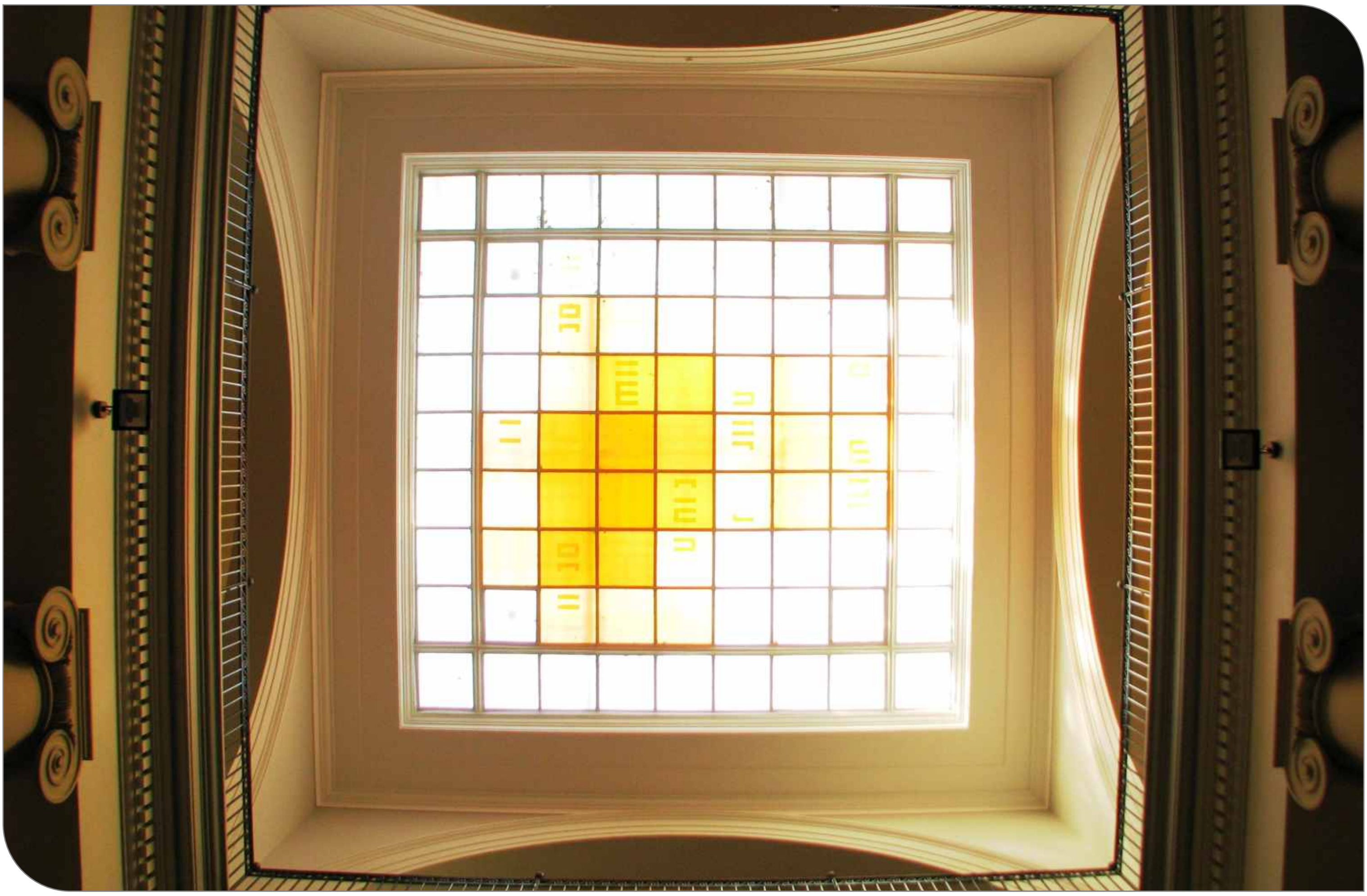
Module Handbook

Civil Engineering (Master of Science (M.Sc.), ER/SPO 2017)

Summer term 2025

Date: 06/03/2025

KIT DEPARTMENT OF CIVIL ENGINEERING, GEO- AND ENVIRONMENTAL SCIENCES



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1 Preliminary remarks

The module handbook is the document in which important additional information about the studies is described. General examination regulation rules (see https://www.sle.kit.edu/english/vorstudium/master-civil-engineering.php; *in German*) and the program structure are specified by the curriculum (Chapt. 2). The main function of the Module Handbook is the compilation of module descriptions (Chapt. 5) and learning controls (Chapt. 6).

In addition to the module handbook, information on the individual courses (form, content, language, etc.) is in the online course catalog. For links to the courses (online) see the learning controls (Chapt. 6). The course language is indicated in the module tables (Chapt. 2) and partly in the course catalog (online). Information on the examinations in the current semester is provided via the portal Campus Management for Students and via notices and on the institutes' web pages as well.

