Karlsruher Institut für Technologie

Module Handbook
Applied Geosciences Master 2016 (Master of Science (M.Sc.))

SPO 2016

Winter term 2020/21

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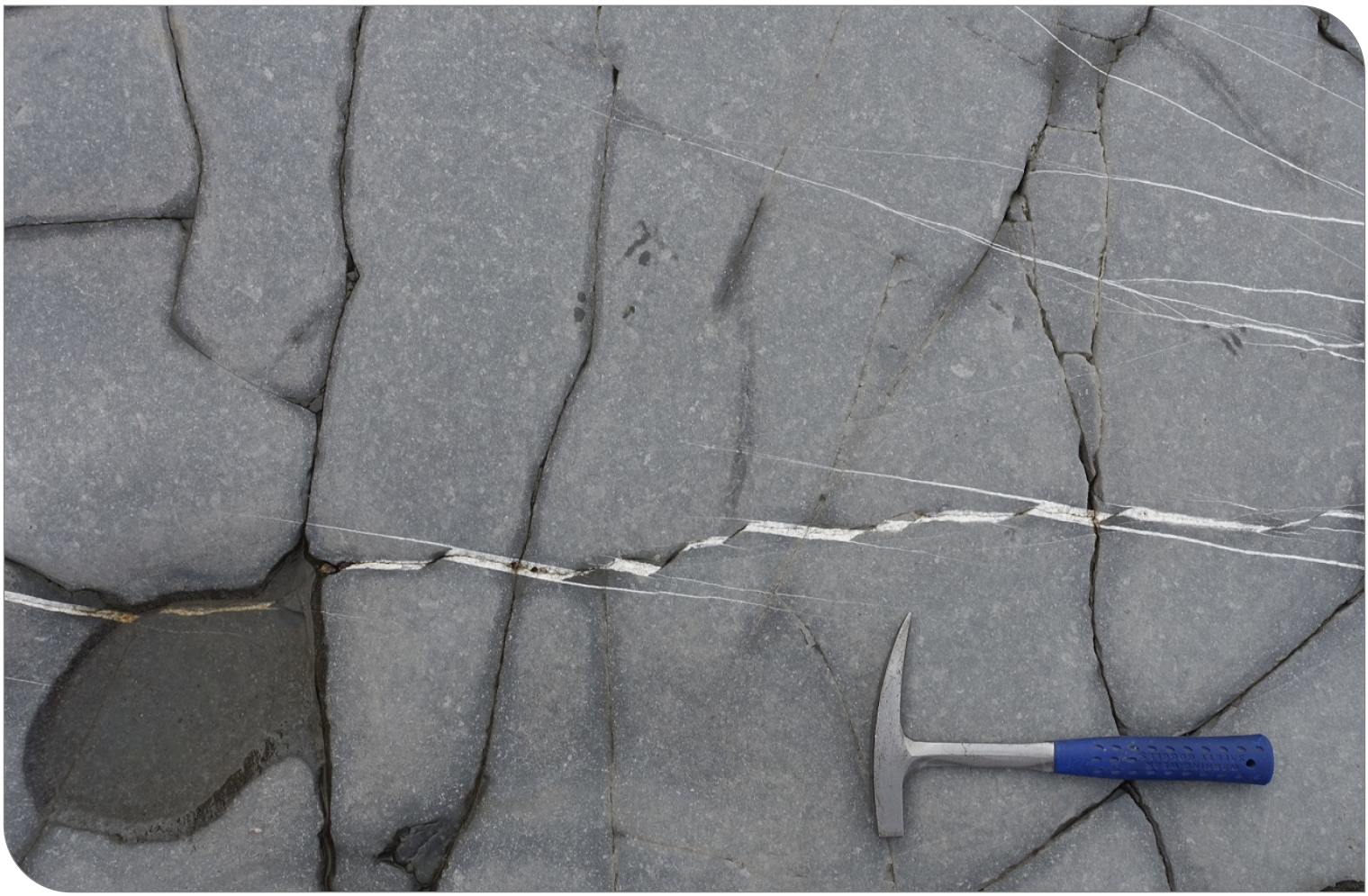
KIT DEPARTMENT OF CIVIL ENGINEERING, GEO- AND ENVIRONMENTAL SCIENCES



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1. Welcome to the New Module Handbook

We are happy that you have decided to start the Applied Geosciences Master's Degree Program at the KIT Department of Civil Engineering, Geo- and Environmental Sciences and wish you a good start of the new semester!

If you have any questions relating to your studies, modules, or exams (partial achievements), 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!

Whether renewable energies, climate protection, water or raw materials for batteries and solar systems - are you interested in the sustainable use of resources? We at the KIT University of Excellence, are one of the few Applied Geoscience 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 personally. 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. Together, we will develop sustainable solutions for the global challenges!

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

Our Applied Geosciences MSc degree program offers three profiles: Energy, Resources, & Storage (ERS), Hydrogeology & Engineering Geology, as well as Mineralogy & Geochemistry (MiG). You can choose your modules from different profiles. The complete ERS profile is offered in English.

Our MSc Profile of Energy, Resources, & Storage - ERS

You will study the sustainable use of geoenergy, georesources, and raw materials and acquire deep understanding of major infrastructure developments, such as geological storage systems. Your broad geoscientific knowledge relating to ERS may be complemented by in-depth knowledge in the areas of groundwater and tunnel construction. You will acquire applied specialist knowledge of high practical relevance and, at the same time, you will learn to handle unknown problems.

We teach what we study in research and study what we teach in the following areas:

- Geoenergy - generation of geothermal energy, use of fossil and chemical energy sources, such as hydrogen, for an increased use of climate-friendly energy sources;
- Raw materials - increasing the security of supply and transparency of raw materials (metals, minerals, and water) for the increased use of renewable energy sources, battery storage systems, and industrial products;
- Large infrastructures - geostorage systems for heat, cold, chemical energy sources, hydropower, greenhouse gases (CCS), repositories, and other subsurface systems.

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) Energy, Resources, & Storage Systems, (ii) Hydrogeology - Engineering Geology, (iii) Mineralogy - Geochemistry or choose the elective modules according to your interests. 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 19 credits and an elective part of 71 credits. The elective part includes three elements (key competences, specializations, subject-related additional studies). The modules consist of assigned courses with the credits corresponding to the respective workload.

This handbook provides information on the profile Energy, Resources & Storage. The language of instruction of this MSc-profile is English. Please refer to the German handbook for further information of the profiles Hydrogeology - Engineering Geology and Mineralogy - 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 seminars (S and GEL)
- Internships (P)
- Excursions (E)
- 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. Excursions 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. More information is given at http://www.agw.kit.edu/downloads/Studiengang/2016_AB_010.pdf.

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 (http://www.sle.kit.edu/amtlicheBekanntmachungen.php) and at
http://www.agw.kit.edu/downloads/Studiengang/2016_AB_010.pdf

4. Overview of the MSc profile Energy, Resources & Storage

Legend: Module name — D - German, E - English, Ex - Excursion, L - Lecture, P - Practical, S - Seminar, GEL - Field Seminar
Course name — FB - submission of field book, N -No Exam, OE - Oral Exam, PR - Presentation, WE - Written Exam, WR -Written Report

