]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105793 - Applied and Regional Hydrogeology

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	5	Grade to a third	Each winter term	1 terms	2

Events					
WT 22/23	6339081	Angewandte Hydrogeologie	2 SWS	Lecture / Practice (/	Goldscheider, Göppert
WT 22/23	6339087	Regionale Hydrogeologie	1,5 SWS	Lecture /	Göppert, Goldscheider

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Oral exam (30 min)

T 9.7 Course: Applied Mapping [T-BGU-111444]

Responsible: Dr. rer. nat. Nadine Göppert
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105713 - Applied Mapping and Processing of Geospatial Data

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	4	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	6310020	Applied Mapping	3 SWS	Practice / 🗣	Göppert

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of an examination of another type. It consists of:
- the geological map
- a report of 15 pages
- an oral presentation of results of 15 minutes duration

Prerequisites
Study profile Engineering and Hydrogeology

T 9.8 Course: Applied Mineralogy: Geomaterials [T-BGU-104811]

Responsible: Dr. Rosa Micaela Danisi
Dr. Gemma de la Flor Martin
Prof. Dr. Frank Schilling

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: M-BGU-102430 - Applied Mineralogy: Geomaterials

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each winter term	3

Events					
WT 22/23	6339079	Microporous Mineral Phases: Characterization and Applications	2 SWS	Lecture / Practice (/)	Danisi, Schilling
WT 22/23	6339083	Crystallography applied to Geomaterials	2 SWS	Lecture / Practice (/)	de la Flor Martin, Schilling

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of an examination of another type (worksheets).

To pass the worksheets, at least 50% of the points must be achieved.

Prerequisites
none

Annotation
Will be held in Englisch to improve language competence.

The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the course progress of the participants.

T 9.9 Course: Basin Analysis and Modeling [T-BGU-111543]

Responsible: TT-Prof. Dr. Nevena Tomašević
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105773 - Basin Analysis and Modeling

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	5	Grade to a third	Each winter term	1 terms	1

Events					
WT 22/23	6339072	Basin Analysis and Modeling	4 SWS	Lecture / Practice (/	Tomašević

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of an end-term examination of another type (graded written report up to 10 pages, submitted 4 weeks after the end of the lecture period and a final oral presentation (and discussion). Each of the two components weighs 50 %.

T 9.10 Course: Borehole Technology [T-BGU-111471]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105745 - Borehole Technology

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	5	Grade to a third	Each term	2 terms	1

Events					
ST 2022	6310426	Borehole Technology: Drilling	2 SWS	Lecture / Practice (/	Kohl, Gaucher
WT 22/23	6339095	Borehole Technology: Logging	2 SWS	Lecture / Practice (/	Kohl, Gaucher

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of a written exam (90 min) according to §4 (2) of the examination regulations (45min Logging, 45min Drilling). The oral presentation in the seminar is included in the grade of the written exam.

Prerequisites
none

Annotation
The oral presentation in the seminar within the lecture "Drilling" consists of an oral presentation (20min), discussion (10min) and a written contribution about the oral presentation.

T 9.11 Course: Brownfield Sites - Investigation, Evaluation, Rehabilitation [T-BGU-100089]

Responsible: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100079 - Environmental Geotechnics

Type	Credits	Grading scale	Recurrence	Version
Oral examination	3	Grade to a third	Each winter term	1

Events					
WT 22/23	6251915	Brownfield Sites - Investigation, Evaluation, Rehabilitation	2 SWS	Lecture / 🗣	Bieberstein, Eiche, Würdemann, Mohrlok

Legend: 🖥 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

T 9.12 Course: Clay Mineralogy Introduction [T-BGU-104839]

Responsible: apl. Prof. Dr. Katja Emmerich
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102444 - Applied Mineralogy: Clay Science

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	2	pass/fail	Each winter term	2

Events					
WT 22/23	6339084	Tonmineralogie Einführung	2 SWS	Lecture / Practice (	Emmerich

Prerequisites
none

T 9.13 Course: Current Research Topics in Hydrogeology and Engineering Geology [T-BGU-111067]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105506 - Current Research Topics in Hydrogeology and Engineering Geology

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	5	pass/fail	Each term	1

Events					
ST 2022	6339041	Fachgespräch Hydrogeologie und Ingenieurgeologie	2 SWS	Seminar /	Goldscheider, Blum
ST 2022	6339042	Field Trip Hydrogeology and Engineering Geology	1 SWS	Excursion (E /	Goldscheider, Blum
WT 22/23	6339051	Oberseminar Hydrogeologie/ Ingenieurgeologie	1,5 SWS	Advanced Graduate Seminar (	Xanke
WT 22/23	6339052	Fachgespräch Hydrogeologie und Ingenieurgeologie	1 SWS	Lecture /	Liesch, Rau, Eingeladene Gäste

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Attendance at current lecture series, field exercise report(s) (1 page/day), presentation (20 min)

T 9.14 Course: Diagenesis [T-BGU-107559]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103734 - Diagenesis and Cores

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each winter term	1

Events					
WT 22/23	6339070	Diagenesis	2 SWS	Seminar /	Felder, Busch

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Competence Certificate
The assessment is a marked written report

Diagenesis: The assessment is based on a marked written report (10 pages) describing and interpreting a given thin section by independent practical microscopy over 4h on the day after completion of the course. This covers petrographic description of a sedimantary rock in thin section, its interpretation plus thin section images and raw data in the enclosure. Submission of report: 2 weeks after the end of the course.

Prerequisites
successfully passed Module Reservoir-Geology

Annotation
Diagenesis: Seminar as block course during winter term due to requirement of microscope lab and involvement of external lecturer

The practical part of this course is carried out in presence. The microscopy exercises are essential for the study progress of the participants.

T 9.15 Course: Earthworks and Foundation Engineering [T-BGU-100068]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100068 - Earthworks and Foundation Engineering

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each term	2

Events					
WT 22/23	6251701	Foundation Types	2 SWS	Lecture / Practice (/	Knittel
WT 22/23	6251703	Basics in Earthworks and Embankment Dams	2 SWS	Lecture / Practice (/	Bieberstein

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
preparation of the student research project for examination preparation

Annotation
none

T 9.16 Course: Electron Microscopy I [T-PHYS-107599]

Responsible: TT-Prof. Dr. Yolita Eggeler
Organisation: KIT Department of Physics
Part of: M-PHYS-103760 - Electron Microscopy I

Type	Credits	Grading scale	Recurrence	Version
Oral examination	5	Grade to a third	Irregular	1

Events					
WT 22/23	4027011	Electron Microscopy I	2 SWS	Lecture /	Eggeler
WT 22/23	4027012	Exercises to Electron Microscopy I	2 SWS	Practice /	Eggeler

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Oral Exam, ca. 45 min

Prerequisites
none

T 9.17 Course: Electron Microscopy II [T-PHYS-107600]

Responsible: TT-Prof. Dr. Yolita Eggeler
Organisation: KIT Department of Physics
Part of: M-PHYS-103761 - Electron Microscopy II

Type	Credits	Grading scale	Recurrence	Version
Oral examination	5	Grade to a third	Irregular	1

Events					
ST 2022	4027021	Elektronenmikroskopie II	2 SWS	Lecture /	Eggeler
ST 2022	4027022	Übungen zu Elektronenmikroskopie II	2 SWS	Practice /	Eggeler

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Oral Exam, ca. 45 min

Prerequisites
none

T 9.18 Course: Energy and Transport Processes [T-BGU-111466]

Responsible: Prof. Dr. Thomas Kohl
Prof. Dr. Frank Schilling

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: M-BGU-105741 - Geothermics I: Energy and Transport Processes

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	5	Grade to a third	Each winter term	1 terms	1

Events					
WT 22/23	6339091	Transport of Heat and Fluids	2 SWS	Lecture / Practice (/	Kohl
WT 22/23	6339196	Energy Budget of the Earth	2 SWS	Lecture / Practice (/	Schilling

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of a written exam (45 min) according to §4 (2) of the examination regulations

Prerequisites
none

T 9.19 Course: Engineering Geologie: Laboratory and Field Methods [T-BGU-111448]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105731 - Engineering Geology: Laboratory and Field Methods

Type	Credits	Grading scale	Recurrence	Version
Oral examination	5	Grade to a third	Each term	1

Events					
ST 2022	6310404	Engineering Geological Field Course	3 SWS	Practice / 🗣	Blum, Menberg, Rau
WT 22/23	6339112	Ingenieurgeologisches Laborpraktikum	1,5 SWS	Practice / 🗣	Blum, Goodwin, N.N.

Legend: 💻 Online, 💐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
none

Annotation
The practical part of this course is carried out in presence. The field courses and laboratory courses are essential for the progress of the participants.

T 9.20 Course: Engineering Geology: Mass Movements [T-BGU-110724]

Responsible: Dr. Kathrin Menberg
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102442 - Engineering Geology: Mass Movements and Modelling

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	1

Events					
WT 22/23	6339082	Massenbewegungen	2 SWS	Lecture / 🗣	Menberg

Legend: 💻 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

T 9.21 Course: Engineering Geology: Modelling [T-BGU-110725]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102442 - Engineering Geology: Mass Movements and Modelling

Type	Credits	Grading scale	Expansion	Version
Examination of another type	3	Grade to a third	1 terms	1

Events					
ST 2022	6310413	Numerische Modellierung in der Ingenieurgeologie	2 SWS	Lecture / Practice (/	Blum, Menberg

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 9.22 Course: Environmental Geochemistry [T-BGU-111525]

Responsible: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105766 - Environmental Geochemistry

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	5	Grade to a third	Each winter term	2 terms	2

Events					
ST 2022	6310407	Substance flow in the environment	2 SWS	Lecture / 🗣	Eiche
WT 22/23	6330104	Environmental Geochemistry Seminar	1 SWS	Seminar / 🗣	Eiche, Rühr

Legend: 💻 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The assessment consists of an examination of another type (ca. 10 exercise sheets in ILIAS for the lecture, a presentation of 30 min including discussion and a report related to the presentation of 10-20 pages) according to §4 (2) of the examination regulations.