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2 Curriculum

This section describes the additional 'Curriculum' rules to the examination and study regulation (ER/SPO) and their amendment statutes, also available online:

https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2017_AB_011.pdf
(2017 KIT 011 Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Masterstudiengang Bauingenieurwesen; *in German*)
https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2020_AB_049.pdf
(2020 KIT 049 Satzung des Karlsruher Instituts für Technologie (KIT) über die Änderung der Studien- und Prüfungsordnungen zur Anwendbarkeit der Satzung des Karlsruher Instituts für Technologie (KIT) zur Durchführung von Erfolgskontrollen im Antwort-Wahl-V., Artikel 38; *in German*)
https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2021_AB_012.pdf
(2021 KIT 012 Satzung zur Änderung der Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Masterstudiengang Bauingenieurwesen; *in German*)
https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2022_AB_016.pdf
(2022 KIT 016 Satzung des Karlsruher Instituts für Technologie (KIT) zur Änderung der Regelungen über den Nachteilsausgleich in den Studien- und Prüfungsordnungen gemäß § 32 Abs. 4 Nr. 5 LHG in der Fassung des 4. Hochschuländerungsgesetzes (HRÄG), Artikel 36; *in German*)
https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2022_AB_037.pdf
(2022 KIT 037 Satzung des Karlsruher Instituts für Technologie (KIT) über die Änderung der Studien- und Prüfungsordnungen zur Anwendbarkeit der Satzung zur Durchführung von Online-Prüfungen am Karlsruher Institut für Technologie (KIT), Artikel 34; *in German*)
https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2023_AB_029.pdf
(2023 KIT 029 Satzung zur Änderung der Regelung über die mündliche Nachprüfung in den Studien- und Prüfungsordnungen des Karlsruher Institut für Technologie (KIT), Artikel 38; *in German*)

2.1 Objectives of the master degree program

The master degree program **Civil Engineering** provides a in-depth and research-oriented qualification in all typical professional fields of civil engineering. The main component of the qualification is the engineering application of the qualifications acquired during the bachelor studies supplemented by in-depth and extended knowledge in at least two of the following five study foci: '*Structural Engineering*', '*Water and Environment*', '*Mobility and Infrastructure*', '*Technology and Management in Construction*' and '*Geotechnical Engineering*'.

The graduates can independently apply their scientific profound and interdisciplinary knowledge and methods in the fields of system analysis, measurement techniques, modeling and management across the disciplines. They can evaluate their significance and scope for solving complex scientific and societal problems. They can develop innovative problem solutions beyond the application of established structurally engineered and scientific rules, and enter new fields of engineering. Because of the increasing complexity of these problems they develop overall economic, socially and ecologically acceptable solutions within an interdisciplinary team.

They have the capability to present technically complex issues understandably and to perform convincingly which prepares them very well for executive functions - also in an interdisciplinary team. They are qualified for responsible activities in planning offices and consultancy, industry, administration and science. They also obtain the qualification for Ph.D. studies.

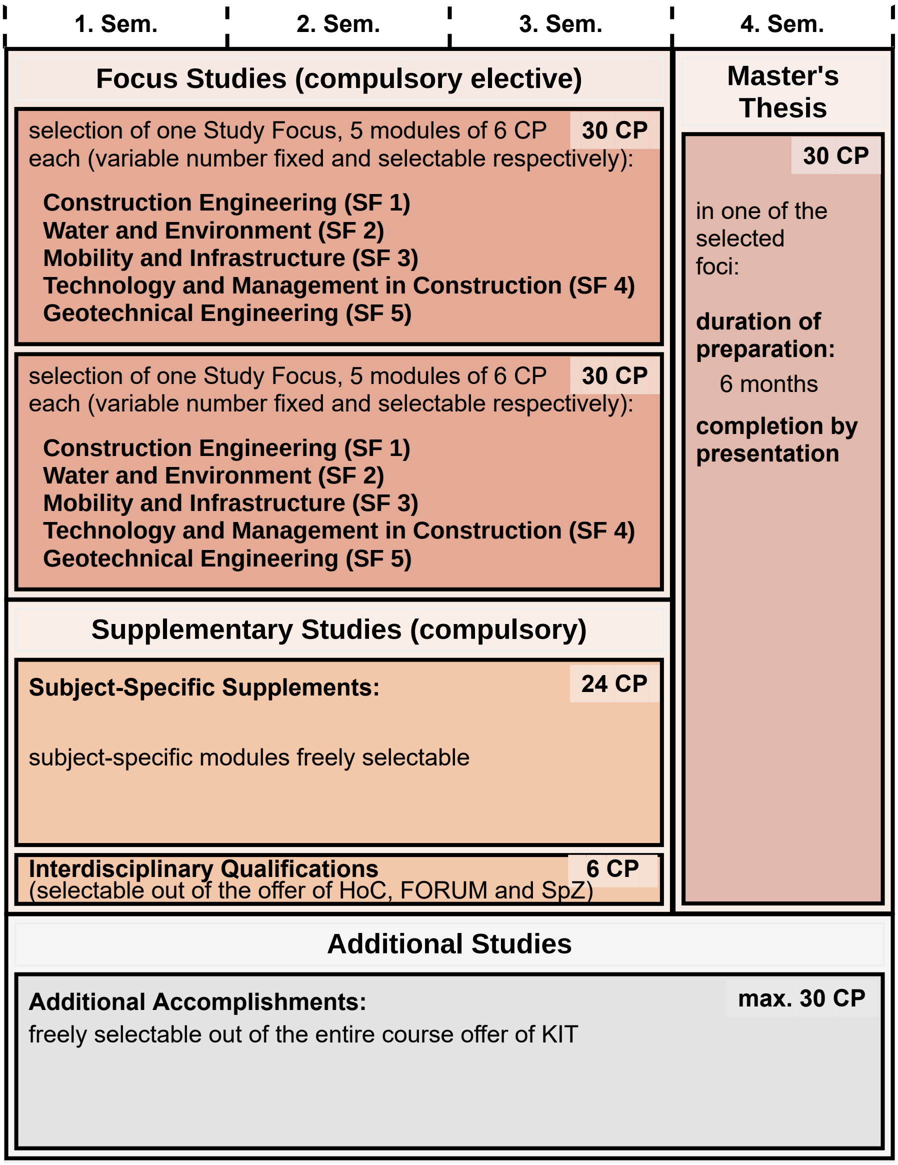
2.2 Structure of the master degree program

The master degree program Civil Engineering comprises 120 credit points (CP). It is structured in a compulsory elective section, the **Focus Studies** (60 CP), a compulsory section, the **Supplementary Studies** (30 CP), and the **Master's Thesis** (30 CP; comp. ER/SPO § 19). Within the Focus Studies two of the five subject-related **Study Foci**

I. Construction Engineering
II. Water and Environment
III. Mobility and Infrastructure
IV. Technology and Management in Construction
V. Geotechnical Engineering

have to be selected as compulsory elective subjects. These represent the different characteristics of the occupational profile. They cover 30 CP each and have different structurs regarding the assigned compulsory modules (PM) and compulsory elective modules (SM). All modules in the master degree program cover 6 CP each and are integrated into these subject-related study foci (s. Tab. 1 - 5) as described in the following sections.