summer term	winter tem	recommended semester	module/course	language of instruction	type	contact hrs (SWS)	CP		self-study time (hr)	type of exam	lecturer	course number
1.1 Master Thesis												
			Module Master Thesis				30					M-BGU-103726
x		4	Master thesis							WR	any	
1.2 Compulsary Modules (at least 14CP)												
			Numerical Methods in Geosciences				6					
	x	1	Numerical Methods Computer Lab	E	LP	4		6	120	WE	Kohl/Gaucher	M-BGU-102436
			Geological Mapping and Processing of Geospatial Data				8				Drüppel	M-BGU-102437
x		2	Processing of Geospatial Data	D ,E	P	2		2	30	N	Menberg	6310399
x		2	Advanced Geological Mapping (field course)	D,E	GEL	8		6	60	WR	Drüppel, (Grimm	6310401
1.2 Project Study or Internship (1 item)												
			Internship OR ...				5			WR		M-BGU-103996
x	x	2	Internship	D,E	P			5	150	WR	company	
			... Project Study					5			Blum	M-BGU-102438
x	x	2	Project Study	E	P	0		4,5	135	WR	Blum	6339082
x		2	Introduction to Project Management	E	S	1		0,5	0	N	Hilgers, Busch	6339083
PROFILE Energy - Resources - Storage												
1.2 Elective modules (Core Electives - 36 + Electives 1 - 25 + Electives 2 - 10 CP = Total at least 71 CP)												
			Borehole Technology				5				Kohl	M-BGU-102449
x		1	Drilling	E	LP	2		3	60	WE	Müller, Kohl, Gau	6310426
x		1	Borehole-Technology I (Logging) /Logging	E	LP	2		2	30		Kohl, Gaucher	6339095
			Applied Mineralogy: Clay Science				5					M-BGU-102444
x		1	Clay Mineralogy Introduction	E	LP	2		3	60	WE	Emmerich	6339084
x		1	Anwendung von Tonen und Laboreinführung	E	P	2		2	30	WR	Emmerich	6310430
			Geothermics: Energy and Transport Processes				5					M-BGU-102432
	x	1	Energy Budget of the Earth	E	L	2		1,5	15	WR	Schilling	6339090
	x	1	General Geothermics	E	L	2		3	60	WE	Kohl	6339091
	x	1	General Geothermics Field Exercises	E	Ex	1		0,5	0	WR	Kohl	6339092
			Geology				5				Hilgers	M-BGU-102431
	x	1	Analysis of Geological Structures	E	LP	3		3	45	WE	Hilgers	6339080
	x	1	Depositional Systems	E	LP	1		2	45		Hilgers	6339086
			Industrial Minerals and Environment				5				Kolb	M-BGU-103993
	x	1	Industrial Minerals	E	LP	2		2	30	WR	Kolb, Patten	6310124
	x	1	Environmental Aspects of Mining	D,E	L	1		1	15		Eiche	6339098
	x	1	Fieldtrip Industrial Minerals (2.5 days)	E	GEL	2		2	37,5	WR	Kolb, Patten	
			Applied Geothermics				5				Kohl	M-BGU-102447
x		2	Applied Geothermics	E	LP	2		4	90	WE	Kohl	6310425
x		2	Applied Geothermics - Excursion	E	E	1		1	15	WR	Kohl	6310427
			Geological Storage of Gas				5				Schilling	M-BGU-102445
x		2	Geological Storage of Gas	E	L	2		2	30	PR	Schilling	6339093
x		2	Fundamentals of Reservoir Geomechanics	E	LP	2		3	60		Schilling, Müller	6339094
			Applied Mineralogy: Petrophysics				5				Schilling	M-BGU-102443
x		2	Petrophysik II	E	L	3		2	15	PR	Schilling	6310428
x		2	Petrophysik II	E	P	1		3	75	WE	Schilling	6310428
			Structural Geology				5				Kontny	M-BGU-102451
x		2	Microstructures	E	LP	2		2	30	PR	Kontny	6339085
x		2	Field Course (e.g. Pyrenees, Spain, 5 days)	E	GEL	4		3	45	FB + PR	Kontny	6310406
			Diagenesis and Cores				5				Hilgers	M-BGU-103734
	x	3	Diagenesis (3 days)	E	S	2		3	60	WR	Busch, Felder, Hi	6339070
	x	3	Reservoir-Analogs and Core Description (3 days)	E	S	2		2	30		Schmidt, Busch, H	6339071
			Field Excercises / Excursion				5				Zeh	M-BGU-102456
x	x	3 or 2	(Field trip / Große Exkursion) 10 days	E	GEL	8		5	60	WR	varying	
			Environmental Geology: Radio- & chemotoxic elements				5				Heberling	MBGU-102455
	x	3	Environmental Geology: Radio- & Chemotoxic Element	E	L	2		3	60	WE	Heberling	6339088
	x	3	Radiogeochemical Field Exercise and Seminar	E	E	2		2	30	WR	Heberling	6339089
			Ore Geology of Metals				5				Kolb	M-BGU-103994
	x	3	Ore forming processes	E	LP	3		3	45	OE	Kolb, Patton	6339099
	x	3	Fieldtrip Ore Geology (2 days)	E	GEL	2		2	37,5	WR	Kolb, Patton	
			Geothermal Reservoir Engineering				5				Kohl	M-BGU-105136
	x	3	Reservoir Engineering - Topics	E	L			3	90	WE	Gaucher, Kohl	6339117
	x	3	Geothermal Reservoir Engineering - Seminar	E	S			2	60	OE	Gaucher, Kohl	6339118
			Sedimentary Petrology				5				Zeh	M-BGU-103733
	x	3	Sedimentary Petrology	D,E	LP	4		5	90	WE	Zeh	6339040

Additional Electives 1 (language of instruction is German):

			Hydrogeology: Methods and Applications					7			Goldscheider	M-BGU-102433
x			Hydraulische Methoden	D	LP	1,5				WE	Liesch	6339081
	x		Angewandte Hydrogeologie	D	LP	2					Goldscheider, Gö	6339081
	x		Regionale Hydrogeologie	D	LP	1,5					Goldscheider, Gö	6339087
			Engineering Geology: Laboratory and Field Methods					7			Blum	M-BGU-102434
x			Ingenieurgeologisches Geländepraktikum	D	P	3				OE, WR	Blum	6310404
	x		IngenieurgeologischesLaborpraktikum	D	P	2					Menberg, Blum,	6339112
			Hydrogeology: Karst and Isotopes					5			Goldscheider	M-BGU-102440
x			Isotopenmethoden in der Hydrogeologie	D	LP	1				WE	Himmelsbach	6310411
	x		Karsthydrogeologie	D	LP	2					Goldscheider	6339076

Take from Electives 2 (specific supplements) - 10 CP (fachbezogene Ergänzungen) or from list 1.2 Electives above:

			Advanced Analysis in GIS				4				Breunig	M-BGU-101053
x		2	Advanced Analysis in GIS	E	LP	2		4	90	OE	Breunig	
			Earthworks and Foudation					6			N.N.	MBGU-100068
	x	1//3	Foundation Types	D	LP	2		2		WE	N.N.	6251701
	x	1//3	Basics in Earthworks and Embankment Dams	D	LP	2		2			Bieberstein, NN	6251703
	x	1//3	Student Research Project	D				2		N	NN	T-BGU-100178
			Environmental Geotechnics					6				M-BGU-100079
	x	1//3	Landfills	D	LP	2		3		OE	Bieberstein	6251913
	x	1//3	Brownfield sites	D	L	2		3		OE	Bieberstein	6251915
			Geotechnical Engineering					11			NN	M-BGU-103698
x		2	Basics in Soil Mechanics	D	L	2				WE	Triantafyllidis	6200415
x		2	Exercises to Basics in Soil Mechanics	D	P	2					Triantafyllidis	6200416
x		2	Tutorials to Basics in Soil Mechanics	D	TU	2					Staff	6200417
	x	1//3	Basics in Foundation Engineering	D	L	2					Kudella	6200515
	x	1//3	Exercises to Basics in Foundation Engineering	D	P	2					Kudella	6200516
	x	1//3	Tutorials to Basics in Foundation Engineering	D	TU	2					NN	6200517
			Rock Mechanics and Tunneling					6			N.N.	MBGU-100069
x		2	Basics in Rock Mechanics	D	LP	2		5		WE	N.N.	6251804
x		2	Basics in Tunnel Construction	D	LP	2					Wagner	6251806
		2	Student Research Project	D				1		N	N.N.	T-BGU-100179

The CP provide information about the workload to be performed by the students.
1 CP = 30 hours.
In the module handbook itself, the CPs can only be displayed in whole numbers, in this table they are also given in 0.5 steps according to the real workload.

5 Field of study structure

Mandatory	
Master Thesis	30 CR
Key Competences in Geosciences	55 CR
Specialization in Geosciences	25 CR
Specific Supplements	10 CR

5.1 Master Thesis

Credits
30

Mandatory		
M-BGU-103726	Module Master Thesis	30 CR

Modelled Conditions
The following conditions have to be fulfilled:

1. You need to earn at least 70 credits in the following fields:
   - Specific Supplements
   - Key Competences in Geosciences
   - Specialization in Geosciences

5.2 Key Competences in Geosciences

Credits
55

Election block: Compulsory Modules (at least 14 credits)		
M-BGU-102436	Numerical Methods in Geosciences	6 CR
M-BGU-102437	Geological Mapping and Processing of Geospatial Data	8 CR
Election block: Project Study or Internship (1 item)		
M-BGU-103996	Internship	5 CR
M-BGU-102438	Project Study	5 CR
Election block: Compulsory Elective Modules (at least 36 credits)		
M-BGU-102430	Applied Mineralogy: Geomaterials	5 CR
M-BGU-102431	Geology	5 CR
M-BGU-102432	Geothermics: Energy and Transport Processes	5 CR
M-BGU-102433	Hydrogeology: Methods and Applications	7 CR
M-BGU-102434	Engineering Geology: Laboratory and Field Methods	7 CR
M-BGU-102440	Hydrogeology: Karst and Isotopes	5 CR
M-BGU-103742	Reservoir-Geology	5 CR
M-BGU-103733	Sedimentary Petrology	5 CR
M-BGU-102445	Geological Storage of Gas	5 CR
M-BGU-103993	Industrial Minerals and Environment	5 CR
M-BGU-102442	Engineering Geology: Mass Movements and Modelling	5 CR
M-BGU-103994	Ore Geology of Metals	5 CR
M-BGU-103995	Geochemical Processes and Analytical Methods	5 CR
M-BGU-105150	Hydrogeology: Karst and Isotopes (with Field Trip)	7 CR