Prerequisites
none

Recommendation
none

Annotation
none

T 9.23 Course: Environmental Geology: Radio- & Chemotoxic Elements [T-BGU-107560]

Responsible: Dr. Frank Heberling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102455 - Environmental Geology: Radio- & Chemotoxic Elements

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each winter term	1

Events					
WT 22/23	6339088	Geowissenschaftliche Aspekte der Entsorgung radio- und chemotoxischer Abfälle	2 SWS	Lecture	Heberling, Metz, Chaparro Sánchez

Prerequisites
none

T 9.24 Course: Field Course Applied Structural Geology [T-BGU-107508]

Responsible: apl. Prof. Dr. Agnes Kontny
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102451 - Structural Geology

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (oral)	2	pass/fail	Each summer term	2

Events					
ST 2022	6310406	Geländeübung zur Strukturgeologie	3 SWS	Practice / 🗣	Kontny

Legend: 💻 Online, 🎛 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The assessment consists of an examination of another type:

Participation in the field course (5-6 days) and ungraded presentation of a topic relevant to the geological field area (from literature and your own field data) depending on the location of the field course. The presentation is given either during the field course or approx. 4-6 weeks afterwards. The presentation consists either of a poster presentation or a 5-10 minutes talk with an approx. 8-page report. The revised field book records are necessary to pass the course.

Prerequisites
none

Annotation
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

T 9.25 Course: Field Seminar [T-BGU-111472]

Responsible: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105746 - Field Seminar

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	5	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	6310460	Geowissenschaftliche Geländeübung/ Exkursion / Master	5 SWS	Practice / 🗣	Zeh, Hilgers, Kontny
WT 22/23	6310124	Industrial Minerals	2 SWS	Lecture / Practice (/ 🗣	Kolb, Patten, Walter
WT 22/23	6310460	Geowissenschaftliche Geländeübung/ Exkursion	5 SWS	Practice	Zeh

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment is the participation of a 10 day (often international) field trip, taking notes in a geological field book, and depending on the respective lecturer a preliminary seminar, daily minutes during the trip, final report or some similar reporting.

Prerequisites
none

Recommendation
Students are requested to take this module in their final year.

Annotation
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

T 9.26 Course: Field Trip Karst Hydrogeology [T-BGU-110413]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105790 - Karst Hydrogeology

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	2	pass/fail	Each summer term	1

Events					
ST 2022	6339078	Field Trip Karst Hydrogeology	1 SWS	Practice / 🗣	Goldscheider

Legend: 📱 Online, 🎭 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Annotation
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

T 9.27 Course: Geochemical and Petrological Modeling [T-BGU-111473]

Responsible: apl. Prof. Dr. Kirsten Drüppel
Dr. Elisabeth Eiche
Dr. Frank Heberling
Prof. Dr. Armin Zeh

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: M-BGU-105747 - Geochemical and Petrological Modeling

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	5	Grade to a third	Each winter term	1 terms	1

Events					
WT 22/23	6339043	Geochemical and Petrological Modeling	2 SWS	Lecture / 🗣	Zeh, Drüppel, Heberling, Eiche

Legend: 💻 Online, 🎛 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The assessment consists of an oral examination (30 minutes duration)

Prerequisites
none

Annotation
Will be held first in in the winter term 2022/2023

T 9.28 Course: Geochemical Processes and Analytical Methods [T-BGU-108192]

Responsible: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103995 - Geochemical Processes and Analytical Methods

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each summer term	3

Events					
ST 2022	6310405	Geochemical Element Cycling	2 SWS	Lecture / 🗣	Eiche, Patten, Kluge, Walter
ST 2022	6310410	Analytical Geochemistry (Advanced Level)	2 SWS	Practical course / 🛠	Eiche, Beranoaguirre, Patten, Kluge, Walter

Legend: 💻 Online, 🛠 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Annotation
The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

T 9.29 Course: Geodata Analysis II – Big Data and Machine Learning [T-BGU-111268]

Responsible: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105634 - Geodata Analysis II – Big Data and Machine Learning

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	5	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	6310505	Geodatenanalyse II - Big Data und Maschinelles Lernen	3 SWS	Lecture / Practice (/	Liesch, Rau

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
Choice of the profile Hydrogeology and Engineering Geology. To register for the exam, the module Geodata Analysis I - Programming and Geostatistics must have been passed.

T 9.30 Course: Geological Storage of Gas [T-BGU-104841]

Responsible: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102445 - Geological Storage of Gas

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each summer term	3

Events					
ST 2022	6339094	Fundamentals of Reservoir Geomechanics	2 SWS	Lecture / 🗣	Schilling, Müller
WT 22/23	6339061	Geological Storage of Gas	2 SWS	Lecture / 🗣	Schilling

Legend: 📱 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The assessment consists of an examination of another type (presentation).

Prerequisites
none

Recommendation
The student shall have a basic knowledge of reservoir geology, mathematics and physics

Annotation
Depending on the auditorium, this course is held in German or English

T 9.31 Course: Geology [T-BGU-111470]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105744 - Geology

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	5	Grade to a third	Each winter term	1 terms	1

Events					
WT 22/23	6339080	Analysis of Geological Structures	3 SWS	Lecture / Practice (/ 🗣	Hilgers
WT 22/23	6339086	Depositional Systems of Regions	1 SWS	Lecture / Practice (/ 🗣	Hilgers

Legend: 📱 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The assessment is a marked written exam over 120 minutes

Prerequisites
none

Annotation
We consider to have one field practical near Karlsruhe.

T 9.32 Course: Geospatial Data Analysis I – Programming and Geostatistics [T-BGU-111066]

Responsible: Dr. Kathrin Menberg
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105505 - Geospatial Data Analysis I – Programming and Geostatistics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	5	Grade to a third	Each winter term	1 terms	2

Events					
WT 22/23	6339042	Geodatenanalyse I – Programmierung und Geostatistik	3 SWS	Lecture / Practice (/ 🗣	Menberg

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Student research project: programming of a code for data analysis, written documentation (ca. 5 pages)

Prerequisites
Choice of the profile Engineering and Hydrogeology

Recommendation
This module should be attended and completed before the module Geodata Analysis II that builds on it.

T 9.33 Course: Geotechnical Engineering [T-BGU-107465]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103698 - Geotechnical Engineering

Type	Credits	Grading scale	Recurrence	Version
Written examination	11	Grade to a third	Each term	1

Events					
ST 2022	6200415	Basics in Soil Mechanics	2 SWS	Lecture /	Stutz
ST 2022	6200416	Exercises to Basics in Soil Mechanics	2 SWS	Practice /	Stutz, N.N.
ST 2022	6200417	Tutorials to Basics in Soil Mechanics	2 SWS	Tutorial (/	Mitarbeiter/innen
WT 22/23	6200515	Basics in Foundation Engineering	2 SWS	Lecture /	Stutz
WT 22/23	6200516	Exercises to Basics of Foundation Engineering	2 SWS	Practice /	Gehring, Mugele
WT 22/23	6200517	Tutorial to Basics in Foundation Engineering	2 SWS	Tutorial (/	N.N.

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
written exam, 150 min.

Prerequisites
none

Recommendation
The preparation of voluntary term papers is strongly recommended as preparation for the examination.

Annotation
none

T 9.34 Course: Geothermal Exploitation – Field Exercise [T-BGU-111469]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105742 - Geothermics II: Application and Industrial Use

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework (written)	1	pass/fail	Each summer term	1 terms	1

Events					
ST 2022	6310427	Geothermal Exploitation - Field Exercises (2 Days)	1 SWS	Practice / 🗣	Kohl

Legend: 🖥 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Non-assessed coursework (participation in field trip and report), see §4 (3) of the examination regulations.

Prerequisites
none

Annotation
The date for the field exercise and the closing date for the field exercise report will be announced in the sumer term.

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

T 9.35 Course: Geothermics in the Rhine Graben – Field Exercise [T-BGU-111467]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105741 - Geothermics I: Energy and Transport Processes

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	0	pass/fail	Each winter term	1 terms	1

Events					
WT 22/23	6339092	Geothermics in the Rhine Graben - Field Exercise	1 SWS	Excursion (E / 🗣)	Kohl

Legend: Online, Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
non-assessed coursework (participation in field exercise and report) according to §4 (3) of the examination regulations

Prerequisites
none

Annotation
The practical part of this course is carried out in presence. The field course is essential for the progress of the participants.

T 9.36 Course: GIS Cartography [T-BGU-111445]

Responsible: Dr. Kathrin Menberg
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105713 - Applied Mapping and Processing of Geospatial Data

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework (written)	1	pass/fail	Each summer term	1 terms	1

Events					
ST 2022	6310399	Processing of Geospatial Data	2 SWS	Practice /	Menberg

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Four unmarked exercise sheets

Prerequisites
none

T 9.37 Course: Ground Water and Earth Dams [T-BGU-100091]

Responsible: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100073 - Ground Water and Earth Dams

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each term	1

Events					
ST 2022	6251814	Geotechnical Ground Water Problems	2 SWS	Lecture / Practice (/	Bieberstein
ST 2022	6251816	Embankment Dams (Advanced)	2 SWS	Lecture / Practice (/	Bieberstein

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
oral exam, appr. 40 min.

Prerequisites
none

Recommendation
none

Annotation
none

T 9.38 Course: Hydrogeology: Field and Laboratory Methods [T-BGU-104834]

Responsible: Dr. rer. nat. Nadine Göppert
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102441 - Hydrogeology: Field and Laboratory Methods

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each summer term	2

Events					
ST 2022	6310412	Field and Laboratory Exercises	2 SWS	Practice /	Göppert
ST 2022	6310414	Preparatory Workshop	1 SWS	Seminar /	Göppert

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of an examination of another type (graded presentation in seminar).

Prerequisites
none

Annotation
The module M-BGU-102433 Hydrogeology: Methods and Appli-cations for students according to SPO 2016 or the module M-BGU-105793 Applied and Regional Hydrogeology for students according to SPO 2021 is recommended, as it forms the theoretical and practical basis for it.

The practical part of this course is done in presence. The field exercises are mandatory for the study progress of the participants.