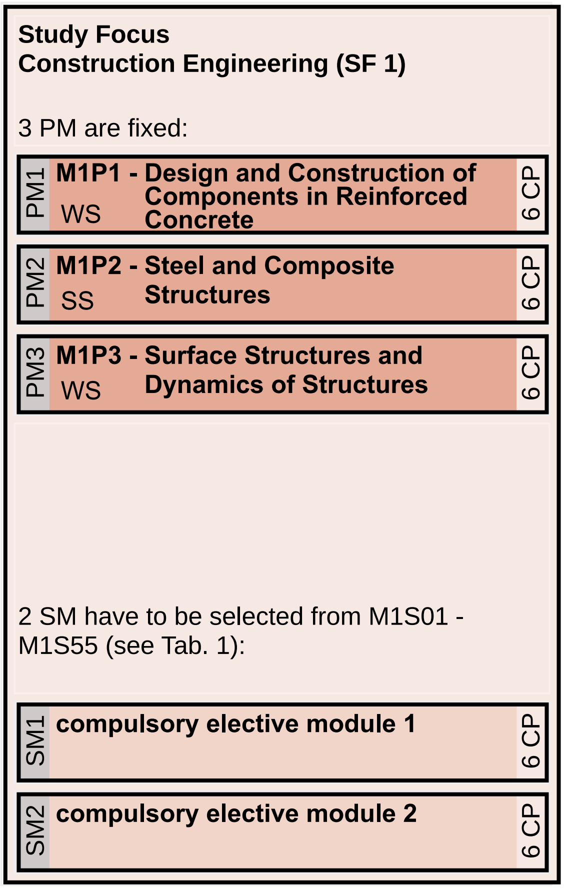
The Supplementary Studies comprises the two compulsory subjects **Subject-Specific Supplements** (24 CP) and **Interdisciplinary Qualifications** (6 CP). Within the subject Subject-Specific Supplements, all modules not already elected from all study foci can be freely selected. To obtain the interdisciplinary qualifications, courses can basically be freely selected from the corresponding course catalog on key competences offered by the House of Competence (HoC) or of the 'General Studies. Forum Science and Society' (FORUM, formerly ZAK) or language courses of the 'Sprachenzentrum' (SpZ, center of language studies).



2.2.1 Study Focus ’Construction Engineering’ (SF 1)

Civil engineers working in construction engineering deal with planning, design and calculation of structures and structural designs of all kinds. The graduates of the study focus '*Construction Engineering*' are able to design, plan and calculate structures and structural designs independently considering technological, ecological and economic aspects by means of their broad knowledge on building material properties and designing approaches.

All modules offered in the study focus ’Construction Engineering’ are summarized in Table 1. This table also provides information about which semester the associated courses are in and the corresponding course assessment.



In this study focus three compulsory modules are predetermined:

- Design and Construction of Components in Reinforced Concrete
- Steel and Composite Structures
- Surface Structures and Dynamics of Structures

In addition, two compulsory elective modules, study focus modules, have to be selected (see Tab. 1).

For several modules recommendations are given which modules should be taken in advance or in parallel.

As part of several courses numerous field trips are offered. It is recommended to attend at least one field trip.

Table 1: Modules in Study Focus Construction Engineering

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
Compulsory modules:								
M1P1:	Design and Construction of Components in Reinforced Concrete	6	Design and Construction of Components in Reinforced Concrete (G)	L/E	2/2		ngA wE	2 4
M1P2:	Steel and Composite Structures	6	Steel and Composite Structures (G)	L/E		2/2	ngA wE	2 4
M1P3:	Surface Structures and Dynamics of Structures	6	Surface Structures (G)	L	2		ngA wE	1 2
			Dynamics of Structures *) (G)	L	2		ngA wE	1 2
Sum compulsory modules		**18**			**8**	**4**		
Compulsory elective modules:								
M1S01:	Bracing and Stability in Reinforced Concrete	6	Bracing and Stability in Reinforced Concrete (G)	L/E		2/2	wE	6
M1S02:	Basics of Prestressed Concrete	6	Basics of Prestressed Concrete (G)	L/E		2/2	wE	6
M1S03:	Solid Construction Bridges	6	Solid Construction Bridges (G)	L/E	2/2		ngA 6) wE	1 5
M1S04:	Applied Dynamics of Structures 1)	6	Applied Dynamics of Structures (G)	L/E		1/1	wE	6
			Earthquake Engineering (G)	L/E	1/1			
M1S06:	Material Science, Welding and Fatigue	6	Material Science, Welding and Fatigue (G)	L/E		4	wE	6
M1S07:	Construction of Steel and Composite Bridges	6	Construction of Steel and Composite Bridges (G)	L/E		2/2	wE	6
M1S08:	Hollow Section Structures	6	Hollow Section Structures **) (G)	L/E	2/2		oE	6
M1S09:	Glass, Plastic and Cable Structures	6	Glass, Plastic and Cable Structures (G)	L/E	3/1		oE	6
M1S11:	Building Preservation of Steel and Timber Structures 5a)	6	Building Preservation in Steel Structures (G)	L	2		wE	3
			Building Preservation in Timber Structures (G)	L/E	2		wE	3
M1S12:	Timber Structures	6	Timber Structures (G)	L/E		2/2	wE	6
M1S14:	Non-linear Analysis of Beam Structures	6	Non-linear Analysis of Beam Structures (G)	L/E	2/2		wE	6
M1S15:	Computational Analysis of Structures	6	Computational Analysis of Structures (G)	L/E		2/2	ngA 6) oE	2 4
M1S16:	FE-Applications in Practical Engineering	6	FE-Applications in Practical Engineering (G)	L/E		4	EoT	6
M1S17:	Shell Structures and Stability of Structures	6	Shell Structures (G)	L/E		1/1	ngA 6) oE	2 4
			Stability of Structures (G)	L/E		1/1		
M1S18:	Numerical Methods in Structural Analysis	6	Numerical Methods in Structural Analysis (G)	L/E	4		oE	6
M1S19:	Non-linear Analysis of Surface Structures	6	Non-linear Analysis of Surface Structures (G)	L/E	2/2		oE	6
M1S20:	Basics of Finite Elements	6	Basics of Finite Elements (G)	L/E	2/2		ngA oE	1 5
M1S21:	Fracture and Damage Mechanics	6	Fracture and Damage Mechanics (G)	L/E		2/2	oE	6
M1S22:	Material Models in Solid Mechanics	6	Material Models in Solid Mechanics (G)	L/E	2/2		oE	6