5.3 Specialization in Geosciences

Credits
25

Election block: Compulsory Elective Modules (at least 25 credits)		
M-BGU-102439	Hydrogeology: Groundwater Modelling	5 CR
M-BGU-102440	Hydrogeology: Karst and Isotopes	5 CR
M-BGU-102441	Hydrogeology: Field and Laboratory Methods	5 CR
M-BGU-102442	Engineering Geology: Mass Movements and Modelling	5 CR
M-BGU-102443	Applied Mineralogy: Petrophysics	5 CR
M-BGU-102444	Applied Mineralogy: Clay Science	5 CR
M-BGU-102445	Geological Storage of Gas	5 CR
M-BGU-102447	Applied Geothermics	5 CR
M-BGU-105136	Geothermal Reservoir Engineering	5 CR
M-BGU-102449	Borehole Technology	5 CR
M-BGU-102451	Structural Geology	5 CR
M-BGU-102452	Petrology	5 CR
M-BGU-102455	Environmental Geology: Radio- & Chemotoxic Elements	5 CR
M-BGU-102456	Field Excercises / Excursion	5 CR
M-BGU-103733	Sedimentary Petrology	5 CR
M-BGU-103734	Diagenesis and Cores	5 CR
M-BGU-103742	Reservoir-Geology	5 CR
M-BGU-102453	Mineral Materials	5 CR
M-BGU-103993	Industrial Minerals and Environment	5 CR
M-BGU-104466	Environmental Mineralogy	5 CR
M-BGU-103994	Ore Geology of Metals	5 CR
M-BGU-103995	Geochemical Processes and Analytical Methods	5 CR
M-CHEMBIO-104581	Physical Chemistry for Applied Geosciences	13 CR
M-BGU-105357	Mineral Exploration	5 CR
M-BGU-105506	Current Research Topics in Hydrogeology and Engineering Geology neu	5 CR
M-BGU-105505	Geospatial Data Analysis I – Programming and Geostatistics neu	6 CR

5.4 Specific Supplements

Credits
10

Election block: Compulsory Elecitve Modules (at least 10 credits)		
M-BGU-100068	Earthworks and Foundation Engineering	6 CR
M-BGU-100069	Rock Mechanics and Tunneling	6 CR
M-BGU-100079	Environmental Geotechnics	6 CR
M-PHYS-103760	Electron Microscopy I	5 CR
M-PHYS-103761	Electron Microscopy II	5 CR
M-CIWVT-103753	Water Chemistry and Water Technology	10 CR
M-BGU-100073	Ground Water and Earth Dams	6 CR
M-BGU-103698	Geotechnical Engineering	11 CR
M-CIWVT-103407	Water Technology	6 CR
M-BGU-101568	Urban Ecology	12 CR
M-BGU-101053	Advanced Analysis in GIS	4 CR
M-BGU-103408	Thermal Use of Groundwater	4 CR
M-BGU-105223	Structural Ceramics	4 CR
M-BGU-105236	Structural and Phase Analysis	4 CR
M-BGU-105222	Introduction to Ceramics	6 CR
M-BGU-103360	Water and Energy Cycles	6 CR

6 Modules

M 6.1 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	Recurrence	Language	Level	Version
4	Each summer term	German/English	4	2

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

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

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.

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

Prerequisites
None

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, …).

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 6.2 Module: Applied Geothermics [M-BGU-102447]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each summer term	English	4	2

Mandatory			
T-BGU-108017	Applied Geothermics	4 CR	Kohl
T-BGU-108018	Applied Geothermics - Excursion	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.

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

Prerequisites
none

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

Annotation
The date for the excursion and the closing date for the excursion 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.

M 6.3 Module: Applied Mineralogy: Clay Science [M-BGU-102444]

Responsible: Dr. Katja Emmerich
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter term	English	4	1

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

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

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

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. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Workload
contact hours: 60

self study time: 90

M 6.4 Module: Applied Mineralogy: Geomaterials [M-BGU-102430]

Responsible: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Elective Modules)

Credits	Recurrence	Language	Level	Version
5	Each winter term	English	5	2

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

Competence Certificate
The assessment consists of a written exam (90 min) according to §4 (2) of the examination regulations.
To pass the exam, at least 50% of the points must be achieved.

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.

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

Prerequisites
keine

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

Recommendation
Openess for new ideas and things

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

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

Literature
Will be discussed during the lectures

M 6.5 Module: Applied Mineralogy: Petrophysics [M-BGU-102443]

Responsible: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each summer term	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 (a combination of oral contributions and a written assignment) according to §4 (2) of the examination regulations.

Prerequisites
none

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

In Abhängigkeit vom Auditorium wird dieses Modul in deutscher oder englischer Sprache gehalten

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.

M 6.6 Module: Borehole Technology [M-BGU-102449]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each term	English	4	1

Mandatory			
T-BGU-104851	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.

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.

Prerequisites
none

Content
Logging
- Introduction into petrophysics, parameter
- Distribution of fluid/rock parameter around a drillhole
- Wireline logging
- Archie´s law
- Active/passive logs (resistivity, induction, sonic, SP, nuclear methods, imaging)
- Examples of application

Driling
- Rig installation / rotary drilling method
- Drilling mud circulation
- Measurement while drilling (MWD)
- Logging while drilling (LWD)
- Well completion
- Examples of application

M 6.7 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: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each term	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, excursion report(s) (1 page/day), presentation (20 min)

Competence Goal
The students can name and explain current research topics in hydro- and engineering geology. They are able to analyse, discuss and present current research topics.

Prerequisites
Choice of the profile Hydrogeology and Engineering Geology

Content

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

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

M 6.8 Module: Diagenesis and Cores [M-BGU-103734]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter term	English	5	1

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

Competence Certificate
The assessment consists of partial exams according to §4 (2) of the examination regulations.

It consists of two examinations of another type:

1. Diagenesis: Examination: Report (5 p.) on own practical microscopic analysis (4h on the day after the end of the course): petrographic description of sedimentary clastic rock and interpretation, raw data and thin section images. Submission: 2 weeks after end of course.

2. Reservoir-Analogs and Core Description: Report (1 page) and digitized core description plus written notes. Submission 2 weeks after end of course.

Competence Goal

- After this course students will be able to apply a workflow of petrographic analyses especially of sediments (description, quantification etc.), sandstone- and carbonate classification, provenance, evaluation of reservoir characteristics and diagenetic processes. They can critically assess data for sampling campaigns.
- 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.

Prerequisites
participation in the module Reservoir-Geology

Content

- Petrography, rock typing and reservoir quality: granulometry, texture and fabric, porosity and porosity loss, primary and secondary porosity, compaction vs. cementation, identification of detrital grains, sandstone classification, intra- and extraclasts, provenance, authigenic mineralogy, quantification via estimation and point counting, sandstone diagenesis, paragenetic sequence and stages of diagenesis, diagenetic processes, geological control factors and burial history, structural diagenesis
- Description of reservoir- and source rocks as well as seals from analogs in the field and reservoir rocks from cores

Recommendation
The student shall have a basic knowledge of reservoir geology

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

Literature
Literature "Diagenesis":
Burley, S., Worden, R. (2003): Sandstone diagenesis: recent and ancient. – 656 S, Wiley-Blackwell.
Tucker, M.E. (2011): Sedimentary Petrology.- 3. edn, 262 S., Oxford (Blackwell).

Literature "Reservoir-analogs and core description":
James, N.P., Dalrymple, R.W. 2010. Facies models.
Kupecz, by J.A. Gluyas J. Bloch S. (eds) 1997 Reservoir quality prediction in sandstones and carbonates, AAPG Memoir 69.

M 6.9 Module: Earthworks and Foundation Engineering (bauiM5P2-ERDGB) [M-BGU-100068]

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

Credits	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	2

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

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'

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.

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

Prerequisites
none

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.

Recommendation
basic knowledge of Soil Mechanics and Foundation Engineering;

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

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

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

Responsible: Jun.-Prof. Dr. Yolita Eggeler
Prof. Dr. Dagmar Gerthsen
Organisation: KIT Department of Physics
Part of: Specific Supplements

Credits	Recurrence	Language	Level	Version
5	Each summer term	German/English	4	1

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

M 6.11 Module: Electron Microscopy II [M-PHYS-103761]

Responsible: Prof. Dr. Dagmar Gerthsen
Organisation: KIT Department of Physics
Part of: Specific Supplements

Credits	Recurrence	Language	Level	Version
5	Each winter term	German/English	4	1

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

M 6.12 Module: Engineering Geology: Laboratory and Field Methods [M-BGU-102434]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Elective Modules)

Credits	Recurrence	Language	Level	Version
7	Each winter term	German	4	1

Mandatory			
T-BGU-104814	Engineering Geologie: Laboratory and Field Methods	7 CR	Blum

Competence Certificate
The assessment consists of an oral exam (20 min) according to §4 (2) of the examination regulations 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 6.13 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: Key Competences in Geosciences (Compulsory Elective Modules)
Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter term	German	5	2

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

Prerequisites
none

M 6.14 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: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter term	German/English	5	2

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 examination of another type (Seminar as preparation for field excercise (15 min presentation) and report (15-20 pages, submission till 2 months after the excercise)) according to §4 (2) of the examination regulations.

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 6.15 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	Recurrence	Duration	Language	Level	Version
6	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'

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.

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

Prerequisites
none

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.

Recommendation
none

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

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 6.16 Module: Environmental Mineralogy [M-BGU-104466]

Responsible: apl. Prof. Dr. Stefan Norra
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter term	German	5	1

Mandatory			
T-BGU-109325	Environmental Mineralogy	5 CR	Norra

Competence Certificate
The assessment consists of an examination of another type (graded report about the lecture and the practice) according to §4 (2) of the examination regulations.

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.

M 6.17 Module: Field Excercises / Excursion [M-BGU-102456]

Responsible: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each summer term	English	5	1

Mandatory			
T-BGU-104878	Field Excercise / Excursion	5 CR	Zeh

Competence Certificate
The assessment consists of an examination of another type according to §4 (2) of the examination regulations. It consists of the participation in field trips (required excursion days: 10) (often international), keeping a field book and different assignments (for example a preparing literature seminar with presentations, daily protocols, reports etc.)