T 9.39 Course: Hydrogeology: Groundwater Modelling [T-BGU-104757]

Responsible: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102439 - Hydrogeology: Groundwater Modelling

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each winter term	2

Events					
WT 22/23	6339113	Groundwater Modeling	2 SWS	Lecture	Liesch, Schäfer
WT 22/23	6339114	Practice Groundwater Modeling	2 SWS	Practice	Liesch, Schäfer

Prerequisites
none

T 9.40 Course: Hydrogeology: Hydraulics and Isotopes [T-BGU-111402]

Responsible: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105726 - Hydrogeology: Hydraulics and Isotopes

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	5	Grade to a third	Each summer term	1 terms	2

Events					
ST 2022	6310411	Isotope Methods in Hydrologeology	1 SWS	Lecture / Practice (/	Himmelsbach, Liesch
ST 2022	6339081	Hydraulic Methods	1,5 SWS	Lecture / Practice (/	Liesch

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Written exam (90 min)

Prerequisites
none

Annotation
The choice of the module "Hydrogeology: Hydraulics and Isotopes" as well as the active participation in it is a prerequisite for the choice/occupation of the modules Hydrogeology: Groundwater Modelling [M-BGU-102439] and Hydrogeology: Field and Laboratory Methods [M-BGU-102441], as it forms the theoretical and practical basis for them.

T 9.41 Course: Industrial Minerals and Environment [T-BGU-108191]

Responsible: Prof. Dr. Jochen Kolb
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103993 - Industrial Minerals and Environment

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each winter term	2

Events					
WT 22/23	6310124	Industrial Minerals	2 SWS	Lecture / Practice (/	Kolb, Patten, Walter
WT 22/23	6310125	Field Seminar Industrial Minerals	2 SWS	Seminar /	Kolb, Eiche, Patten, Walter

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of an examination of another type (graded module report incl. field seminar report)

Prerequisites
keine

Annotation
The course "Field Seminar Industrial Minerlas" is part of this module, duration: 2,5 days. The date will be announced during the winter term.

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

T 9.42 Course: Internship [T-BGU-108210]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103996 - Internship

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Irregular	2

Competence Certificate
see module description

T 9.43 Course: Introduction to Ceramics [T-MACH-100287]

Responsible: Prof. Dr. Michael Hoffmann
Organisation: KIT Department of Mechanical Engineering

Part of: M-BGU-105222 - Introduction to Ceramics

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each winter term	1

Events					
WT 22/23	2125757	Introduction to Ceramics	3 SWS	Lecture / 🗣	Hoffmann

Legend: 🖥 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The assessment consists of an oral exam (30 min) taking place at a specific date.

The re-examination is offered at a specific date.

Prerequisites
None

T 9.44 Course: Introduction to Reflection Seismics [T-BGU-111952]

Responsible: Prof. Dr. Thomas Bohlen
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105777 - Seismic Interpretation

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	4060431	Introduction to Reflection Seismics	1 SWS	Lecture / 🗣	Bohlen, Hertweck
ST 2022	4060432	Exercises to Introduction to Reflection Seismics	1 SWS	Practice / 🗣	Bohlen, Hertweck

Legend: 💻 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The assessment consists of a graded written mid term exam (60-90 min).

Prerequisites
See module descripton

T 9.45 Course: Isotope Geochemistry and Geochronology [T-BGU-112211]

Responsible: Dr. Aratz Beranoaguirre
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106025 - Isotope Geochemistry and Geochronology

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	5	Grade to a third	Each summer term	1 terms	1

Competence Certificate
The assessment consists of a written exam (multiple choice, ~45min, ~30 questions).

Prerequisites
none

Annotation
This module will start in the summer term of 2023, the courses will be added to the course catalog by then.

T 9.46 Course: Karst Hydrogeology [T-BGU-111592]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105790 - Karst Hydrogeology

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each winter term	1 terms	3

Events					
WT 22/23	6339076	Karsthydrogeologie	2 SWS	Lecture / Practice (	Goldscheider

Competence Certificate
Written Exam, 60 min

T 9.47 Course: Laboratory Work in Physical Chemistry [T-CHEMBIO-109395]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-104581 - Physical Chemistry for Applied Geosciences

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each winter term	1 terms	2

Events					
ST 2022	5229	Physikalisch-chemisches Praktikum für Angewandte Geowissenschaften	8 SWS	Practical course / 🗣	Höfener, Nattland, Unterreiner, Die Dozenten des Instituts
WT 22/23	5229	Physikalisch-chemisches Praktikum für Angewandte Geowissenschaften	8 SWS	Practical course	Höfener, Unterreiner, Die Dozenten des Instituts

Legend: 💻 Online, 🌐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
acc. to lecturer

T 9.48 Course: Landfills [T-BGU-100084]

Responsible: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100079 - Environmental Geotechnics

Type	Credits	Grading scale	Recurrence	Version
Oral examination	3	Grade to a third	Each winter term	1

Events					
WT 22/23	6251913	Landfills	2 SWS	Lecture / Practice (/	Bieberstein

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

T 9.49 Course: Master's Thesis [T-BGU-111758]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105845 - Module Master's Thesis

Type	Credits	Grading scale	Recurrence	Version
Final Thesis	30	Grade to a third	Each term	1

Final Thesis
This course represents a final thesis. The following periods have been supplied:

Submission deadline	6 months
Maximum extension period	3 months
Correction period	8 weeks

T 9.50 Course: Microstructures [T-BGU-107507]

Responsible: apl. Prof. Dr. Agnes Kontny
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102451 - Structural Geology

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each summer term	1

Events					
ST 2022	6339085	Microstructures	2 SWS	Lecture / Practice (/	Kontny

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The success control is carried in form of an approx. 20 min graded presentation in the course microstructure at the end of the course.
Content: Geological framework, description of the microstructures and derivation of the deformation history based on exercise thin sections.

Prerequisites
none

Annotation
The practical part of this course is carried out in presence. The microscopy courses are essential for the progress of the participants.

T 9.51 Course: Mineral and Rock Physics [T-BGU-104838]

Responsible: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105784 - Petrophysics

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each summer term	4

Events					
ST 2022	6310428	Mineral and Rock Physics	4 SWS	Lecture / Practice (/	Schilling, Kontny

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of an examination of another type

Prerequisites
none

Annotation
From the summer term 2022 on the lecture in this course will be named "Mineral and Rock Physics" (till now Petrophysics II)

The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

T 9.52 Course: Mineral Exploration [T-BGU-110833]

Responsible: Dr. Clifford Patten
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105357 - Mineral Exploration

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	5	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	6321410	Mineral Exploration	4 SWS	Lecture / Practice (/	Patten, Walter

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Report (after preliminary review), see module description

Prerequisites
see module description

Recommendation
see module description

Annotation
Starting from the summer term 2022, in this brick 3 courses are given:

Course 1: Geochemical and Environmental Analysis (5 days), Lecture and Practical
Course 2: Geochemical Field Analysis and Sampling Techniques, Field Seminar
Course 3: Geochemical Core Analysis and Lab Techniques (3 days), Practical

T 9.53 Course: Mineral Materials [T-BGU-104856]

Responsible: Dr. Matthias Schwotzer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102453 - Mineral Materials

Type	Credits	Grading scale	Recurrence	Version
Oral examination	5	Grade to a third	Each term	1

Events					
ST 2022	6310419	Werkstoffschädigende Reaktionen	2 SWS	Lecture / 🗣	Schwotzer
WT 22/23	6339089	Mineralische Bindemittel im Bauwesen	2 SWS	Lecture / 🧩	Schwotzer

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
none

Annotation
The practical part of this course is carried out in presence. The laboratory courses are essential for the progress of the participants.

T 9.54 Course: Mineralogical Analytics [T-BGU-111524]

Responsible: apl. Prof. Dr. Kirsten Drüppel
Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105765 - Mineralogical Analytics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	5	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	6339090	Mineralogical Analytics	4 SWS	Lecture / Practice (/	Schilling, Zeh, Schwotzer, Göttlicher, Heberling, Danisi, Drüppel

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of an examination of another type, including colloquia (15 Min) and short reports (1-2 pages each) for the laboratory exercises and a written examination (60 min).

Prerequisites
none

Recommendation
none

Annotation
none

T 9.55 Course: Numerical Methods in Geosciences [T-BGU-111456]

Responsible: Dr. Emmanuel Gaucher
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105739 - Numerical Methods in Geosciences

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each winter term	1

Events					
WT 22/23	6339078	Numerical Methods in Geosciences	4 SWS	Lecture / Practice (/	Gaucher

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of a written exam (90 min).

Prerequisites
none

Annotation
The practical part of this course is carried out in presence. The exercises are partly conducted in the computing lab and are essential for the progress of the participants.

T 9.56 Course: Ore Geology of Metals [T-BGU-109345]

Responsible: Prof. Dr. Jochen Kolb
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103994 - Ore Geology of Metals

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	5	Grade to a third	Each winter term	1 terms	1

Events					
WT 22/23	6339096	Field Seminar Ore Geology	2 SWS	Seminar /	Kolb, Patten, Walter
WT 22/23	6339097	Ore Microscopy and Ore Analysis	2 SWS	Practice /	Kolb, Patten, Walter
WT 22/23	6339099	Ore-forming processes	1 SWS	Lecture /	Kolb, Patten, Walter

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of an oral exam (30 min). A report on the field seminar has to be handed in before the oral exam.

Annotation
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

T 9.57 Course: Petrology [T-BGU-104854]

Responsible: apl. Prof. Dr. Kirsten Drüppel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102452 - Petrology

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each summer term	1

Events					
ST 2022	6339104	Rock Forming Processes	3 SWS	Lecture /	Drüppel
ST 2022	6339108	Field Course	1 SWS	Practice /	Drüppel

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
see module description

Prerequisites
none

Annotation
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

T 9.58 Course: Physical Chemistry [T-CHEMBIO-103385]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-104581 - Physical Chemistry for Applied Geosciences

Type	Credits	Grading scale	Version
Written examination	9	Grade to a third	2

Events					
WT 22/23	5206	Physikalische Chemie I	4 SWS	Lecture	Schuster, Kappes
WT 22/23	5207	Übungen zur Vorlesung Physikalische Chemie I	2 SWS	Practice	Kappes, Schuster, Assistenten

Prerequisites
none

T 9.59 Course: Project Study [T-BGU-104826]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102438 - Project Study

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each term	1

Events					
ST 2022	6339082	Projektstudie/ Project Study	6 SWS	Practice /	Dozenten der Geowissenschaften, Zeh

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
see module description

Prerequisites
none

T 9.60 Course: Radiogeochemical Field Excercise and Seminar [T-BGU-107623]

Responsible: Dr. Frank Heberling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102455 - Environmental Geology: Radio- & Chemotoxic Elements

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	2	pass/fail	Each summer term	2

Events					
ST 2022	6339089	Radiogeochemische Geländeübung und Radiogeochemisches Seminar	2 SWS	Practice / 🗣	Heberling, Metz

Legend: 💻 Online, 🎛 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The assessment consists of an ungraded coursework: seminar as preparation for the field excercise (15 min presentation) and report (15-20 pages, submission till 2 months after the excercise).