(continuing next page)

*) Practical course Dynamics of Structure recommended as supplementary additional accomplishment

**) Courses were not offered in winter term 2024/25

Table 1: Modules in Study Focus Construction Engineering (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M1S24:	Concrete Construction Technology	6	Concrete Technology (G)	L/E	3		oE	6
			Modeling in Concrete Technology (E)	L	1			
M1S25:	Durability and Service Life Design	6	Corrosion Processes and Life Time (G)	L/E	3		oE	6
			Analytic Methods (G)	L	1			
M1S26:	Building Preservation of Concrete and Masonry Constructions	6	Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions (G)	L/E		2/1	ngA oE	1 5
			Building Analysis (G)	L		1		
M1S27:	Building Physics I	6	Applied Building Physics (G)	L	2		oE	3
			Building Technology (G)	L	2		oE	3
M1S28:	Building Physics II	6	Practical Noise Control (G)	L		2	oE	3
			Practical Fire Protection (G)	L		2	oE	3
M1S29:	Materials Testing and Measuring Techniques	6	Measuring Techniques in Construction Engineering (G)	L/E	1/1		oE	6
			Materials Testing in the Field of Concrete (G)	L	2			
M1S37:	Finite Elements in Solid Mechanics	6	Finite Elements in Solid Mechanics (G)	L/E		2/2	oE	6
M1S38:	Numerical Structural Dynamics	6	Numerical Structural Dynamics (G)	L/E		4	oE	6
M1S39:	Tank Construction	6	Tank Construction (G)	L/E	3/1		EoT oE	3 3
M1S40:	Modeling in Solid Mechanics	6	Modeling in Solid Mechanics (G)	L/E		4	oE	6
M1S41:	Contact Mechanics	6	Contact Mechanics (G)	L/E	2/2		oE	6
M1S42:	Digital Planning and Building Information Modeling	6	Digital Planning and Building Information Modeling (G)	L/E	4		EoT	6
M1S43:	Design and Construction in Metal and Lightweight Structures	6	Design and Construction in Metal and Lightweight Structures (G)	L/E	4		EoT	6
M1S44:	Timber Structures: Materials and Appropriate Design [5b)]	6	Timber Structures: Materials and Appropriate Design (G)	L/E	4		oE	6
M1S45:	Innovations and Developments in Steel and Timber Structures [5a)]	6	Innovations and Developments in Metal and Lightweight Structures (G)	L/E		2	oE	3
			Innovations and Developments Timber Structures (G)	L/E	2		oE	3
M1S46:	Building Preservation and Innovations in Metal and Lightweight Structures [5c)]	6	Building Preservation in Steel Structures (G)	L/E	2		wE	3
			Innovations and Developments in Metal and Lightweight Structures (G)	L/E		2	oE	3
M1S47:	Building Preservation and Innovations in Timber Structures [5c)]	6	Building Preservation in Timber Structures (G)	L/E	2		wE	3
			Innovations and Developments Timber Structures (G)	L/E	2		oE	3
M1S48:	Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis	6	Structural Analysis with Uncertain Data (G)	L		2	oE	6
			Artificial Neural Networks in Structural Analysis (G)	L		1		
			Structural Optimization (G)	L		1		
M1S49:	Continuum Mechanics and Wave Propagation [2,4)]	6	Continuum Mechanics (G)	L	2		oE	3
			Wave Propagation in Solids (G)	L		2	oE	3

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Table 1: Modules in Study Focus Construction Engineering (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M1S50:	Practical Course in Experimental Solid Mechanics 2)	6	Basics of Experimental Solid Mechanics (G)	P	2		ngA 6)	3
			Advanced Experimental Solid Mechanics (G)	P		2	ngA 6) oE	3
M1S51:	Interdisciplinary Design of Timber Structures	6	Interdisciplinary Design of Timber Structures ***) (G)	L/E		4	EoT	6
M1S52:	Fire Behavior of Building Materials, Components and Constructions	6	Fire Behavior of Building Materials, Components and Constructions (G)	L/E	2/2		oE	6
M1S53:	Mechanics of Composite Materials	6	Mechanics of Planar Laminates (G)	L	2		oE	3
			Micromechanics of Heterogeneous Solids (G)	L		2	oE	3
M1S54:	Practical FE Analyses in Strength Analysis	6	Practical FE Analyses in Strength Analysis (G)	L/E	2/2		ngA 6) oE	1 5
M1S55:	Construction Chemistry II 3)	6	Construction Chemistry II (G)	L/E		2/2	oE	6
Sum compulsory elective modules		**252**			**90**	**78**		