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 6.18 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: Key Competences in Geosciences (Compulsory Elective Modules)
Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each summer term	German/English	5	2

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) according to §4 (2) of the examination regulations.

Prerequisites
none

Recommendation
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.

M 6.19 Module: Geological Mapping and Processing of Geospatial Data [M-BGU-102437]

Responsible: apl. Prof. Dr. Kirsten Drüppel
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Modules)

Credits	Recurrence	Language	Level	Version
8	Each summer term	German/English	4	1

Mandatory			
T-BGU-104819	Geological Mapping and Processing of Geospatial Data	8 CR	Drüppel

Competence Certificate
The assessment consists of an examination of another type according to §4 (2) of the examination regulations. It consists of field work, creating a geological mal and a mapping report.

Prerequisites
keine

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

M 6.20 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: Key Competences in Geosciences (Compulsory Elective Modules)
Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each summer term	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) according to §4 (2) of the examination regulations.

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

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 6.21 Module: Geology [M-BGU-102431]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Elective Modules)

Credits	Recurrence	Language	Level	Version
5	Each winter term	English	5	1

Mandatory			
T-BGU-104812	Geology	5 CR	Hilgers

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

Competence Goal
• Students will be trained to apply structural geology at an advanced level and using real world examples.
• Students will be trained to link rocks to depositional systems and vice versa.

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

Content
Applied Structural Geology:
• Stress and Strain
• Fractures and Mohr Circle
• Joints and Veins
• Normal faults
• Thrust faults
• Strike slip faults
• Inversion
• Strain measurements
• Diapirs & Intrusions
• Folds
• Folds and Cleavage
• Microstructures
• Maps / Structural Analysis

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

Literature
Structural Geology
Price N.J., Cosgrove, J.W. 1990 Analysis of geological structures. Cambridge University Press, 502 pp. (reprint 2005)
Ramsay J.G., Huber M.I. 1987 The techniques of modern structural geology Vol.1: Folds and fractures. Academic Press, 391pp.
Ramsay J.G., Huber M. The techniques of modern structural geology Vol.2: Strain analyses. Academic Press, 307pp.
Ramsay J.G., Lisle, R.J. 2000. The techniques of modern structural geology Vol.3: Applications of continuum mechanics in structural geology. Academic Press

Depositional Systems
James, N.P., Dalrymple, R.W. 2010. Facies models 4. Geological Association of Canada; ISBN-13: 978-1-897095-50-8 ; ISSN: 1208-2260, 586 pp.
Posamentier, H.W., Walker, R.G. 2006. Facies models revisited. SEPM Special Publication 84, 527pp.
Slatt, R.M. 2006. Stratigraphic reservoir characterization for petroleum geologists, geophysicists and engineers. Elsevier 478 pp

M 6.22 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: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
6	Each winter term	German	4	1

Mandatory			
T-BGU-111066	Geospatial Data Analysis I – Programming and Geostatistics	6 CR	Menberg

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

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.

Prerequisites
Choice of the profile Hydrogeology and Engineering Geology

Content
The course is divided into a lecture (2 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, time series analysis, error analysis, etc.) of spatial and temporal datasets.

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

Recommendation
This module should be attended and completed before the module Geodata Analysis II (starting summer term 2021) that builds on it.

Workload
60 h attendance time and 120 h self-study time

Learning type
Lecture and exercise, student research project

M 6.23 Module: Geotechnical Engineering (bauiBFP7-GEOING) [M-BGU-103698]

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

Credits	Recurrence	Language	Level	Version
11	Each summer term	German	4	1

Mandatory			
T-BGU-107465	Geotechnical Engineering	11 CR	Kudella, Niemunis

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'

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.

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

Prerequisites
none

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

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.

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

Literature
Triantafyllidis, Th. (2014): Arbeitsblätter und Übungsblätter Bodenmechanik

Triantafyllidis, Th. (2011): Arbeitsblätter und Übungsblätter Grundbau

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

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

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

M 6.24 Module: Geothermal Reservoir Engineering [M-BGU-105136]

Responsible: Dr. Emmanuel Gaucher
PD Dr. Jens Carsten Grimmer
Prof. Dr. Thomas Kohl

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

Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter term	English	4	1

Mandatory			
T-BGU-110427	Geothermal Reservoir Engineering - Topics	3 CR	Gaucher, Grimmer, Kohl
T-BGU-110428	Geothermal Reservoir Engineering - Seminar	2 CR	Gaucher, Grimmer, Kohl

Competence Certificate
The assessment consists of

1. a written exam (90 minutes) (following §4(2), of the examination regulation).

2. oral presentation

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.

Module grade calculation
The overall grade of the module is the average of the grades for each course weighted by the credits.

Prerequisites
none

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-102432 - Geothermics: Energy and Transport Processes must have been passed.
2. The module M-BGU-102447 - Applied Geothermics must have been passed.

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
- Ground source heat pumps

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

2. Starting from the winter term 2019/2020 this is the new name for the module M-BGU-102448, Topics of Geothermal Research

3. Presentation required

Workload
regular attendance: 50 hours

self study 100 hours

M 6.25 Module: Geothermics: Energy and Transport Processes [M-BGU-102432]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Elective Modules)

Credits	Recurrence	Language	Level	Version
5	Each winter term	English	4	2

Mandatory			
T-BGU-104813	Geothermics: Energy and Transport Processes	5 CR	Kohl, Schilling
T-BGU-107635	Field Trip General Geothermics	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 excursion and report) according to §4 (3) of the examination regulations.

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

Annotation
The date for the excursion and the closing date for the excursion 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.

M 6.26 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	Recurrence	Duration	Language	Level	Version
6	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'

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.

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

Prerequisites
none

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.

Recommendation
module 'Earthworks and Foundation Engineering'

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

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 6.27 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: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each summer term	German	5	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) according to §4 (2) of the examination regulations.

Prerequisites
It is mandatory to choose the module "Hydrogeology: Methods and Applications" as a requirement for this module, since it addresses the theoretical and practical background.

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

M 6.28 Module: Hydrogeology: Groundwater Modelling [M-BGU-102439]

Responsible: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter 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) according to §4 (2) of the examination regulations.

Prerequisites
It is mandatory to choose the module "Hydrogeology: Methods and Applications" as a requirement for this module, since it addresses the theoretical and practical background.

M 6.29 Module: Hydrogeology: Karst and Isotopes [M-BGU-102440]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Elective Modules)
Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter term	German	4	1

Mandatory			
T-BGU-104758	Hydrogeology: Karst and Isotopes	5 CR	Goldscheider

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

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

Prerequisites
none

M 6.30 Module: Hydrogeology: Karst and Isotopes (with Field Trip) [M-BGU-105150]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Elective Modules)

Credits	Recurrence	Language	Level	Version
7	Each winter term	German	4	1

Mandatory			
T-BGU-104758	Hydrogeology: Karst and Isotopes	5 CR	Goldscheider
T-BGU-110413	Field Trip Karst Hydrogeology	2 CR	Goldscheider

Competence Certificate
The assessment consists of a written exam (90 min) according to §4 (2) of the examination regulations and a non-assessed coursework (non-assessed excursion report).

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 6.31 Module: Hydrogeology: Methods and Applications [M-BGU-102433]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Elective Modules)

Credits	Recurrence	Language	Level	Version
7	Each winter term	German	4	1

Mandatory			
T-BGU-104750	Hydrogeology: Methods and Applications	7 CR	Goldscheider

Competence Certificate
The assessment consists of a written module exam (120 min) according to §4 (2) of the examination regulations.

Prerequisites
none

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

M 6.32 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: Key Competences in Geosciences (Compulsory Elective Modules)
Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter term	German/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 trip report) according to §4 (2) of the examination regulations.

Competence Goal
Industrial Minerals

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.

Environmental aspects of mining

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.

Prerequisites
none

Content
Industrial Minerals

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.

Environmental aspects of mining

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.

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
60 hours lectures and practicals (including 2 days of field trip) and 90 hours self study/homework

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 6.33 Module: Internship [M-BGU-103996]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Project Study or Internship)

Credits	Recurrence	Language	Level	Version
5	Irregular	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)

according to §4 (2) of the examination regulations.

Prerequisites
None

M 6.34 Module: Introduction to Ceramics [M-BGU-105222]

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

Credits	Recurrence	Language	Level	Version
6	Each winter 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 6.35 Module: Mineral Exploration [M-BGU-105357]

Responsible: Dr. Clifford Patten
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each summer 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.

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.

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

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.

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.

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.

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

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

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

Literature
Papers presented in lectures

M 6.36 Module: Mineral Materials [M-BGU-102453]

Responsible: Dr. Matthias Schwotzer
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each term	German	4	1

Mandatory			
T-BGU-104856	Mineral Materials	5 CR	Schwotzer

Competence Certificate
The assessment consists of an oral exam (30 min) according to §4 (2) of the examination regulations.

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 6.37 Module: Module Master Thesis [M-BGU-103726]

Responsible: Prof. Dr. Philipp Blum
Organisation: University
Part of: Master Thesis

Credits	Recurrence	Language	Level	Version
30	Each term	German	5	1

Mandatory			
T-BGU-107516	Master 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 presenation should take place within 8 weeks after the submission of the Master's Thesis.