Annotation
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

T 9.61 Course: Raw Materials and Environment [T-BGU-112118]

Responsible: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105963 - Raw Materials and Environment

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	5	Grade to a third	Each winter term	2 terms	2

Events					
WT 22/23	6339090	Assessment of Mine Waste	2 SWS	Practice / 🗣	Eiche
WT 22/23	6339197	Raw Materials & Environment	2 SWS	Lecture / 🗣	Eiche

Legend: 💻 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Oral exam (20-30 min) + report on characterization of mine waste deposit

Prerequisites
none

Annotation
none

T 9.62 Course: Reserve Modeling [T-BGU-111499]

Responsible: Dr. Benjamin Walter
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105759 - Reserve Modeling

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	5	Grade to a third	Each winter term	1 terms	2

Events					
WT 22/23	6320101	Reserve Modeling - Feasibility Study of Mining Projects (2 days)	2 SWS	Seminar / 🗣	Steinmüller
WT 22/23	6320104	Economic- and Risk Evaluation (3 Days)	2 SWS	Seminar / 🗣	Frenzel

Legend: 💻 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The assessment consists of an oral examination

T 9.63 Course: Reservoir Engineering and Modeling Exercises [T-BGU-111523]

Responsible: Dr. Emmanuel Gaucher
Prof. Dr. Thomas Kohl

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: M-BGU-105743 - Geothermics III: Reservoir Engineering and Modeling

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	5	Grade to a third	Each winter term	1 terms	1

Events					
WT 22/23	6339117	Reservoir Engineering and Modeling Exercises	2 SWS	Lecture / Practice (/	Gaucher, Kohl, Grimmer, Nitschke
WT 22/23	6339118	Case Studies - Seminar	2 SWS	Seminar /	Gaucher, Kohl, Grimmer, Nitschke

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment consists of a written exam (90 minutes), where an oral presentation is beeing considered as part of the grade.

Prerequisites
See modeled conditions under the module description

T 9.64 Course: Reservoir Geology [T-BGU-107563]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103742 - Reservoir Geology

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each summer term	1

Events					
ST 2022	6310600	Reservoir-Geology	2 SWS	Lecture / Practice (/	Hilgers, Busch
ST 2022	6310601	Field Seminar Reservoir-Geology	4 SWS	Seminar /	Hilgers

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The assessment is a marked written exam over 120 minutes, the participitation in the Field Seminar Reservoir-Geology and the submission of field book.

Prerequisites
Entrance to the module examination requires the submission of homework (100%) within the given deadline, of which 80% are passed

Recommendation
The student shall have a basic knowledge of sedimentology and structural geology, such as presented in the module Geology, MSc 1st semester

Annotation
Field Seminar Reservoir-Geology: For participants of field seminar Reservoir-Geology: Please mind the visa regulations.

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

T 9.65 Course: Reservoir-Analogs and Core Description [T-BGU-107624]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103734 - Diagenesis and Cores

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	2	pass/fail	Each summer term	2

Events					
WT 22/23	6339071	Reservoir Analogs & Core Description	2 SWS	Seminar / 🗣	Hilgers, Quandt

Legend: 💻 Online, 🎛 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The assessment is based on a passed report of 2 pages plus digital and hand-written enclosures of a core description (passed/ not passed). Submission of report: 2 weeks after the end of the course.

Prerequisites
Module Reservoir-Geology successfully passed

Annotation
Seminar as block course during winter term due to visit of industry core shed.

The practical part of this course is carried out in presence. The field course is essential for the study progress of the participants.

T 9.66 Course: Rock Mechanics and Tunneling [T-BGU-100069]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100069 - Rock Mechanics and Tunneling

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each term	2

Events					
ST 2022	6251804	Basics in Rock Mechanics	2 SWS	Lecture / Practice (/	Mutschler
ST 2022	6251806	Basics in Tunnel Construction	2 SWS	Lecture / Practice (/	Wagner

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
preparation of the student research project for examination preparation

Annotation
none

T 9.67 Course: Sedimentary Petrology [T-BGU-107558]

Responsible: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103733 - Sedimentary Petrology

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each winter term	1

Events					
WT 22/23	6339040	Sedimentpetrologie	4 SWS	Lecture / Practice (	Zeh

Competence Certificate
see module description

Prerequisites
none

T 9.68 Course: Seismic & Sequence Stratigraphy [T-BGU-111720]

Responsible: TT-Prof. Dr. Nevena Tomašević
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105777 - Seismic Interpretation

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework (written)	2	pass/fail	Each summer term	1 terms	1

Events					
ST 2022	6339014	Seismic and Sequence Stratigraphy	2 SWS	Lecture / Practice (/	Tomašević

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
End-term ungraded coursework (completed course exercises on the lecture Seismic & Sequence Stratigraphy)

T 9.69 Course: Shallow Geothermal Energy [T-BGU-111447]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105730 - Shallow Geothermal Energy

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	5	Grade to a third	Each winter term	1 terms	1

Events					
WT 22/23	6339115	Thermal Use of Groundwater	2 SWS	Lecture / Practice (	Blum
WT 22/23	6339116	Exercises to Shallow Geothermal Energy	1 SWS	Practice	Blum

Competence Certificate
Oral exam (15 min.)

Prerequisites
none

Recommendation
Basic programming skills in Matlab are recommended, e.g. by completing the course “Introduction to Matlab (CC772)”.

Annotation
The basic course with 2 SWS will be complemented by laboratory and field exercises, heat transport modelling and energy planning will be performed. (1 SWS in winter term).

T 9.70 Course: Structural and Phase Analysis [T-MACH-102170]

Responsible: Dr. Manuel Hinterstein
Dr.-Ing. Susanne Wagner

Organisation: KIT Department of Mechanical Engineering

Part of: M-BGU-105236 - Structural and Phase Analysis

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each winter term	1

Events					
WT 22/23	2125763	Structural and phase analysis	2 SWS	Lecture / 🗣	Wagner

Legend: 📱 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Oral examination

Prerequisites
none

T 9.71 Course: Structural Ceramics [T-MACH-102179]

Responsible: Prof. Dr. Michael Hoffmann
Organisation: KIT Department of Mechanical Engineering

Part of: M-BGU-105223 - Structural Ceramics

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each summer term	1

Events					
ST 2022	2126775	Structural Ceramics	2 SWS	Lecture / 🗣	Hoffmann

Legend: 💻 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Oral examination, 20 min

Prerequisites
none

T 9.72 Course: Student Research Project 'Earthworks and Foundation Engineering' [T-BGU-100178]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100068 - Earthworks and Foundation Engineering

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	2

Events					
WT 22/23	6251701	Foundation Types	2 SWS	Lecture / Practice (/	Knittel
WT 22/23	6251703	Basics in Earthworks and Embankment Dams	2 SWS	Lecture / Practice (/	Bieberstein

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
report appr. 45 pages;

definition of a project available from lecturer

Prerequisites
none

Recommendation
none

Annotation
none

T 9.73 Course: Student Research Project 'Rock Mechanics and Tunneling' [T-BGU-100179]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
University
Part of: M-BGU-100069 - Rock Mechanics and Tunneling

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each summer term	2

Events					
ST 2022	6251804	Basics in Rock Mechanics	2 SWS	Lecture / Practice (/ 🗣	Mutschler
ST 2022	6251806	Basics in Tunnel Construction	2 SWS	Lecture / Practice (/ 🗣	Wagner

Legend: 🖥 Online, 🌸 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
report appr. 15 pages;

definition of a project available from lecturer

Prerequisites
none

Recommendation
none

Annotation
none

T 9.74 Course: Water and Energy Cycles [T-BGU-106596]

Responsible: Prof. Dr.-Ing. Erwin Zehe
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103360 - Water and Energy Cycles

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	6	Grade to a third	Each term	2

Events					
WT 22/23	6224702	Water and Energy Cycles in Hydrological Systems: Processes, Predictions and Management	4 SWS	Lecture / Practice (/	Zehe

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
submission of at least 50% of the weekly exercises plus a written term paper on a given topic, approx. 10 to 15 pages

Prerequisites
none

Recommendation
none

Annotation
none

T 9.75 Course: Water Chemistry and Water Technology [T-CIWVT-107585]

Responsible: Prof. Dr. Harald Horn
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-103753 - Water Chemistry and Water Technology

Type	Credits	Grading scale	Recurrence	Version
Oral examination	10	Grade to a third	Each term	1

Events					
WT 22/23	22603	Scientific Principles for Water Quality Assessment	2 SWS	Lecture / 🗣	Abbt-Braun
WT 22/23	22621	Water Technology	2 SWS	Lecture / 🗣	Horn
WT 22/23	22622	Exercises to Water Technology	1 SWS	Practice / 🗣	Horn, und Mitarbeiter

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
None

Studies and Examination Regulations of Karlsruhe Institute of Technology (KIT) for the Master's Program in Applied Geosciences

dated August 10, 2021

Based on § 10 paragraph 2 number 4 and § 20 paragraph 2 of the law on the Karlsruhe Institute of Technology (KIT Law - KITG) in the version of July 14, 2009 (GBl. p. 317 f), last amended by Article 1 of the Second KIT Further Development Act (2. KIT-WG) of February 04, 2021 (GBl p. 77, 83 ff), and § 32 paragraph 3 sentence 1 of the law on universities in Baden-Württemberg (state university law - LHG) in the version of January 1, 2005 (GBl. p. 1 f), last amended by Article 1 of the Fourth Higher Education Law Amendment Act (4. HRÄG) of December 17, 2020 (GBl. p. 1204 ff), the following study and examination regulations for the master's degree in applied geosciences were decided by the KIT senate on July 19, 2021.

The President gave his approval in accordance with § 20 Paragraph 2 Clause 1 KITG in conjunction with § 32 Paragraph 3 Clause 1 LHG on August 10, 2021.