***) In this course, interdisciplinary qualifications 'Working in interdisciplinary teams' are taught additionally; for this, 1 CP can be credited.

explanations to Table 1:

in general:

- M1PX Study Focus I, compulsory modules
- M1SXX Study Focus I, compulsory elective modules
- LC learning control
- CP credit point
- HpW / SWS hours per week
- W / S winter term / summer term
- G / E language German / English
- 1) Starting the module in summer term (S) is recommended.
- 2) Starting the module in winter term (W) is recommended.
- 3) Module will be offered newly as from summer term 2025.
- 4) Module must not be selected together with module M5P4 (SF 5) and not with module M1S32 not offered anymore.
- 5a) Module must not be selected together with the modules M1S46 and M1S47.
- 5b) Module must not be selected together with the module M1S13 not offered anymore.
- 5c) Module must not be selected together with the modules M1S11 and M1S45.

type of course:

- L lecture
- L/E lecture and exercise, separate or integrated
- P practical course

type of learning control:

- wE written examination
- oE oral examination
- EoT examination of other type
- ngA not graded accomplishment
- ngA 6) not graded accomplishment as examination prerequisite

2.2.2 Study Focus 'Water and Environment' (SF 2)

Civil engineers working in water management and environmental engineering deal with the management of water resources, their interaction with soil and air as well as the handling of waste and wastewater. The graduates of the study focus '*Water and Environment*' can develop efficient and adapted solutions for any kind of problems in water management based on a in-depth understanding of fluid mechanical processes on water and mass transport as well as methods for their quantification.

All modules offered in the study focus 'Water and Environment' are summarized in Table 2. This table also provides information about which semester the associated courses are in and the corresponding course assessment.

Study Focus
Water and Environment (SF 2)

3 PM out of 5 PM have to be selected:

PM1	**M2P9 - Advanced Fluid Mechanics** SS	6 CP
PM2	**M2P5 - Numerical Fluid Mechanics** WS	6 CP
PM3	**M2P6 - Hydraulic Engineering** SS	6 CP
PM4	**M2P10 - Urban Water Infrastructure and Management** WS	6 CP
PM5	**M2P8 - Water and Energy Cycles** WS	6 CP

2 SM have to be selected from M2S04 - M2S55 or M2P5 - M2P10, if not already selected as PM (see Tab. 2):

SM1	**compulsory elective module 1**	6 CP
SM2	**compulsory elective module 2**	6 CP

In this study focus five compulsory modules are predetermined:

- Advanced Fluid Mechanics
- Numerical Fluid Mechanics
- Hydraulic Engineering
- Urban Water Infrastructure and Management
- Water and Energy Cycles

At least three out of these five compulsory modules have to be selected. In case of selecting less than five compulsory modules the corresponding number of compulsory elective modules, study focus modules, have to be selected (see Tab 2).

Table 2: Modules in Study Focus Water and Environment

Module			Course				LC	
Code (baui)	Name	CP	Name (Language)	Type	HpW / SWS W	 S	Type	CP
*Compulsory modules *): 3 compulsory modules have to be selected, in total 18 CP.*								
M2P5:	Numerical Fluid Mechanics *)	6	Numerical Fluid Mechanics (E)	L/E	4		wE	6
M2P6:	Hydraulic Engineering *)	6	River Engineering (E)	L/E		2	ngA [6]	1
			Design of Hydraulic Structures (E)	L/E		2	ngA [6] wE	1 4
M2P8:	Water and Energy Cycles *)	6	Water and Energy Cycles in Hydrological Systems: Processes, Predictions and Management (E)	L/E	4		EoT	6
M2P9:	Advanced Fluid Mechanics *)	6	Advanced Fluid Mechanics (E)	L/E		4	wE	6
M2P10:	Urban Water Infrastructure and Management *)	6	Urban Water Infrastructure and Management (E)	L/E	4		ngA [6] wE	2 4
Sum compulsory modules		**30**			**12**	**8**		
*Compulsory elective modules *): At least 2 modules out of the compulsory elective modules and the not already selected compulsory modules have to be selected, in total 12 CP.*								
M2S03:	Subsurface Flow and Contaminant Transport [3]	6	Transport and Transformation of Contaminants in Hydrological Systems (E)	L/E		4	oE	6
M2S04:	Analysis of Spatial Data	6	Geostatistics (E)	L/E		4	EoT	6
M2S05:	Hydrological Measurements in Environmental Systems	6	Hydrological Measurements in Environmental Systems (E)	PE		4	EoT	6
M2S07:	Environmental Communication	6	Environmental Communication [2] (G)	S	2	2	ngA [6] EoT	0 6
M2S08:	Groundwater Management [1]	6	Groundwater Hydraulics (E)	L/E		2	oE	3
			Numerical Groundwater Modeling (E)	Pj	2		EoT	3
M2S11:	Hydro Power Engineering	6	Hydro Power Engineering (G)	L/E		4	oE	6
M2S12:	Waterway Engineering	6	Waterway Engineering (G)	L/E		4	ngA [6] oE	1 5
M2S19:	Environmental Fluid Mechanics	6	Environmental Fluid Mechanics (E)	L/E	4		wE	6
M2S21:	Advanced Computational Fluid Dynamics	6	Numerical Fluid Mechanics II (E)	L/E		2	oE	3
			Parallel Programming Techniques for Engineering Problems (E)	L/E		2	oE	3
M2S33:	Project Studies in Water Resources Management	6	Project Studies in Water Resources Management (G)	L/E	4		EoT	6
M2S34:	Numerical Flow Modeling in Hydraulic Engineering	6	Numerical Flow Modeling in Hydraulic Engineering (G)	L/E	4		oE	6
M2S36:	Hydraulic Structures [3]	6	Groundwater Flow around Structures (E)	L/E		2	wE	3
			Interaction Flow - Hydraulic Structures (E)	L/E	2		wE	3
M2S38:	Water Distribution Systems	6	Water Distribution Systems (E)	L/E	4		ngA [6] oE	2 4
M2S39:	Experiments in Fluid Mechanics	6	Experiments in Fluid Mechanics (E)	L/E		4	EoT	6
M2S41:	Freshwater Ecology	6	Applied Ecology and Water Quality (E)	L/S		3	EoT	3
			Field Training Water Quality (E)	E		1	EoT	3
M2S42:	River Basin Modeling [1]	6	Mass Fluxes in River Basins (E)	L		2	ngA [6]	3
			Modeling Mass Fluxes in River Basins (E)	E	2		EoT	3
M2S43:	Wastewater Treatment Technologies	6	Wastewater Treatment Technologies (E)	L/E		4	wE	6