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to earn at least 70 credits in the following fields:
   - Specific Supplements
   - Key Competences in Geosciences
   - Specialization in Geosciences

M 6.38 Module: Numerical Methods in Geosciences [M-BGU-102436]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Modules)

Credits	Recurrence	Language	Level	Version
6	Each winter term	English	4	1

Mandatory			
T-BGU-104816	Numerical Methods in Geosciences	6 CR	Kohl

Competence Certificate
The assessment consists of a written exam (90 min) according to §4 (2) of the examination regulations. As a prerequisite for admission to the exam, a homework must be handed in.

Competence Goal
- The students are able to apply a numerical simulation model
- The students obtain knowledges in basic applications of statistical and probability calculations for analysis of geoscientific data and modelling of processes
- The students are able to handle Matlab as programming language

Prerequisites
none

Content
- Matlab as programming language: introduction, basics, graphics
- Statistical methods and probability calculations of geoscientific data
- Physical mechanisms and processes in geosciences
- Numerical strategies for solution of complex coupled processes (finite differences, finite elements, coupling)
- Introduction into reservoir simulation
- Calculation of a doublet with analytical calibration models

Recommendation
Own laptop/PC

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.

M 6.39 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: Key Competences in Geosciences (Compulsory Elective Modules)
Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter 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) according to §4 (2) of the examination regulations. A report of the field trip and a protocol have to be handed in before the exam.

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.

Prerequisites
none

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.

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

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

Workload
Approx. 60 hours lectures and practicals (including a 2 day field trip) and 90 hours homework

Learning type
Lecture / Practicals

(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 6.40 Module: Petrology [M-BGU-102452]

Responsible: apl. Prof. Dr. Kirsten Drüppel
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each summer 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) according to §4 (2) of the examination regulations.

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

Responsible: wechselnde Dozenten, siehe Vorlesungsverzeichnis
PD Dr. Andreas-Neil Unterreiner
Organisation: KIT Department of Chemistry and Biosciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
13	Each term	German	4	1

Mandatory			
T-CHEMBIO-103385	Physical Chemistry	8 CR	
T-CHEMBIO-109395	Laboratory Work in Physical Chemistry	5 CR	

Prerequisites
None

M 6.42 Module: Project Study [M-BGU-102438]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Project Study or Internship)

Credits	Recurrence	Language	Level	Version
5	Irregular	German/English	4	2

Mandatory			
T-BGU-104826	Project Study	5 CR	Blum
T-BGU-107639	Introduction to Project Management	0 CR	Hilgers

Competence Certificate
The assessment consists of an examination of another type (Project Study: graded report an presentation) according to §4 (2) of the examination regulations, as well as a non-assessed coursework (participation in course "Introduction to Project Management" and presentation) according to §4 (3) of the examination regulations.

Prerequisites
none

M 6.43 Module: Reservoir-Geology [M-BGU-103742]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Elective Modules)
Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each summer term	English	5	1

Mandatory			
T-BGU-107563	Reservoir-Geology	5 CR	Hilgers

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

Competence Goal
After this course students are enabled to interpret fluid migration in porous and fractured rock in 3D sedimentary bodies over time, governing aspects from basin- and structural evolution to facies- and porosity-permeability development. They 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 with published literature.

Prerequisites
none

Content
Basins and reservoirs; methods: petrography, isotopy, microthermometry and cathodoluminescence; burial history and maturation; depositional settings and well correlations; structures; migration and traps; pore pressures, compaction and water saturation; diagenesis; reservoir characterization; reservoir quality prediction; plays and risks. Practical application of reservoir geology in a given field study area with special focus on structure, diagenesis and 3D geometries in sedimentary rocks

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

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

Literature
Bjorlykke, K. 2015. Petroleum Geoscience. From sedimentary environments to rock physics.
Gluyas, J., Swarbrick, R.2015 Petroleum geoscience.

M 6.44 Module: Rock Mechanics and Tunneling (bauiM5P3-FMTUB) [M-BGU-100069]

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

Credits	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	2

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

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'

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.

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

Prerequisites
none

Content
see German version

Recommendation
basic knowledge of Engineering Geology;

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

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

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

Responsible: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Key Competences in Geosciences (Compulsory Elective Modules)
Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each winter 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) according to §4 (2) of the examination regulations.

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

Prerequisites
none

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 6.46 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	Recurrence	Language	Level	Version
4	Each winter 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.

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

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

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

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

Credits	Recurrence	Language	Level	Version
4	Each summer 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 6.48 Module: Structural Geology [M-BGU-102451]

Responsible: apl. Prof. Dr. Agnes Kontny
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specialization in Geosciences

Credits	Recurrence	Language	Level	Version
5	Each summer term	English	4	1

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

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.

Prerequisites
none

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.

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

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 6.49 Module: Thermal Use of Groundwater [M-BGU-103408]

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

Credits	Recurrence	Language	Level	Version
4	Each winter term	English	4	2

Mandatory			
T-BGU-106803	Thermal Use of Groundwater	4 CR	Blum

Competence Certificate
The assessment consists of an oral exam (approx. 15 min), according to § 4 Par. 2 No. 2.

Competence Goal
Students get familiar with the topic 'Thermal Use of Groundwater' and will be able to integrate their knowledge in particular in an urban water energy nexus. They get knowledge about the fundamentals of thermal transport in groundwater and their application to shallow geothermal systems such as ground source and groundwater heat pump systems. Hence, analytical and numerical simulations will be performed using Excel and Matlab scripted codes. They will be able to perform their own simulations and will be able to design shallow geothermal systems in context of the water energy nexus.

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

Content
The content of this module is mainly based on the textbook on 'Thermal Use of Shallow Groundwater' and is therefore structured as follows:
- Fundamentals (theory of heat transport in the subsurface)
- Analytical solutions for closed and open systems
- Numerical solutions for shallow geothermal systems
- Long-term operability and sustainability
- Field methods such as thermal tracer tests and thermal response tests (TRT)
- Case studies and applications

Analytical simulations are performed using Excel and Matlab scripted codes. In addition, calibration and validation exercises are performed using existing field and monitoring data. Finally, the students are actively planning an own geothermal system from the application up to the long-term performance of such a system. Hence, a final planning report should be written.

Recommendation
knowledge of programming with Matlab; otherwise, it is strongly recommended to attend the course 'Introduction to Matlab' (6224907)

Workload
Regular Attendance, active participation in lectures: 30 hours
Preparation and follow-up of lectures (at home): 40 hours
Self-study, preparation for the exam plus oral exam: 50 hours

total of 120 hours

Literature
Stauffer, F., Bayer, P., Blum, P., Molina-Giraldo, N., Kinzelbach W. (2013): Thermal Use of Shallow Groundwater. 287 pages, CRC Press.
Other documents such as recent publications are made available on ILIAS

M 6.50 Module: Urban Ecology (E13) [M-BGU-101568]

Responsible: apl. Prof. Dr. Stefan Norra
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Specific Supplements

Credits	Recurrence	Language	Level	Version
12	Each term	German	5	3

Mandatory			
T-BGU-103001	Urban Ecology	3 CR	Norra
T-BGU-106684	Urban Ecology Lecture	3 CR	Norra
T-BGU-106685	Urban Ecology Practical Course	6 CR	Norra

Prerequisites
None

Annotation
None

M 6.51 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	Recurrence	Language	Level	Version
6	Each winter 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'

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.

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

Prerequisites
none

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

Recommendation
course Hydrology (6200511) and module Water Resources Management and Engineering [bauiBFW9-WASSRM];
knowledge of programming with Matlab or another similar progamming language, otherwise the attendance of the course 'Introduction to Matlab' (6224907) is strongly recommended

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

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 6.52 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	Recurrence	Language	Level	Version
10	Each winter term	German/English	4	1

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

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.

Prerequisites
None

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

M 6.53 Module: Water Technology [M-CIWVT-103407]

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

Credits	Recurrence	Language	Level	Version
6	Each winter term	English	4	1

Mandatory			
T-CIWVT-106802	Water Technology	6 CR	Horn

Competence Certificate
Oral exam, 30 min

Competence Goal
Students learn fundamental knowledge in water chemistry and how to apply it to processes in aquatic systems in general and in reactors for water treatment. Water treatment will be taught for drinking water and partly waste water. The students are able to apply physical, chemical and biochemical treatment for the respective removal of particulate and dissolved components in water. They are able to use the fundamental design parameters for the different types of unit operations.

Prerequisites
None

Content
Water cycle, different types of raw water (ground and surface water). Water as solvent, carbonate balance, differentiation between microbiological and chemical population. Unit operations: sieving, sedimentation, filtration, flocculation, flotation, ion exchange, aeration, oxidation, disinfection, adsorption). For all unit operations design parameters will be provided. Simple 1D models will be discussed for description of kinetics and retention time in reactors for water treatment.

Workload
Attendance time: 45 h
Preparation/follow-up: 60 h
Examination + exam preparation: 75 h

Literature
Crittenden, J.C. et al., 2005. Water treatment – Principles and design. Wiley & Sons, Hoboken.

Jekel, M., Gimbel, R., Ließfeld, R., 2004. DVGW-Handbuch: Wasseraufbereitung – Grundlagen und Verfahren. Oldenbourg, München.