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III. Final Provisions

Preamble

[1]In the context of the implementation of the Bologna process for the establishment of a European higher education area, the KIT has set itself the goal of completing the studies at the KIT with a master's degree. [2]KIT therefore sees the consecutive bachelor's and master's courses offered at KIT as an overall concept with a consecutive curriculum.

I. General Provisions

§ 1 Scope

[1]These Master's Examination Regulations regulate the course of study, examinations and the completion of studies in the Master's program in Applied Geosciences at KIT.

§ 2 Aims of the study, academic degree

(1) [1]In the consecutive master's degree, the scientific and professional qualifications acquired in the bachelor's degree should be further deepened, broadened, expanded or supplemented. [2]The aim of the course is the ability to independently apply scientific and technical knowledge and methods and to assess their importance and scope for solving complex scientific and social problems.

(2) [1]On the basis of passing the master's examination, the academic degree "Master of Science (M.Sc.)" is awarded for the master's program in Applied Geosciences.

§ 3 Standard period of study, course structure, credit points

(1) [1]The standard period of study is four semesters.

(2) [1]The course offerings are divided into subjects, the subjects are divided into modules, and the respective modules are divided into courses. [2]The subjects and their scope are specified in § 19. [3]The module manual describes the details.

(3) [1]The workload planned for the completion of courses and modules is shown in credit points (CP). [2]The standards for the allocation of credit points correspond to the European Credit Transfer System (ECTS). [3]One credit point corresponds to a workload of around 30 hours. [4]As a rule, the credit points should be distributed evenly over the semesters.

(4) [1]The extent of the coursework and examinations required for the successful completion of the course is measured in credit points and amounts to a total of 120 credit points.

(5) [1]Courses are offered in German or English.

§ 4 Module examinations, study and examination achievements

(1) [1]The Master's examination consists of module examinations. [2]Module examinations consist of one or more controls of success. [3]Controls of success are divided into study or examination achievements.

(2) [1]Examination achievements are:

1. written exams,
2. oral exams or
3. Other types of examinations.

(3) [1]Course achievements are written, oral or practical achievements that are usually provided by the students alongside the course. [2]The Master's examination may not be concluded with a course achievement.
(4) [1]At least 70% of the module examinations should be graded.
(5) In the case of complementary content, the module examinations of several modules can be replaced by an examination that is also cross-module (section 2, nos. 1 to 3).

§ 5 Registration and admission to the module examinations and courses

(1) [1]In order to be able to take part in the module examinations, the students must register online in the student portal for the respective success controls. [2] In exceptional cases, registration can be made in writing at the examination office of the Master's degree in Applied Geosciences. [3]The examiners can set registration deadlines for the controls of success. [4]Registration of the master's thesis is regulated in the module handbook.
(2) [1]If options are available, students must, in order to be admitted to an examination in a specific module, submit a binding declaration of their choice of the relevant module and its assignment to a subject before the first examination in this module when registering for the examination hand over. [2]Upon application by the student to the examination board, the selection or allocation can be changed later.
(3) [1]Anyone who is to be admitted to a performance review
1. is enrolled in the master's program Applied Geosciences at KIT; the admission of students on leave is limited to examinations and
2. proves that he/she fulfills the requirements laid down in the module handbook for admission to a performance assessment and
3. proves that he/she has not lost the right to take examinations in the master's program in Applied Geosciences.

(4) [1]In accordance with section 30 (5) LHG, admission to individual compulsory courses can be restricted. [2] The examiner decides on the selection among the students who have registered in time by the date set by the examiner, taking into account the study progress of these students and taking into account § 13 paragraph 1 sentences 1 and 2, if it is not possible to reduce the surplus through other or additional events. [3]In the case of the same study progress, further criteria are to be defined by the KIT faculties. [4]The result will be announced to the students in time.
(5) [1]Admission is to be denied if the requirements specified in subsections 3 and 4 are not fulfilled. [2]Admission may be denied if the performance review in question has already been completed in an undergraduate bachelor's degree at KIT, which was a prerequisite for admission to this master's degree. [3]This does not apply to preferential master's degrees. [4]Admission to these is to be expressly approved in accordance with sentence 1.

§ 6 Controls of success

(1) [1]Controls of success are carried out during the course of study, usually during the course of teaching the teaching content of the individual modules or shortly after.
(2) [1]The type of success control (§ 4 Para. 2 No. 1 to 3, Para. 3) is determined by the examiner of the relevant course in relation to the learning content of the course and the learning objectives of the module set. [2]The type of success control, its frequency, order and weighting and, if applicable, the formation of the module grade must be announced in the module handbook at least six weeks before the start of lectures. [3]

With the agreement of the examiner and the student, the type of examination and the examination language can also be changed later; in the first case, however, Section 4 (4) must be taken into account. [4]When organizing the examination, the interests of students with disabilities or chronic illnesses must be taken into account in accordance with Section 13, Paragraph 1. 5§ 13 paragraph 1 sentences 3 and 4 apply accordingly.

(3) [1]If the examination effort is unreasonably high, a written examination can also be taken orally, or an oral examination can also be taken in writing. [2]This change must be announced at least six weeks before the examination.

(4) [1]In the case of courses held in English (Section 3, Paragraph 5), the corresponding controls of success can be conducted in this language. § 6 paragraph 2 applies accordingly.

(5) [1]Written examinations (§ 4 Section 2 No. 1) are usually to be assessed by an examiner according to § 17 Section 2 or 3. [2]If an assessment is made by several examiners, the grade results from the arithmetic mean of the individual assessments. [3]If the arithmetic mean does not correspond to any of the grade levels defined in Article 7, Paragraph 2, Sentence 2, it must be rounded up or down to the nearest grade level. [4]If the distance is the same, round to the next higher grade level. [5]The evaluation process should not exceed six weeks. [6]Written examinations last at least 60 and at most 300 minutes.

(6) [1]Oral examinations (§ 4 Paragraph 2 No. 2) are to be eveluated by several examiners (collegial examination) or by one examiner in the presence of an observer as a group or
individual exam. [2]Before determining the grade, the examiner listens to the other examiners involved in the collegial examination. [3]Oral examinations usually last at least 15 minutes and a maximum of 60 minutes per student.
[1]The main subjects and results of the oral examination are recorded in a protocol to hold on. [2]The result of the examination is communicated to the student following the oral announce the exam.
[1]Students who want to take the same examination in a later semester will be allowed to listen to oral examinations depending on the available space and with the examinee's consent. [2]The admission does not extend to the consultation and announcement of the examination results.

(7) [1]For examinations of a different kind (§ 4 Para. 2 No. 3) appropriate processing periods are to be granted and deadlines set. [2]It must be ensured through the type of task and through appropriate documentation that the examination performance is attributable to the student. [3]The essential objects and results of the controls of success are to be recorded in a protocol.
[1]In the case of oral examinations of a different kind, an assessor must be present in addition to the examiner, who draws the protocol in addition to the examiner.
[1]Written work as part of an examination of a different kind must bear the following declaration: [2] "I truthfully affirm that I have completed the work independently, that I have fully and precisely specified all the aids used and that I have identified everything that was taken from the work of others either unchanged or with modifications." [3]If the work does not bear this declaration, it will not be accepted. [4]The essential items and results of such a control of success are to be recorded in a protocol.

§ 6 a Controls of success in the answer-choice procedure

[1]The statutes of the Karlsruhe Institute of Technology (KIT) for the implementation of controls of success in the answer-choice procedure in the currently valid version apply to the implementation of controls of success in the answer-choice procedure.

§ 6 b Computer-assisted controls of success

(1) [1]Success checks can be carried out with the help of a computer. [2]The student's answer or solution will be transmitted electronically and, if possible, automatically evaluated. [3]The examination content is to be created by an examiner.

(2) [1]Before the computer-aided success control, the examiner must ensure that the electronic data can be clearly identified and unmistakably and permanently assigned to the students. [2]The trouble-free course of a computer-assisted performance review is to be guaranteed by appropriate technical support; in particular, the performance review is to be carried out in the presence of a technically competent person. [3]All examination tasks must be available for processing during the entire processing time.

(3) [1]Apart from that, §§ 6 and 6a apply to the implementation of computer-aided performance reviews.

§ 7 Evaluation of coursework and examinations

(1) [1]The result of an examination is determined by the respective examiners in the form of a grade.

(2) [1]The following grades should be used:

Sehr gut (very good): excellent performance,

gut (good): a performance well above average requirements,

befriedigend (satisfactory): a performance that meets average requirements,

ausreichend (sufficient): a performance that, despite its shortcomings, still has the requirements are sufficient

nicht ausreichend (failed): a performance that fails because of significant deficiencies does not meet the requirements.

[2]Only the following grades are permitted for the differentiated assessment of individual examinations:

1.0; 1.3: very good

1.7; 2.0; 2.3: good

2.7; 3.0; 3.3: satisfactory

3.7; 4.0: sufficient

5.0: insufficient

(3) [1]Academic achievements are evaluated as “passed” or “failed”.