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Table 2: Modules in Study Focus Water and Environment (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M2S44:	Introduction to Environmental Data Analysis and Statistical Learning	6	Introduction to Environmental Data Analysis and Statistical Learning (E)	L/E	4		ngA [6)] wE	2 4
M2S45:	Fluid Mechanics of Turbulent Flows	6	Fluid Mechanics of Turbulent Flows (E)	L/E		4	oE	6
M2S46:	Modeling of Turbulent Flows – RANS and LES	6	Modeling of Turbulent Flows – RANS and LES (E)	L/E	4		oE	6
M2S47:	Interaction Flow - Building Structure [5a)]	6	Interaction Flow - Hydraulic Structures (E)	L/E	2		wE	3
			Building and Environmental Aerodynamics (E)	L/E	1/1		oE	3
M2S48:	Integrated Design Project in Water Resources Management	6	Integrated Design Project in Water Resources Management (E)	L/E		4	EoT	6
M2S49:	River Processes [5b)]	6	Landscape and River Morphology (E)	L/E		2	EoT	6
			Transport Processes in Rivers (E)	L/E		2		
M2S50:	Deep Learning in Hydrological Modeling	6	Deep Learning in Hydrological Modeling (E)	L/E		4	EoT	6
M2S51:	Stormwater Management	6	Stormwater Management (E)	L/E		4	EoT	6
M2S52:	Modeling Wastewater Treatment Processes	6	Modeling Wastewater Treatment Processes (E)	L/E		4	EoT	6
M2S53:	Experimental Hydraulics and Measurement Techniques [5c)]	6	Flow Measurement Techniques (E)	L/E	2		oE	3
			Experimental Hydraulics (E)	L/E	2		EoT	3
M2S54:	Surface and Subsurface Contaminant Transport [4a)]	6	Surface and Subsurface Contaminant Transport: From Processes to Numerical Models (E)	L/E		4	oE	6
M2S55:	Hydraulic Interactions [4b)]	6	Interaction Flow - Sediment Bed and Subsurface (E)	L/E		2	wE	3
			Interaction Flow - Hydraulic Structures (E)	L/E	2		wE	3
Sum compulsory elective modules		**156**			**42**	**64**		

explanations to Table 2:

in general:

M2PX	Study Focus II, compulsory modules
M2SXX	Study Focus II, compulsory elective modules
LC	learning control
CP	credit point
HpW / SWS	hours per week
W / S	winter term / summer term
G / E	language German / English
1)	Starting the module in summer term (S) is recommended.
2)	Course is offered every semester.
3)	Module will not be offered anymore as from summer term 2025.
4a)	Module will be offered newly as from summer term 2025 and must not be selected together with the module M2S03 not offered anymore.
4b)	Module will be offered newly as from summer term 2025 and must not be selected together with the module M2S36 not offered anymore.
5a)	Module must not be selected together with the module M2S55.
5b)	Module must not be selected together with the module M2S35 not offered anymore.
5c)	Module must not be selected together with the module M2S37 not offered anymore.

type of course:

L	lecture
L/E	lecture and exercise, separate or integrated
L/S	lecture and seminar, integrated
E	exercise
S	seminar
PE	practical exercise
Pj	project

type of learning control:

wE	written examination
oE	oral examination
EoT	examination of other type
ngA 6)	not graded accomplishment as examination prerequisite

2.2.3 Study Focus ’Mobility and Infrastructure’ (SF 3)

Civil Engineers working in urban, regional and federal state planning or transportation, highway engineering and railroad deal with the provision and maintenance of transportation infrastructure. The graduates of the study focus '*Mobility and Infrastructure*' are able to design, construct and operate transportation systems under logistical, ecological and socio-economic aspects by means of in-depth knowledge of the interrelationships between urban planning, regional planning, mobility behavior and required infrastructure.

All modules offered in the study focus ’Mobility and Infrastructure’ are summarized in Table 3. This table also provides information about which semester the associated courses are in and the corresponding course assessment.