Lecture notes will be provided in ILIAS

7 Courses

T 7.1 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	Version
Oral examination	4	2

Events					
SS 2020	6026208	Advanced Analyses in GIS	2 SWS	Lecture (V)	Rösch

Competence Certificate
oral exam with 20 minutes

Prerequisites
Keine

Recommendation
None

Annotation
Keine

T 7.2 Course: Advanced Clay Mineralogy [T-BGU-104840]

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

Type	Credits	Recurrence	Version
Examination of another type	2	Each summer term	1

Events					
SS 2020	6310430	Anwendungen von Tonen und Laboreinführung	2 SWS	Lecture / Practice (VÜ)	Emmerich

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.

T 7.3 Course: Applied Geothermics [T-BGU-108017]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102447 - Applied Geothermics

Type	Credits	Recurrence	Version
Written examination	4	Each summer term	1

Events					
SS 2020	6310425	Geothermische Nutzung	2 SWS	Lecture / Practice (VÜ)	Kohl

Prerequisites
none

T 7.4 Course: Applied Geothermics - Excursion [T-BGU-108018]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102447 - Applied Geothermics

Type	Credits	Recurrence	Version
Completed coursework (written)	1	Each summer term	1

Events					
SS 2020	6310427	Exkursion zu Geothermische Nutzung (2 Tage)	1 SWS	Practice (Ü)	Kohl

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 7.5 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	Recurrence	Version
Written examination	5	Each winter term	2

Events					
WS 20/21	6339079	Microporous Mineral Phases: Characterization and Applications	2 SWS	Lecture / Practice (VÜ) /	Danisi, Schilling
WS 20/21	6339083	Crystallography applied to Geomaterials	2 SWS	Lecture / Practice (VÜ) /	de la Flor Martin, Schilling

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.

To pass the exam, 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 7.6 Course: Borehole Technology [T-BGU-104851]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102449 - Borehole Technology

Type	Credits	Recurrence	Version
Written examination	5	Each term	1

Events					
SS 2020	6310426	Drilling	2 SWS	Lecture / Practice (VÜ)	Müller, Kohl
WS 20/21	6339095	Borehole-Technology I (Logging) / Logging	2 SWS	Lecture / Practice (VÜ) /	Kohl

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

Prerequisites
none

T 7.7 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	Recurrence	Version
Oral examination	3	Each winter term	1

Events					
WS 20/21	6251915	Brownfield Sites - Investigation, Evaluation, Rehabilitation	2 SWS	Lecture (V) /	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 7.8 Course: Clay Mineralogy Introduction [T-BGU-104839]

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

Type	Credits	Recurrence	Version
Written examination	3	Each winter term	1

Events					
WS 20/21	6339084	Tonmineralogie Einführung	2 SWS	Lecture / Practice (VÜ)	Emmerich

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.

T 7.9 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	Recurrence	Version
Completed coursework	5	Each term	1

Events					
WS 20/21	6339044	Fachgespräch Hydrogeologie und Ingenieurgeologie	1 SWS	Lecture (V) / 💻	Dozenten der Hydrogeologie und Ingenieurgeologie, Eingeladene Gäste
WS 20/21	6339051	Oberseminar Hydrogeologie/ Ingenieurgeologie	1,5 SWS	Advanced Graduate Seminar (OS)	Xanke

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

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

Prerequisites
Choice of the profile Hydrogeology and Engineering Geology

T 7.10 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	Recurrence	Version
Examination of another type	3	Each winter term	1

Events					
WS 20/21	6339070	Diagenesis	2 SWS	Seminar (S) /	Felder, Busch

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

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

Responsible: Dr.-Ing. Andreas Bieberstein
Dr.-Ing. Peter Kudella
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-100068 - Earthworks and Foundation Engineering

Type	Credits	Recurrence	Version
Written examination	4	Each term	2

Events					
WS 20/21	6251701	Foundation Types	2 SWS	Lecture / Practice (VÜ)	Knittel
WS 20/21	6251703	Basics in Earthworks and Embankment Dams	2 SWS	Lecture / Practice (VÜ) / 💻	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 7.12 Course: Electron Microscopy I [T-PHYS-107599]

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

Type	Credits	Recurrence	Version
Oral examination	5	Irregular	1

Events					
WS 20/21	4027011	Electron Microscopy I	2 SWS	Lecture (V) /	Gerthsen, Eggeler
WS 20/21	4027012	Exercises to Electron Microscopy I	2 SWS	Practice (Ü)	Gerthsen, Eggeler

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

Competence Certificate
Oral Exam, ca. 45 min

Prerequisites
none

T 7.13 Course: Electron Microscopy II [T-PHYS-107600]

Responsible: Prof. Dr. Dagmar Gerthsen
Organisation: KIT Department of Physics
Part of: M-PHYS-103761 - Electron Microscopy II

Type	Credits	Recurrence	Version
Oral examination	5	Irregular	1

Events					
SS 2020	4027021	Elektronenmikroskopie II	2 SWS	Lecture (V)	Gerthsen
SS 2020	4027022	Übungen zu Elektronenmikroskopie II	2 SWS	Practice (Ü)	Gerthsen

Competence Certificate
Oral Exam, ca. 45 min

Prerequisites
none

T 7.14 Course: Engineering Geologie: Laboratory and Field Methods [T-BGU-104814]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102434 - Engineering Geology: Laboratory and Field Methods

Type	Credits	Recurrence	Version
Oral examination	7	Each term	1

Events					
SS 2020	6310404	Ingenieurgeologisches Geländepraktikum/ Engineering Geological	3 SWS	Practice (Ü)	Blum, Menberg, Schweizer
WS 20/21	6339112	Ingenieurgeologisches Laborpraktikum	2 SWS	Practice (Ü) /	Menberg, Blum, Rau, Schweizer

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 7.15 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	Recurrence	Version
Completed coursework	2	Each winter term	1

Events					
WS 20/21	6339082	Massenbewegungen	2 SWS	Lecture (V) /	Menberg

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

T 7.16 Course: Engineering Geology: Modelling [T-BGU-110725]

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	Expansion	Version
Examination of another type	3	1 terms	1

Events					
SS 2020	6310413	Numerische Modellierung in der Ingenieurgeologie	2 SWS	Lecture / Practice (VÜ)	Blum, Menberg, Chaparro Sánchez

T 7.17 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	Recurrence	Version
Written examination	3	Each winter term	1

Events					
WS 20/21	6339088	Geowissenschaftliche Aspekte der Entsorgung radio- und chemotoxischer Abfälle	2 SWS	Lecture (V)	Heberling, Metz

Prerequisites
none

T 7.18 Course: Environmental Mineralogy [T-BGU-109325]

Responsible: apl. Prof. Dr. Stefan Norra
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-104466 - Environmental Mineralogy

Type	Credits	Recurrence	Expansion	Version
Examination of another type	5	Each winter term	2 terms	1

Events					
SS 2020	6339201	Übungen zur Umweltmineralogie	2 SWS	Practice (Ü)	Norra, Rühr
WS 20/21	6339198	Umweltmineralogie	2 SWS	Lecture (V) / 🖳	Norra, Rühr

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

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 7.19 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	Recurrence	Version
Examination of another type	2	Each summer term	1

Events					
SS 2020	6310406	Geländeübung zur Angewandten Strukturgeologie	3 SWS	Practice (Ü)	Kontny

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 7.20 Course: Field Excercise / Excursion [T-BGU-104878]

Responsible: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102456 - Field Excercises / Excursion

Type	Credits	Recurrence	Version
Examination of another type	5	Each summer term	1

Events					
SS 2020	6310460	Geowissenschaftliche Geländeübung/ Exkursion	5 SWS	Practice (Ü)	Zeh

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 7.21 Course: Field Trip General Geothermics [T-BGU-107635]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102432 - Geothermics: Energy and Transport Processes

Type	Credits	Recurrence	Version
Completed coursework	0	Each winter term	1

Events					
WS 20/21	6339092	General Geothermics Field Exercises	SWS	Excursion (EXK) /	Kohl

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 7.22 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-105150 - Hydrogeology: Karst and Isotopes (with Field Trip)

Type	Credits	Recurrence	Version
Completed coursework (written)	2	Each summer term	1

Events					
SS 2020	6339078	Exkursion zur Karsthydrogeologie/ Field Trip Karst Hydrogeology	1 SWS	Practice (Ü)	Goldscheider

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

T 7.23 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	Recurrence	Version
Examination of another type	5	Each summer term	2

Events					
SS 2020	6310405	Geochemical element cycling	2 SWS	Lecture (V)	Eiche, Patten, Kluge, Walter
SS 2020	6310410	Analytical geochemistry (advanced level)	2 SWS	Practical course (P)	Eiche, Kolb, Patten, Walter, Kluge

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 7.24 Course: Geological Mapping and Processing of Geospatial Data [T-BGU-104819]

Responsible: apl. Prof. Dr. Kirsten Drüppel
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102437 - Geological Mapping and Processing of Geospatial Data

Type	Credits	Recurrence	Version
Examination of another type	8	Each summer term	1

Events					
SS 2020	6310399	Digitale Geoinformationsverarbeitung/ Processing of Geospatial Data	2 SWS	Practice (Ü)	Menberg
SS 2020	6310401	Geologische Kartierübung für Fortgeschrittene/ Advanced Geological Mapping (field course)	4 SWS	Practice (Ü)	Grimmer, Drüppel

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 7.25 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	Recurrence	Version
Examination of another type	5	Each summer term	3

Events					
SS 2020	6339093	Grundlagen der Gasspeicherung/ Geological Storage of Gas	2 SWS	Lecture (V)	Schilling
SS 2020	6339094	Grundlagen der Reservoirgeomechanik	2 SWS	Lecture (V)	Schilling, Müller

T 7.26 Course: Geology [T-BGU-104812]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102431 - Geology

Type	Credits	Recurrence	Version
Written examination	5	Each winter term	1

Events					
WS 20/21	6339080	Analysis of Geological Structures	3 SWS	Lecture / Practice (VÜ) /	Hilgers
WS 20/21	6339086	Depositional Systems	1 SWS	Lecture (V) /	Hilgers

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

Prerequisites
none

T 7.27 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	Expansion	Version
Examination of another type	6	1 terms	1

Events					
WS 20/21	6339052	Programmierung und Geostatistik für Hydro- und Ingenieurgeologen	4 SWS	Lecture / Practice (VÜ) / 💻	Menberg, Rau

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 Hydrogeology and Engineering Geology

Recommendation
This module should be attended and completed before the module Geodata Analysis II (starting summer term 2021) that builds on it.