(4) [1]When calculating the weighted average of the module grades, the subject grades and the overall grade, only the first decimal place after the decimal point is taken into account; all other digits are deleted without rounding.
(5) [1]Each module and each performance check may only be evaluated once in the same course.
(6) [1]An examination is passed if the grade is at least "sufficient" (4.0).
(7) [1]The module examination is passed if all required performance checks have been passed. [2]The module examination and the formation of the module grade should be regulated in the module handbook. [3]If the module handbook does not contain any regulations on the formation of the module grade, the module grade is calculated from an average grade weighted according to the credit points of the individual sub-modules. [4]The differentiated grades (paragraph 2) are to be used as starting data when calculating the module grades.
(8) [1]The results of the success checks and the credit points earned are managed by the KIT student service.
(9) [1]The grades of the modules in a subject are included in the subject grade with a weight proportional to the credit points shown for the modules.
(10) [1]The overall grade of the master's examination, the subject grades and the module grades are as follows:

up to 1.5 = very good

from 1.6 to 2.5 = good

from 2.6 to 3.5 = satisfactory

from 3.6 to 4.0 = sufficient

§ 8 Repetition of controls of success, definitive failure

(1) [1]Students can repeat a failed written examination (§ 4 Paragraph 2 No. 1) once. [2]If a written re-examination is assessed as “insufficient” (5.0), then an oral re-examination takes place at the same time as the date of the failed examination. [3] In this case, the grade of this examination cannot be better than "sufficient" (4.0).
(2) [1]Students can repeat a failed oral examination (§ 4 Paragraph 2 No. 2) once.
(3) [1]Repeat examinations according to paragraphs 1 and 2 must correspond to the first in content, scope and form (oral or written). [2]The responsible examination board can allow exceptions upon request.
(4) [1]Examinations of a different kind (§ 4 Paragraph 2 No. 3) can be repeated once.
(5) [1]Course achievements can be repeated several times.
(6) [1]Examinations must be repeated by the end of the examination period of the next but one semester at the latest.
(7) [1]The examination is definitively failed if the oral re-examination of a written re-examination within the meaning of paragraph 1 is graded as "insufficient" (5.0). [2]The examination is also definitively failed if the oral examination in the sense of paragraph 2 or another type of examination in accordance with paragraph 4 has been assessed twice as “failed”.
(8) [1]The module is definitively failed if an examination required for passing it is definitively failed.
(9) [1]A second repetition of the same examination according to § 4 paragraph 2 is only permitted in exceptional cases at the request of the student (''Application for a second

repetition"). [2]The application must be submitted in writing to the examination board within two months after the grade has been announced.
[1]The examination board decides on a student's first application for a second repetition if it approves the application. [2]If the examination board accepts this application rejects, a member of the executive committee decides. [3]A member of the Presidential Board decides on further applications for a second resit after the Examination Committee has given its opinion. [4]If the application is approved, the second repetition must take place no later than the next but one examination date. [5]Paragraph 1 sentences 2 and 3 apply accordingly.

(10) [1]It is not permitted to repeat a passed examination.

(11) [1]The Master's thesis can be repeated once if the grade is "insufficient" (5.0). [2]A second repetition of the Master's thesis is not permitted.

§ 9 Loss of examination entitlement

[1] If one of the required coursework or examinations according to these study and examination regulations is finally not passed, or a repeat examination according to § 8 paragraph 6 is not completed in time, or the master's examination has not been completed in full by the end of the examination period of the 8th semester, including any repetitions, then expires the right to take an examination in the Applied Geosciences master's program, unless you are not responsible for exceeding the deadline. [2]The decision on an extension of the deadline and on exceptions to the deadline regulation is made by the examination board at the request of the student, taking into account the activities specified in § 32 Para. 6 LHG. [3]As a rule, the application must be submitted in writing no later than six weeks before the deadline expires.

§ 10 Cancellation; default, resignation

(1) [1]Students can revoke their registration for written examinations without giving reasons until the examination tasks have been issued (deregistration). [2]You can deregister online in the student portal up to midnight on the day before the examination or, in justified exceptional cases, contact the student service during business hours. [3]If the deregistration is requested at the examiner, he/she must ensure that the de-registration is recorded in the Campus Management System.

(2) [1]In the case of oral examinations, the deregistration must be declared to the examiner no later than three working days before the relevant examination date. Withdrawal from an oral examination less than three working days before the relevant examination date is only possible under the conditions of paragraph 5. [2]Rescission of oral re-examinations within the meaning of Section 9, Paragraph 1 is generally only possible under the conditions of Paragraph 5.

(3) [1]Deregistration from examinations of a different kind and coursework is regulated in the module handbook.

(4) [1]A performance review is assessed as "inadequate" (5.0) if the student misses an examination date without a good reason or if they withdraw from the performance review without a good reason after the start of the performance review. [2]The same applies if the master's thesis is not completed within the scheduled processing time, unless the student is not responsible for exceeding the deadline.

(5) [1]The reason given for the withdrawal after the start of the performance review or for the absence must be reported to the examination board immediately in writing and

substantiated. [2]In the case of illness of the student or of a child to be cared for alone or relatives in need of care, the presentation of a medical certificate can be requested.

§ 11 Cheating, violation of regulations

(1) [1]If students try to influence the result of their performance assessment by cheating or using non-approved aids, the performance assessment in question counts as co-operative rated “inadequate” (5.0).

(2) [1]Students who disturb the proper course of a success assessment can be excluded from the continuation of the success assessment by the examiner or the supervisor. [2] In this case, the success check in question is rated as “inadequate” (5.0). [3] In serious cases, the Examination Board can exclude these students from further performance checks.

(3) [1]The general statutes of the KIT on probity in examinations and internships in the currently valid version regulate further details.

§ 12 Maternity leave, parental leave, performance of family responsibilities

(1) [1]The regulations of the law for the protection of mothers at work, in training and in studies (Maternity Protection Act - MuSchG) apply in its currently valid version. [2]The maternity protection periods interrupt any period according to these examination regulations. [3]The duration of maternity leave is not included in the period.

(2) [1]Likewise, the deadlines for parental leave in accordance with the applicable law (Federal Parental Allowance and Parental Leave Act - BEEG) must be taken into account upon request. [2]The student must notify the Examination Board in writing at least four weeks before the parental leave is due to begin, enclosing the required evidence, in which period of time the parental leave is to be taken. [3]The examination board has to check whether the legal requirements are met that would trigger an employee's entitlement to parental leave and inform the student of the result and the newly determined examination times without delay. [4]The processing time for the Master's thesis cannot be interrupted by parental leave. [5]The work submitted is deemed not to have been awarded. [6]After the end of the parental leave, the student receives a new topic, which must be worked on within the processing time specified in § 14.

(3) [1]Upon application, the examination board decides on the flexible handling of examination deadlines in accordance with the provisions of the State Higher Education Act if students have family responsibilities. [2]Paragraph 2 sentences 4 to 6 apply accordingly.

§ 13 Students with disabilities or chronic illnesses

(1) [1]The needs of students with disabilities or chronic illnesses must be taken into account when designing and organizing the course and the examinations. [2] In particular, students with disabilities or chronic illnesses are to be granted preferential access to courses with limited participation and the sequence for completing certain courses is to be adjusted according to their needs. [3]Students are disabled according to the Federal Equal Opportunities Act (BGG) and the Ninth Book of Social Code (SGB IX) if their physical function, mental ability or mental health deviate with a high degree of probability from the state typical for their age for more than six months and therefore their participation in life in the society is affected. [4]Upon application by the

student, the examination board decides whether the requirements according to clauses 2 and 3 are met. [5]The student must present the relevant evidence.

(2) [1]If students can provide evidence of a disability or chronic illness and it follows that they are not able to take part or all of the performance reviews in the prescribed time or form, the Examination Board can allow the performance reviews to be carried out in a different period or in a different form to provide. [2] In particular, students with disabilities or chronic illnesses are to be allowed to use necessary aids.

(3) [1]If students can provide evidence of a disability or chronic illness and it follows that they are unable to attend courses regularly or to complete the coursework and examinations required in accordance with § 19, the Examination Board may, upon application, allow individual Studies and examinations can be completed after the deadlines specified in these study and examination regulations.

§ 14 Master's thesis module

(1) [1]The prerequisite for admission to the Master's thesis module is that the student has successfully completed module examinations amounting to 70 CP, of which at least 10 CP must be from the compulsory modules of the subject "Geoscientific Specialization". [2]The module handbook regulates further details. [3]The examination board decides on exceptions at the request of the student.

(1 a) 30 CP are assigned to the Master's thesis module. It consists of the master's thesis.

(2) [1]The master's thesis can be assigned by university lecturers, senior scientists according to § 14 paragraph 3 number 1 KITG in the version before the 2nd KIT-WG of February 4th, 2021 came into force and members of the KIT faculty who have completed their habilitation. [2]In addition, the examination board can authorize other examiners to assign the topic in accordance with § 17, paragraphs 2 and 3. [3]Students are to be given the opportunity to make suggestions for the topic. [4]If the master's thesis is to be written outside the KIT Department of Applied Geosciences, this requires the approval of the examination board. [5The] Master's thesis can also be approved in the form of group work if the contribution of the individual students to be assessed as an examination performance is clearly distinguishable on the basis of objective criteria that enable clear differentiation and meets the requirement of paragraph 4. [6] In exceptional cases, the chairperson of the examination board shall ensure, at the student's request, that the student receives a topic for the master's thesis within four weeks. [7]In this case, the topic is assigned by the chairperson of the examination board.

(3) [1]The topic, task and scope of the Master's thesis are to be limited by the supervisor in such a way that it can be processed with the workload specified in paragraph 4.

(4) [1]The Master's thesis should show that the students are able to work on a problem from their field of study independently and within a limited time using scientific methods. [2]The scope of the master's thesis corresponds to 30 credit points. The maximum processing time is 6 months. [3]Topic and task are to be adapted to the intended scope. [4]The master's thesis can be written in German or English. 5Upon application by the student, the examination board can authorize the master's thesis to be written in another language.

(5) [1]When submitting the Master's thesis, the students must confirm in writing that they have written the work independently and that they have not used any sources or aids other than those specified have used, have marked the passages taken over

verbatim or in terms of content as such and have observed the statutes of the KIT for ensuring good scientific practice in the currently valid version. [2]If this declaration is not included, the work will not be accepted. [3]The declaration can be as follows: [4] "I truthfully affirm that I have written the work independently, that I have fully and precisely specified all the sources and aids used and that I have identified everything that was taken from the work of others either unchanged or with modifications, as well as the statutes of the KIT for the Safeguarding good scientific practice in the currently valid version." [5]If an untrue statement is submitted, the master's thesis will be graded “insufficient” (5.0).

(6) [1]The time at which the topic of the master's thesis is issued is to be recorded by the supervisor and the student and this is to be put on record by the examination board. [2]The date of submission of the master's thesis is to be recorded by the examiner with the examination board. [3]The topic can only be returned once and only within the first month of the processing time. [4]If the student asserts a valid reason, the examination board can extend the processing time specified in paragraph 4 by a maximum of three months at the student's request. [5]If the Master's thesis is not submitted by the deadline, it will be graded as "insufficient" (5.0), unless the students are not responsible for this omission.

(7) [1]The master's thesis is written by at least one university teacher, one senior scientist according to Section 14, Paragraph 3, Item 1 of the KITG in the version before the 2nd KIT-WG came into effect on February 4, 2021, or a habilitated member of the KIT faculty and another examiner. [2] As a rule, one of the examiners is the person who assigned the work in accordance with paragraph 2. [3]If these two people do not agree, the examination board determines the grade of the master's thesis within the framework of the evaluation of these two people; he/she can also appoint another reviewer. [4]The assessment has to be made within eight weeks after submission of the master's thesis.