Study Focus
Mobility and Infrastructure (SF 3)

3 PM out of 5 PM have to be selected:

PM1	**M3P1 - Urban and Regional Planning** WS	6 CP
PM2	**M3P2 - Models and Methods in Traffic Engineering and Transportation Planning** WS	6 CP
PM3	**M3P3 - Infrastructure Management** SS	6 CP
PM4	**M3P5 - Laws and Proceedings concerning Traffic and Roads** SS	6 CP
PM5	**M3P6 - City Transport Facilities** WS	6 CP

2 SM have to be selected from M3S01 - M3S25 or M3P1 - M3P6, if not already selected as PM (see Tab. 3):

SM1	**compulsory elective module 1**	6 CP
SM2	**compulsory elective module 2**	6 CP

In this study focus five compulsory modules are predetermined:

- Urban and Regional Planning
- Models and Methods in Traffic Engineering and Transportation Planning
- Infrastructure Management
- Laws and Proceedings concerning Traffic and Roads
- City Transport Facilities

At least three out of these five compulsory modules have to be selected. In case of selecting less than five compulsory modules the corresponding number of missing modules have to be selected from the offer of this study focus (Tab. 3).

Students selecting the study focus ’Mobility and Infrastructure’ are recommended to attend one field trip over several days. Normally, this takes place annually in the week following the Whitsun holidays.

Table 3: Modules in Study Focus Mobility and Infrastructure

Module			Course				LC	
Code (baui)	Name	CP	Name (Language)	Type	HpW / SWS W	HpW / SWS S	Type	CP
*Compulsory modules *): 3 compulsory modules have to be selected, in total 18 CP.*								
M3P1:	Urban and Regional Planning *)	6	Urban Planning (G)	L/E	2		oE	6
			Regional Planning (G)	L	2			
M3P2:	Models and Methods in Traffic Engineering and Transportation Planning *)	6	Methods and Models in Transportation Planning (G)	L/E	2		oE	6
			Traffic Engineering (G)	L/E	2			
M3P3:	Infrastructure Management *)	6	Design and Construction of Highways (G)	L		2	wE	6
			Operation and Maintenance of Highways (G)	L		2		
M3P5:	Laws and Proceedings concerning Traffic and Roads *)	6	Laws concerning Traffic and Roads (G)	L		2	wE	6
			Environmental Impact Assessment (G)	L		1		
			Assessment and Evaluation Techniques (G)	L		1		
M3P6: (M3S17)	City Transport Facilities *)	6	City Transport Facilities (G)	L/E	4		ngA [8] oE	2 4
Sum compulsory modules		**30**			**12**	**8**		
*Compulsory elective modules *): At least 2 modules out of the compulsory elective modules and the not already selected compulsory modules have to be selected, in total 12 CP.*								
M3S01:	Urban Renewal	6	Urban Management (G)	L/E		2	ngA [8] oE	1 2
			History of Urban Planning (G)	L		2	oE	3
M3S02:	Space and Infrastructure [1]	6	Introduction to GIS for Students of Natural, Engineering and Geo Sciences (G)	L/E	4		ngA [8] ngA [8] wE	3 1 2
			Logistics, Supply and Disposal (G)	L/E		2		
M3S03:	Traffic Management and Simulation Methods	6	Traffic Management and Transport Telematics (G)	L/E		2	ngA [8] oE	0 6
			Traffic Flow Simulation (G)	L/E		2		
M3S04:	Planning of Transportation Systems	6	Characteristics of Transportation Systems (G)	L		2	wE	6
			Strategic Transport Planning (G)	L		2		
M3S05:	Highway Design	6	IT-based Road Design (G)	L/E	2		ngA [8] oE	2 4
			Highway Design Project Study (G)	L/E	2			
M3S06:	Road Construction	6	Practical Laboratory Training in Road Construction (G)	L/E	2		oE	6
			Pavement Structural Design and Failure Analysis (G)	L	2			
M3S09:	Project Integrated Planning [2]	6	Project Integrated Planning (G)	Pj	4		ngA [8] oE	5 1
M3S11:	Intermodality in Freight, Long-distance and Air Transport	6	Freight Transport (G)	L/E		2	wE	3
			Long-distance and Air Traffic (G)	L	2		wE	3
M3S12:	Road Safety	6	Safety Management in Highway Engineering (G)	L/E		2	ngA [8] wE	3 3
			Seminar in Highway Engineering (G)	S		2		

(continuing next page)

Table 3: Modules in Study Focus Mobility and Infrastructure (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M3S13:	Special Topics in Highway Engineering	6	Technical and Economic Management Tools in Highway Engineering **) (G)	L		2	oE	6
			Simulations and Analysis Methods in Highway Engineering **) (G)	L		1		
			Special Topics in Highway Engineering **) (G)	L		1		
M3S20:	Analysis and Evolution of Mobility	6	Transportation Data Analysis (G)	L/E	2		ngA [8] oE	0 6
			Mobility Services and new Forms of Mobility (G)	L		2		
M3S22:	Special Issues of Public Transport [3,6]	6	Tendering, Planning and Financing in Public Transport (G)	L		2	oE	3
			Information Management for Public Mobility Services (G)	L/E	2		EoT	3
			Sustainability in Mobility Systems (G)	L	2		wE	3
			Seminar in Transportation [4] (G)	S	2	2	EoT	3
			Seminar on Modeling and Simulation in Transportation (G)	S	2		EoT	3
M3S24:	Seminars on Empirical Research, Modeling and Simulation in Transportation [7]	6	Seminar in Transportation [4] (G)	S	2	2	EoT	3
			Seminar on Modeling and Simulation in Transportation (G)	S	2		EoT	3
M3S25:	Interdiscipliny Design – Urban and Transportation Planning	6	'Interdisciplinу Design – Urban and Transportation Planning' ***) [5] (G/E)	S/Pj	(4)	(4)	EoT	6
Sum compulsory elective modules		**84**			**34**	**32**		