T 7.28 Course: Geotechnical Engineering [T-BGU-107465]

Responsible: Dr.-Ing. Peter Kudella
apl. Prof. Dr. Andrzej Niemunis

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

Part of: M-BGU-103698 - Geotechnical Engineering

Type	Credits	Recurrence	Version
Written examination	11	Each term	1

Events					
SS 2020	6200415	Basics in Soil Mechanics	2 SWS	Lecture (V)	Niemunis
SS 2020	6200416	Exercises to Basics in Soil Mechanics	2 SWS	Practice (Ü)	Niemunis, Kimmig
SS 2020	6200417	Tutorials to Basics in Soil Mechanics	2 SWS	Tutorial (Tu)	Mitarbeiter/innen
WS 20/21	6200515	Basics in Foundation Engineering	2 SWS	Lecture (V) /	Kudella
WS 20/21	6200516	Exercises to Basics of Foundation Engineering	2 SWS	Practice (Ü) /	Kudella
WS 20/21	6200517	Tutorial to Basics in Foundation Engineering	2 SWS	Tutorial (Tu) /	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 7.29 Course: Geothermal Reservoir Engineering - Seminar [T-BGU-110428]

Responsible: Dr. Emmanuel Gaucher
PD Dr. Jens Carsten Grimmer
Prof. Dr. Thomas Kohl

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

Part of: M-BGU-105136 - Geothermal Reservoir Engineering

Type	Credits	Recurrence	Expansion	Version
Examination of another type	2	Each winter term	1 terms	1

Events					
WS 20/21	6339118	Geothermal Reservoir Engineering - Seminar	1 SWS	Seminar (S) /	Kohl, Gaucher, Grimmer, Gholamikorzani, Held

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

Competence Certificate
The assessment consists of an oral presentation

Prerequisites
none

T 7.30 Course: Geothermal Reservoir Engineering - Topics [T-BGU-110427]

Responsible: Dr. Emmanuel Gaucher
PD Dr. Jens Carsten Grimmer
Prof. Dr. Thomas Kohl

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

Part of: M-BGU-105136 - Geothermal Reservoir Engineering

Type	Credits	Recurrence	Expansion	Version
Written examination	3	Each winter term	1 terms	1

Events					
WS 20/21	6339117	Geothermal Reservoir Engineering - Topics	3 SWS	Lecture (V) /	Kohl, Gaucher, Grimmer, Gholamikorzani, Held

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

Competence Certificate
The assessment consists of a written exam (90 minutes) (following §4(2), of the examination regulation).

Prerequisites
none

T 7.31 Course: Geothermics: Energy and Transport Processes [T-BGU-104813]

Responsible: Prof. Dr. Thomas Kohl
Prof. Dr. Frank Schilling

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

Part of: M-BGU-102432 - Geothermics: Energy and Transport Processes

Type	Credits	Recurrence	Version
Written examination	5	Each winter term	1

Events					
WS 20/21	6339090	Energy Budget of the Earth	1 SWS	Lecture (V) /	Schilling
WS 20/21	6339091	General Geothermics	2 SWS	Lecture (V) /	Kohl

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

Prerequisites
none

T 7.32 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	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6251814	Geotechnical Ground Water Problems	2 SWS	Lecture / Practice (VÜ)	Bieberstein
SS 2020	6251816	Embankment Dams (Advanced)	2 SWS	Lecture / Practice (VÜ)	Bieberstein

Competence Certificate
oral exam, appr. 40 min.

Prerequisites
none

Recommendation
none

Annotation
none

T 7.33 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	Recurrence	Version
Examination of another type	5	Each summer term	1

Events					
SS 2020	6310412	Gelände- und Laborübung/ Field and Laboratory Exercises	2 SWS	Practice (Ü)	Göppert
SS 2020	6310414	Vorbereitendes Seminar/ Preparatory Workshop	1 SWS	Seminar (S)	Göppert

Prerequisites
none

Annotation
It is mandatory to choose the module "Hydrogeology: Methods and Applications" as a requirement for this module, since it addresses the theoretical and practical background.

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

T 7.34 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	Recurrence	Version
Examination of another type	5	Each winter term	1

Events					
WS 20/21	6339113	Groundwater Modeling	2 SWS	Lecture (V)	Liesch, Schäfer
WS 20/21	6339114	Practice Groundwater Modeling	2 SWS	Practice (Ü)	Liesch, Schäfer

Prerequisites
It is mandatory to choose the module "Hydrogeology: Methods and Applications" as a requirement for this module, since it addresses the theoretical and practical background.

T 7.35 Course: Hydrogeology: Karst and Isotopes [T-BGU-104758]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102440 - Hydrogeology: Karst and Isotopes
M-BGU-105150 - Hydrogeology: Karst and Isotopes (with Field Trip)

Type	Credits	Recurrence	Version
Written examination	5	Each term	1

Events					
SS 2020	6310411	Isotopenmethoden in der Hydrogeologie / Isotope Methods in Hydrologeology	1 SWS	Lecture / Practice (VÜ)	Himmelsbach
WS 20/21	6339076	Karsthydrogeologie	2 SWS	Lecture / Practice (VÜ) /	Goldscheider

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

Competence Certificate
Written Exam, 90 min.

Recommendation
Module "Hydrogeology: Methods and Applications" passed successfully

T 7.36 Course: Hydrogeology: Methods and Applications [T-BGU-104750]

Responsible: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102433 - Hydrogeology: Methods and Applications

Type	Credits	Recurrence	Version
Written examination	7	Each term	1

Events					
SS 2020	6339081	Hydraulische Methoden/ Hydraulic Methods	1,5 SWS	Lecture / Practice (VÜ)	Liesch
WS 20/21	6339081	Angewandte Hydrogeologie	2 SWS	Lecture / Practice (VÜ) / 🖳	Goldscheider, Göppert
WS 20/21	6339087	Regionale Hydrogeologie	1,5 SWS	Lecture (V) / 🖳	Goldscheider, Göppert

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

Prerequisites
none

T 7.37 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	Recurrence	Version
Examination of another type	5	Each winter term	1

Events					
WS 20/21	6310124	Industrial Minerals	2 SWS	Lecture / Practice (VÜ) /	Kolb, Patten, Walter
WS 20/21	6339098	Umweltaspekte der Rohstoffgewinnung	1 SWS	Lecture (V) /	Eiche

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

Prerequisites
keine

Annotation
The course "Industrial Minerals in the Field" is part of this module, duration: 2 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 7.38 Course: Internship [T-BGU-108210]

Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-103996 - Internship

Type	Credits	Recurrence	Version
Examination of another type	5	Irregular	2

T 7.39 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	Recurrence	Version
Oral examination	6	Each winter term	1

Events					
WS 20/21	2125757	Introduction to Ceramics	3 SWS	Lecture (V) /	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 7.40 Course: Introduction to Project Management [T-BGU-107639]

Responsible: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102438 - Project Study

Type	Credits	Recurrence	Version
Completed coursework	0	Each summer term	1

Events					
SS 2020	6339083	Grundlagen des Projektmanagements	1 SWS	Lecture (V)	Hilgers

T 7.41 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	Recurrence	Expansion	Version
Oral examination	5	Each winter term	1 terms	1

Events					
SS 2020	5229	Physikalisch-chemisches Praktikum für Angewandte Geowissenschaften	8 SWS	Practical course (P)	Böttcher, Nattland, Unterreiner, Die Dozenten des Instituts
WS 20/21	5229	Physikalisch-chemisches Praktikum für Angewandte Geowissenschaften	8 SWS	Practical course (P) /	Böttcher, Nattland, Unterreiner, Die Dozenten des Instituts

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

Prerequisites
acc. to lecturer

T 7.42 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	Recurrence	Version
Oral examination	3	Each winter term	1

Events					
WS 20/21	6251913	Landfills	2 SWS	Lecture / Practice (VÜ) /	Bieberstein

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

T 7.43 Course: Master Thesis [T-BGU-107516]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-103726 - Module Master Thesis

Type	Credits	Recurrence	Version
Final Thesis	30	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 7.44 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	Recurrence	Version
Examination of another type	3	Each summer term	1

Events					
SS 2020	6339085	Mikrogefüge von Gesteinen / Microstructures	2 SWS	Lecture / Practice (VÜ)	Kontny

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 7.45 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-102443 - Applied Mineralogy: Petrophysics

Type	Credits	Recurrence	Version
Examination of another type	5	Each summer term	2

Events					
SS 2020	6310428	Petrophysik II	3 + 1 SWS	Lecture / Practice (VÜ)	Schilling

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.