§ 15 Additional accomplishments

(1) [1]Additional credit points (additional achievements) amounting to a maximum of 30 CP can also be acquired from the overall range of KIT. [2]§ 3 and § 4 of the examination regulations remain unaffected. [3]These additional achievements are not included in determining the overall and module grades. [4]The credit points not taken into account when determining the module grade are listed as additional achievements in the Transcript of Records and marked as additional achievements. [5]Upon application by the student, the additional achievements will be included in the master's certificate and marked as additional achievements. [6]Additional achievements are listed with the grades specified in § 7.

(2) [1]When registering for an examination in a module, the students must declare this as an additional achievement. [2]Upon application by the student, the assignment of the module can be changed later.

§ 16 Examination Board

(1) [1]An examination board is set up for the master’s degree in applied geosciences. [2]It consists of 6 members with voting rights: 4 university teachers / senior scientists according to Section 14 (3) No. 1 KITG in the version before the 2nd KIT-WG came into force on February 4, 2021 / private lecturers, 2 academic Employees according to § 52 LHG / scientific employees according to § 14 paragraph 3 number 2 KITG in

the version before the 2nd KIT-WG came into force on February 4th, 2021 and one student with an advisory vote. [3] If a joint examination board is set up for the bachelor's and master's degree programs in applied geosciences, the number of students increases to two members with an advisory vote, with one of these two coming from the bachelor's and one from the master's degree program. [4]The term of office for non-student members is two years, for student members one year.

(2) [1]The chair, his/her deputy, the other members of the examination board and their deputies are appointed by the KIT Faculty Council, the academic staff according to § 52 LHG, the scientific staff according to § 14 paragraph 3 number 2 KITG in the version before the entry into force of the 2nd KIT-WG of February 4, 2021 and the students at the suggestion of the members of the respective group; Reordering is possible. [2]The chairperson and his/her deputy must be university teachers, leading scientists according to Section 14, Paragraph 3, Item 1 of the KITG in the version before the 2nd KIT-WG came into force on February 4, 2021, or private lecturers at KIT being. [3]The chairperson of the examination board is responsible for day-to-day business and is supported by the respective examination office.

(3) [1]The examination board ensures compliance with the provisions of these study and examination regulations and makes decisions on examination matters. [2]It decides on the recognition of periods of study as well as study and examination achievements and makes the determination in accordance with § 18 Paragraph 1 Clause 1 Module and overall grades. [3]He regularly reports to the KIT faculty on the development of examination and study times, including the processing times for the master's theses and the distribution of the module and overall grades. [4]He is responsible for suggestions for the reform of the study and examination regulations and for module descriptions. [5]The examination board decides with the majority of its votes. [6]In the event of a tie, the chairperson of the examination board decides.

(4) [1]The examination board can transfer the execution of its tasks for all regular cases to the chairperson of the examination board. [2] In urgent matters that cannot wait until the next meeting of the examination board, the chairperson of the examination board decides.

(5) [1]The members of the Examination Board have the right to attend examinations. [2]The members of the examination board, the examiners and the assessors are subject to confidentiality. [3]If they are not in public service, they are to be sworn to secrecy by the chairperson.

(6) [1]In matters of the examination board that concern an examination to be completed at another KIT faculty, a member of the examination board may apply to consult a person who is competent and authorized to examine and who is to be named by the KIT faculty concerned.

(7) [1]Incriminating decisions of the examination board are to be communicated in writing. [2]They are to be justified and provided with instructions on legal remedies. [3]Before a decision is made, there is the opportunity to give a statement. [4]Objections to decisions made by the examination board must be submitted to the board within one month of receipt of the decision. [5]The Executive Committee member responsible for teaching decides on objections.

§ 17 Examiners and assessors

(1) [1]The examination board appoints the examiners. [2]He can delegate the appointment to the chairperson.

(2) [1]Examiners are university teachers and leading scientists according to Section 14, Paragraph 3, Item 1 of the KITG, members who have completed their habilitation and academic staff members according to Section 52 of the LHG who belong to the KIT faculty and to whom the authority to examine has been transferred; similarly, the authorization to examine can be transferred to scientific employees in accordance with Section 14, Paragraph 3, Item 2 of the KITG. [2]Only those who have acquired at least the technical qualification corresponding to the respective examination subject may be appointed.

(3) [1]Insofar as courses are conducted by persons other than those named under paragraph 2, these persons should be appointed as examiners if they can demonstrate the qualifications required under paragraph 2 sentence 2.

(4) [1]External persons can also be appointed as examiners for a Master's thesis, provided they can demonstrate the qualifications required under Paragraph 2 Clause 2.

(5) [1]The assessors are appointed by the examiners. [2]Only those who have acquired an academic degree in a master’s degree in applied geosciences or an equivalent academic degree may be appointed as assessors.

§ 18 Recognition of study and examination achievements, periods of study

(1) [1]Study and examination achievements as well as periods of study in degree programs at state or state-recognized universities and vocational academies in the Federal Republic of Germany or at foreign state or state-recognized universities, will be recognized at the student's request, provided that the skills acquired do not differ significantly from the achievements or degrees that are to be replaced. [2]There is no schematic comparison, but an overall consideration. [3]The ECTS principles are used with regard to the scope of a study and examination performance submitted for recognition (accreditation).

(2) [1]Students must submit the documents required for recognition. [2]Students newly enrolled in the Applied Geosciences master's program must submit the application with the documents required for recognition within one semester of enrollment. [3]For documents that are not available in German or English, an officially certified translation may be required. [4]The onus is on proving that the application does not meet the requirements for recognition at the examination board.

(3) [1]If achievements that were not performed at KIT are credited, they will be shown as “recognized” in the certificate. [2]If grades are available, the grades will be adopted, provided the grading systems are comparable, and included in the calculation of the module grades and the overall grade. [3]If the grading systems are not comparable, the grades can be converted. [4]If there are no grades, the note "passed" is included.

(4) [1]When recognizing study and examination achievements that were completed outside of the Federal Republic of Germany, the equivalence agreements approved by the Conference of Ministers of Education and the Conference of University Rectors as well as agreements within the framework of university partnerships must be observed.

(5) [1]Knowledge and skills acquired outside of the higher education system are credited if they are equivalent in content and level to the coursework and examinations that are to be replaced and the institution in which the knowledge and skills were acquired has a standardized quality assurance system. [2]The recognition can be denied in parts if more than 50 percent of the university studies are to be replaced.

(6) [1]The examination board is responsible for recognition and crediting. [2] When determining whether there is a significant difference within the meaning of paragraph

1, the responsible subject representatives are to be heard. [3]The examination board decides on placement in a higher semester depending on the type and scope of the coursework and examinations to be credited.

II. Master's examination

§ 19 Scope and type of the master's examination

(1) [1]The master's examination consists of the module examinations according to paragraph 2 and the master's thesis module (§ 14).

(2) [1]Module examinations are to be taken in the following subjects:

1. First Subject "Geoscientific Specialization": Module(s) totaling 70 CP.
   [2]In the subject "Geoscientific Specialization" one of the following profiles is to be chosen:
   a) Sustainable Energy Resources Storage
   b) Mineralogy and Geochemistry
   c) Engineering Geology and Hydrogeology.

2. Second Subject “Specific Supplements”: module(s) totaling 20 CP.

[3]The modules available for selection and their subject and profile allocation are determined in the module handbook.

§ 20 Passing the master's examination, formation of the overall grade

(1) [1]The master's examination is passed if all module examinations specified in § 19 have been passed.
(2) [1]The overall grade of the Master's examination is calculated as an average grade of the subject grades and the Master's thesis module weighted with credit points.
(3) [1]If students have completed the master's thesis with a grade of 1.0 and the master's examination with an average of 1.2 or better, the grade "with distinction" is awarded.

§ 21 Master's transcript, Master's certificate, Diploma Supplement and Transcript of Record

(1) [1]A master's transcript and a certificate will be issued after the last examination has been evaluated. [2]The master’s transcript and certificate should be issued no later than three months after the last examination has been taken. [3]Master's transcript and master's certificate are issued in German and English. Master's transcript and the certificate bears the date of successful completion of the last examination. [4]These documents are given to the students together. [5] In the Master’s certificate, the award of the academic master's degree is certified. [6]The master's certificate is signed by the President and the KIT Dean of the KIT Faculty and provided with the KIT seal.
(2) [1]The transcript contains the subject and module grades as well as the credit points assigned to the modules and subjects and the overall grade. [2]If a differentiated evaluation of individual examination performances was carried out according to § 7 paragraph 2 sentence 2, the corresponding decimal grade is also shown on the transcript; § 7 paragraph 4 remains unaffected. [3]The transcript is to be signed by the KIT Dean of the KIT Faculty and by the chairperson of the examination board.

(3) [1]With the certificate, the students receive a diploma supplement in German and English, which corresponds to the requirements of the applicable ECTS Users' Guide, as well as a transcript of records in German and English.

(4) [1]The Transcript of Records contains all study and examination achievements in a structured form. [2]This includes all subjects and subject grades together with the assigned credit points, the modules assigned to the respective subject with the module grades and assigned credit points as well as the success controls assigned to the modules including grades and assigned credit points. [3]Paragraph 2 sentence 2 applies accordingly. [4]The Transcript of Records should clearly indicate the assignment of performance reviews to the individual modules. [5]Credited study and examination achievements are to be included in the Transcript of Records. [6]All additional services are listed in the Transcript of Records.

(5) [1]The master's transcript, the master's certificate and the diploma supplement including the Transcript of Records are issued by the KIT student service.

III. Final Provisions

§ 22 Certification of examinations

[1]If students have finally failed the Master's examination, they will be issued with a written certificate upon application and upon presentation of the de-registration certificate, which contains the study and examination achievements and their grades and shows that the examination has not been passed overall. [2]The same applies if the right to take an examination has expired.

§ 23 Withdrawal of the master's degree

(1) [1]If students have cheated in an examination and this fact becomes known after the certificate has been issued, the grades of the module examinations in which cheating took place can be corrected. [2]If necessary, the module examination can be declared as "insufficient" (5.0) and the master's examination as "failed".