T 7.46 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	Recurrence	Expansion	Version
Examination of another type	5	Each summer term	1 terms	1

Events					
SS 2020	6321410	Mineral Exploration	4 SWS	Lecture / Practice (VÜ)	Patten

Competence Certificate
Report (after preliminary review), see module description

Prerequisites
see module description

Recommendation
see module description

Annotation
see module description

T 7.47 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	Recurrence	Version
Oral examination	5	Each term	1

Events					
SS 2020	6310419	Werkstoffschädigende Reaktionen	2 SWS	Lecture (V)	Schwotzer
WS 20/21	6339089	Mineralische Bindemittel im Bauwesen	2 SWS	Lecture (V) / 💻	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 7.48 Course: Numerical Methods in Geosciences [T-BGU-104816]

Responsible: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-102436 - Numerical Methods in Geosciences

Type	Credits	Recurrence	Version
Written examination	6	Each winter term	1

Events					
WS 20/21	6339078	Numerical Methods in Geosciences	4 SWS	Lecture / Practice (VÜ) /	Kohl, Gaucher

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

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 7.49 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	Recurrence	Expansion	Version
Oral examination	5	Each winter term	1 terms	1

Events					
WS 20/21	6339099	Ore-forming processes	3 SWS	Lecture / Practice (VÜ) /	Kolb, Patten, Walter

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 7.50 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	Recurrence	Version
Examination of another type	5	Each summer term	1

Events					
SS 2020	6339104	Gesteinsbildende Prozesse/ Rock forming processes	3 SWS	Lecture (V)	Drüppel
SS 2020	6339108	Geländeübung/ Field course	1 SWS	Practice (Ü)	Drüppel

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 7.51 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	Version
Written examination	8	1

Events					
WS 20/21	5206	Physikalische Chemie I	4 SWS	Lecture (V) /	Schuster, Kappes
WS 20/21	5207	Übungen zur Vorlesung Physikalische Chemie I	2 SWS	Practice (Ü) /	Schuster, Kappes, Strelnikov, Assistenten

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

Prerequisites
none

T 7.52 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	Recurrence	Version
Examination of another type	5	Each term	1

Events					
SS 2020	6339082	Projektstudie/ Project Study	6 SWS	Practice (Ü)	Dozenten der Geowissenschaften

Prerequisites
none

T 7.53 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	Recurrence	Version
Examination of another type	2	Each summer term	1

Events					
SS 2020	6339089	Radiogeochemische Geländeübung und Radiogeochemisches Seminar	2 SWS	Practice (Ü)	Heberling, Metz

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

T 7.54 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	Recurrence	Version
Examination of another type	2	Each summer term	1

Events					
WS 20/21	6339071	Reservoir Analogs & Core Description	2 SWS	Seminar (S) /	Schmidt, Hilgers

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

Prerequisites
...

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 7.55 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	Recurrence	Version
Written examination	5	Each summer term	1

Events					
SS 2020	6310600	Reservoir-Geology	2 SWS	Lecture / Practice (VÜ)	Hilgers, Busch
SS 2020	6310601	Field Seminar Reservoir-Geology	4 SWS	Seminar (S)	Hilgers

Prerequisites
none

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

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

T 7.56 Course: Rock Mechanics and Tunneling [T-BGU-100069]

Responsible: Thomas Mutschler
Martin Wagner
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-100069 - Rock Mechanics and Tunneling

Type	Credits	Recurrence	Version
Written examination	5	Each term	2

Events					
SS 2020	6251804	Basics in Rock Mechanics	2 SWS	Lecture / Practice (VÜ)	Mutschler
SS 2020	6251806	Basics in Tunnel Construction	2 SWS	Lecture / Practice (VÜ)	Wagner

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
preparation of the student research project for examination preparation

Annotation
none

T 7.57 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	Recurrence	Version
Written examination	5	Each winter term	1

Events					
WS 20/21	6339040	Sedimentpetrologie	4 SWS	Lecture / Practice (VÜ) /	Zeh

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

Prerequisites
none

T 7.58 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	Recurrence	Version
Oral examination	4	Each winter term	1

Events					
WS 20/21	2125763	Structural and phase analysis	2 SWS	Lecture (V) /	Wagner, Hinterstein

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

Competence Certificate
Oral examination

Prerequisites
none

T 7.59 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	Recurrence	Version
Oral examination	4	Each summer term	1

Events					
SS 2020	2126775	Structural Ceramics	2 SWS	Lecture (V)	Hoffmann

Competence Certificate
Oral examination, 20 min

Prerequisites
none

T 7.60 Course: Student Research Project 'Earthworks and Foundation Engineering' [T-BGU-100178]

Responsible: Dr.-Ing. Andreas Bieberstein
Dr.-Ing. Peter Kudella

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

Part of: M-BGU-100068 - Earthworks and Foundation Engineering

Type	Credits	Recurrence	Version
Completed coursework	2	Each winter term	2

Events					
WS 20/21	6251701	Foundation Types	2 SWS	Lecture / Practice (VÜ)	Knittel
WS 20/21	6251703	Basics in Earthworks and Embankment Dams	2 SWS	Lecture / Practice (VÜ) / 🖳	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 7.61 Course: Student Research Project 'Rock Mechanics and Tunneling' [T-BGU-100179]

Responsible: Thomas Mutschler
Martin Wagner

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

Part of: M-BGU-100069 - Rock Mechanics and Tunneling

Type	Credits	Recurrence	Version
Completed coursework	1	Each summer term	2

Events					
SS 2020	6251804	Basics in Rock Mechanics	2 SWS	Lecture / Practice (VÜ)	Mutschler
SS 2020	6251806	Basics in Tunnel Construction	2 SWS	Lecture / Practice (VÜ)	Wagner

Competence Certificate
report appr. 15 pages;
definition of a project available from lecturer

Prerequisites
none

Recommendation
none

Annotation
none

T 7.62 Course: Thermal Use of Groundwater [T-BGU-106803]

Responsible: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-103408 - Thermal Use of Groundwater

Type	Credits	Recurrence	Version
Oral examination	4	Each winter term	2

Events					
WS 20/21	6339115	Thermal Use of Groundwater	2 SWS	Lecture / Practice (VÜ) /	Blum

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

Competence Certificate
The assessment consists of an oral exam (approx. 25 min), according to § 4 Par. 2 No. 2.

T 7.63 Course: Urban Ecology [T-BGU-103001]

Responsible: Stefan Norra
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-101568 - Urban Ecology

Type	Credits	Recurrence	Version
Examination of another type	3	Each winter term	4

Events					
WS 20/21	6111211	Seminar Stadtökologie	2 SWS	Seminar (S) /	Norra, Böhnke

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

Prerequisites
None

Recommendation
None

Annotation
None

T 7.64 Course: Urban Ecology Lecture [T-BGU-106684]

Responsible: apl. Prof. Dr. Stefan Norra
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-101568 - Urban Ecology

Type	Credits	Recurrence	Version
Completed coursework (written)	3	Each summer term	4

Events					
SS 2020	6111211	Stadtökologie	2 SWS	Lecture (V)	Norra

Prerequisites
None

Recommendation
None

Annotation
None

T 7.65 Course: Urban Ecology Practical Course [T-BGU-106685]

Responsible: apl. Prof. Dr. Stefan Norra
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-101568 - Urban Ecology

Type	Credits	Recurrence	Version
Examination of another type	6	Each summer term	2

Events					
SS 2020	6111213	Stadtökologie	3 SWS	Practical course (P)	Norra, Gebhardt

Prerequisites
None

Recommendation
None

Annotation
None

T 7.66 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	Recurrence	Version
Examination of another type	6	Each term	2

Events					
WS 20/21	6224702	Water and Energy Cycles in Hydrological Systems: Processes, Predictions and Management	4 SWS	Lecture / Practice (VÜ) / 💻	Zehe, Loritz

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
as from summer term 2020 examination of other type

T 7.67 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	Recurrence	Version
Oral examination	10	Each term	1

Events					
WS 20/21	22603	Scientific Principles for Water Quality Assessment	2 SWS	Lecture (V) / 🖳	Abbt-Braun
WS 20/21	22621	Water Technology	2 SWS	Lecture (V) / 🖳	Horn
WS 20/21	22622	Exercises to Water Technology	1 SWS	Practice (Ü) / 🖳	Horn, und Mitarbeiter

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

Prerequisites
None

T 7.68 Course: Water Technology [T-CIWVT-106802]

Responsible: Prof. Dr. Harald Horn
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-103407 - Water Technology

Type	Credits	Recurrence	Version
Oral examination	6	Each winter term	1

Events					
WS 20/21	22621	Water Technology	2 SWS	Lecture (V) / 🖳	Horn
WS 20/21	22622	Exercises to Water Technology	1 SWS	Practice (Ü) / 🖳	Horn, und Mitarbeiter

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