(2) [1]If the requirements for admission to an examination were not met without the student wanting to deceive, and this fact only becomes known after the certificate has been issued, this deficiency is remedied by passing the examination. [2]If the student intentionally obtained admission unjustly, the module examination can be declared "insufficient" (5.0) and the master's examination "failed".

(3) [1]Before a decision is made by the examination board, an opportunity to comment must be given.

(4) [1]The incorrect certificate is to be withdrawn and, if necessary, a new one is to be issued. [2]The master’s certificate must also be withdrawn along with the incorrect certificate if the master’s examination was declared “failed” due to cheating.

(5) [1]A decision according to paragraph 1 and paragraph 2 sentence 2 is excluded after a period of five years from the date of the certificate.

(6) [1]The revocation of the academic degree is based on § 36 para. 7 LHG.

§ 24 Inspection of the examination files

(1) [1]After completing the Master's examination, students are granted access to the examination copy of their Master's thesis, the assessments relating to it and the examination protocols within one year upon request.

(2) [1]For the inspection of the written module examinations, written partial module examinations or examination records, there is a period of one month after the announcement of the examination result.
(3) [1]The examiner determines the place and time of the inspection.
(4) [1]Examination documents are to be kept for at least five years.

§ 25 Entry into Force, Transitional Provisions

(1) [1]These study and examination regulations come into effect on October 1, 2021 and apply to
1. Students who start their studies in the master's program Applied Geosciences at KIT in the first semester, as well as for
2. Students who start their studies in the Master's program in Applied Geosciences at KIT in a higher semester, provided that this semester is not higher than the semester that the first year according to Item 1 achieves.

(2) [1]The Study and Examination Regulations of KIT for the master's program in Applied Geosciences dated March 3, 2016 (Official Announcement of KIT No. 10 dated March 7, 2016) remain valid for
1. Students who last started their studies in the master's program Applied Geosciences at KIT in the summer semester 2021, as well as for
2. Students who will start their studies in the master's program in Applied Geosciences at KIT from the winter semester 2021/2022 in a higher semester, provided that the semester is higher than that achieved by the first year according to paragraph 1 number 1.

[2]For the rest, it is no longer in force.

(3) [1]Students who have started their studies at KIT on the basis of the study and examination regulations for the Master's degree program in Applied Geosciences dated March 3, 2016 (Official Announcement of KIT No. 10 dated March 7, 2016) can take examinations based on these studies - and examination regulations for the last time by the examination period of the summer semester 2026.

Karlsruhe, August 10, 2021

signed Prof. Dr.-Ing. Holger Hanselka
(President)

Admission Regulations for the Master's Program of Applied Geosciences at KIT
from Nov 23rd 2020 (English translation, legally not binding)

Based on § 10 (2) No. 6 and § 20 of the KIT Act (KITG) in the version dated July 14, 2009 (GBl. p. 317 ff), last amended by Article 2 of the Law on the Further Development of University Law (HRWeitEG) March 13, 2018 (GBl. p. 85, 94), §§ 59 (1), 63 (2) State Higher Education Act (LHG) in the version of January 1, 2005 (GBl. p. 1 ff), last amended by Article 1 of the law amending the State Higher Education Act and the Student Services Act of June 24, 2020 (GBl. p. 426 ff.), the KIT Senate passed the following statutes in its meeting on November 16, 2020.

§ 1 – Area of Application

The statute regulates access to the master's program in Applied Geosciences at Karlsruhe Institute of Technology (hereinafter: KIT).

§ 2 - Deadlines

(1) Students are admitted for both the winter and the summer semester.

(2) Application for admission, including all required documents, has to be submitted to KIT

- ➢ by September 30 for a start of studies in the winter term
- ➢ and by March 31 for a start of studies in the summer term

§ 3 – Form of Application

(1) The form of the application is based on the general provisions applicable to the admission and enrollment procedure in the applicable admission and enrollment regulations of KIT.

(2) The following documents are to be enclosed with the application:
1. A copy of proof of a bachelor's degree or an equivalent degree in accordance with § 5 (1) No. 1 including a diploma supplement and transcript of records (stating the credit points achieved according to the European Credit Transfer System - ECTS).
2. Evidence of the minimum achievements specified in § 5, Paragraph 1, No. 2, from which the contents of the course emerge,
3. A written declaration by the applicant as to whether he/she has definitively failed an examination required by the examination regulations in the Master's degree program in Applied Geosciences or a related degree program with essentially the same content, or whether the right to take the examination no longer exists for other reasons,
4. The documents that are specified in the applicable admission and enrollment regulations.

The KIT can demand that the originals of the documents on which the admission decision is based are to be presented upon enrollment.

(3) It is possible to apply for the enrollment in the master's program of Applied Geoscience if the bachelor's degree is not available by the end of the application period as defined in § 2 and it is to be expected based on the course of studies to date, in particular the examination results to date, that the applicant completes the bachelor's degree in time before the start of the master's degree in Applied Geosciences.
In this case, the study and examination achievements completed up to this point in time are to be taken into account in the context of the admission decision. The later result of the bachelor's degree is not taken into account. The application must be accompanied by a certificate of the examinations completed by the end of the application period (e.g. transcript of grades).

§ 4 – Admission Committee

(1) To prepare the admission decision, the KIT Faculty for Civil Engineering, Geo and Environmental Sciences appoints an admissions committee consisting of at least two people from the full-time scientific staff. A student representative can participate in the admissions committee meetings in an advisory capacity. One of the members of the Admissions Committee chairs the committee.

(2) The Admissions Committee reports to the KIT Faculty Council after the completion of the admissions procedure on the experiences gained and makes suggestions for improving and further developing the admissions procedure.

§ 5 – Admission Requirements master's program of Applied Geosciences at KIT

(1) For admission to the master's program of Applied Geosciences, the following requirements must be fulfilled:
1. A bachelor's degree or an at least equivalent degree in the bachelor's program of Applied Geosciences or a program with essentially the same contents at a university, a university of applied sciences, or a cooperative state university in Germany or a university abroad. The program must have been completed within the framework of a standard period of study of at least three years and with a minimum number of 180 ECTS points.

2. Necessary imparted minimum knowledge and minimum performance in the following areas:
   - Geosciences: Achievements worth at least 60 credit points,
   - Chemistry: Achievements worth at least 10 credit points,
   - Mathematics or physics: Achievements totaling at least 15 ECTS,
   - At least another 20 credit points from other mathematical-natural-scientific or geoscientific subjects.

   In case of doubt, the admission and selection committee decides on the eligibility of the work performed by the applicant.

3. that in the Master's degree in Applied Geosciences or a related degree course with essentially the same content, there is no final failure of an examination required by the examination regulations and the examination entitlement still exists.

4. proof of sufficient knowledge in:
   a) the German language in accordance with the requirements of the valid admissions and enrollment regulations of the KIT **or**

   b) the English language, which corresponds to at least level B2 of the Common European Framework of Reference for Languages (GER) or equivalent, as proven, for example by one of the following internationally recognized tests:
      a. Test of English as Foreign Language (TOEFL) with at least 90 points in the internet-based test or
      b. IELTS with an overall score of at least 6.5 and no section below 5.5 or
      c. University of Cambridge Certificate in Advanced English (CAE) or University of Cambridge Certificate of Proficiency in English (CPE)
      d. UNIcert at least level II.

   Applicants do not need to prove their English language skills through one of the tests mentioned above if they have:
      a) a university degree from a university with English as the only language of instruction and examination; English as the only and official language of the completed degree program must be shown in the diploma supplement, in the transcript of records or in the diploma; other confirmations about the language of instruction and examination will not be accepted as proof of language proficiency;

      b) a high school diploma, whereby the foreign language must have been covered for at least 5 years of learning up to the degree that entitles the student to university entrance and the final or average grade of the last two years of learning of the language course must be at least the German grade 4 (sufficient) or at least 5 points .

   If proof of language proficiency cannot be submitted by the application deadline, admission can be granted on the condition that one of the accepted proof of sufficient English language skills is submitted at the latest when enrolling.

(2) The admission committee for the Master's degree in Applied Geosciences, in consultation with the Examination Committee for the Master's degree in Applied Geosciences, decides on the equivalence of the Bachelor's degree within the meaning of Paragraph 1 No. 1 and the definition of courses with essentially the same content within the meaning of Paragraph 1 No. 3. When recognizing foreign qualifications, the recommendations of the Conference of Ministers of Education and Cultural Affairs and the agreements made within the framework of university partnerships are to be considered.

§ 6 – Decision of Enrollment

(1) The decision on whether the admission requirements are fulfilled and on enrollment is made by the President based on the proposal made by the admissions committee.

(2) The enrollment is to be refused if
   a) the application documents were not submitted by the deadline within the meaning of § 2 or were not submitted in full within the meaning of § 3,
   b) the requirements outlined in § 5 are not fulfilled,
   c) in the master's program in Applied Geosciences or in a related program with essentially the same content, an examination required by the examination regulations was finally failed or the entitlement to the examination no longer exists for other reasons (§ 60 Para. 2 No. 2 LHG, § 9 Para. 2 HZG).

   In the case of § 3 para. 3, enrollment can be guaranteed with the provisio that the final proof of the bachelor's degree is submitted immediately, at the latest two months after the start of the semester for which enrollment was requested. If the proof is not provided by the deadline, the assurance expires and enrollment does not take place. If the applicant is not responsible for exceeding the deadline, he/she must prove this to the admissions committee and provide written evidence. In justified individual cases, the admissions committee can extend the deadline for submitting the final certificate.

(3) If the applicant does not fulfill the admission requirements and/or cannot be enrolled, he/she will be informed in writing of the result of the admission procedure. The decision must be justified and provided with instructions on legal remedies.

(4) The course of the admission procedure is to be documented in writing.

(5) Apart from that, the general provisions for the admission and enrollment procedure in the admission and enrollment regulations of the KIT remain unaffected.

§ 7 – Entry into force

These statutes come into force on the day after their announcement in the official announcements of the KIT. It applies for the first time to the application process for the summer semester 2021.

At the same time, the statutes for admission to the master's program in Applied Geosciences dated May 24, 2012 (official announcements of KIT No. 20 dated May 24, 2012) expire.

Karlsruhe, November 23, 2020

signed Prof. Dr.-Ing. Holger Hanselka

(President)