**) Course will <u>not</u> be offered in summer term 2025.

***) Topic of the course varies over the semester and will be available in the course catalog.

explanations to Table 3:

in general:

- M3PX Study Focus III, compulsory modules
- M3SXX Study Focus III, compulsory elective modules
- LC learning control
- CP credit point
- HpW / SWS hours per week
- W / S winter term / summer term
- G / E language German / English
- 1) Starting the module in winter term (W) is recommended.
- 2) Taking this module in the first semester is not recommended.
- 3) Two of these courses with the related learning controls have to be selected.
- 4) Course is offered every semester.
- 5) Course is offered irregularly with varying topics (see also module description).
- 6) Not more than one of the two seminars can be selected. Selecting of the seminars the module M3S24 cannot be selected anymore.
- 7) Selecting this module none of the seminars in the module M3S22 can be selected.

type of course:

- L lecture
- L/E lecture and exercise, separate or integrated
- S seminar
- Pj project

type of learning control:

- wE written examination
- oE oral examination
- EoT examination of other type
- ngA [8] not graded accomplishment as examination prerequisite

2.2.4 Study Focus ’Technology and Management in Construction’ (SF 4)

Civil engineers working in construction management comprehensively deal with the life cycle of a building from planning to construction to demolition at the end of utilization. The graduates of the study focus '*Technology and Management in Construction*' can specifically apply their in-depth knowledge to project management, process engineering and economics in construction operation as well as their knowledge in methods of project development and facility management for solving all problems, in order to optimally realize buildings in all fields of civil engineering by means of their broad understanding of the legal, economic and technical interrelationships.

All modules offered in the study focus ’Technology and Management in Construction’ are summarized in Table 4. This table also provides information about which semester the associated courses are in and the corresponding course assessment.

Study Focus
Technology and Management in Construction (SF 4)

4 PM are fixed:

PM1	**M4P5 - Project Management in Construction and Real Estate Industry**	WS	6 CP
PM2	**M4P6 - Machinery and Process Engineering**	WS	6 CP
PM3	**M4P7 - Production Planning and Control in Construction**	SS	6 CP
PM4	**M4P4 - Sustainability in Real Estate Management**	SS	6 CP

1 SM has to be selected from M4S06 - M4S29 (s. Tab. 4):

SM1	**compulsory elective module 1**	6 CP

In this study focus four compulsory modules are predetermined:

- Project Management in Construction and Real Estate Industry
- Machinery and Process Engineering
- Production Planning and Control in Construction
- Sustainability in Real Estate Management

In addition, one compulsory elective module, study focus module, has to be selected (s. Tab. 4).

Besides numerous field trips as part of several lectures, an annual one-day field trip takes place annually at the beginning of the winter term. The attendance at this fall field trip is obligatory for students that selected the study focus ’Technology and Management in Construction’ (SF 4).

Furthermore, a large field trip over several days is offered also annually in the week following the Whitsun holidays. All students planning to prepare their master's thesis in this study focus should attend this once.

Table 4: Modules in Study Focus Technology and Management in Construction

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
Compulsory modules:								
M4P4:	Sustainability in Real Estate Management	6	Sustainability in Real Estate Management (G)	L/E		3	wE	6
			Real Estate Life Cycle Management (G)	L		1		
M4P5:	Project Management in Construction and Real Estate Industry	6	Project Management in Construction and Real Estate Industry (G)	L/E	4		ngA EoT	1 5
M4P6:	Machinery and Process Engineering	6	Construction Equipement (G)	L	2		ngA wE	1 5
			Process Engineering (G)	L	2			
M4P7:	Production Planning and Control in Construction [1a)]	6	Site Management (G)	L		1	ngA wE	1 5
			Site Planning and Handling (G)	L/E		3		
Sum compulsory modules		**24**			**8**	**8**		
Compulsory elective modules:								
M4S06:	Environmentally-friendly Recycling and Disassembly of Buildings	6	Project Studies (G)	L/E		2	oE	6
			Disassembly Process Engineering (G)	L/E		2		
M4S07:	Upgrading of Existing Buildings and Energetic Refurbishment	6	Upgrading of Existing Buildings (G)	L/E	3		EoT wE	1,5 4,5
			Energetic Refurbishment (G)	L	1			
M4S08:	Real Estate Management	6	Controlling in Real Estate Management (G)	L	1		wE	6
			Basics of Real Estate Valuation (G)	L	1			
			Corporate und Public Real Estate Management (G)	L	1			
			Project Development with Case Study (G)	L	1			
M4S09:	Lean Construction	6	Lean Construction (G)	L/E	4		EoT wE	1,5 4,5
M4S10:	Advanced Studies in Construction Engineering	6	Tunnel Construction and Blasting Engineering (G)	L	2		wE	6
			Operation Methods for Foundation and Marine Construction (G)	L	1			
			Operation Methods for Earthmoving (G)	L	1			
M4S12:	Decommissioning of Nuclear Facilities	6	Removal and Decontamination of Nuclear Facilities (G)	L/E	2		oE	6
			New Development and Optimization of Decommissioning Machine Technology (G)	L/E	2			
M4S16:	Building Information Modeling (BIM)	6	Building Information Modeling (BIM) (G)	L/E		4	EoT	6
M4S17:	Research Seminar Construction Management	6	Research Seminar Construction Management I (G)	S		2	EoT	6
			Research Seminar Construction Management II (G)	S	2			
M4S18:	Equipment and Special Construction Techniques in Building Practice	6	Equipment and Special Construction Techniques in Building Practice I (G)	L		2	oE	6
			Equipment and Special Construction Techniques in Building Practice II (G)	L	2			
M4S19:	Digitalization in Facility and Real Estate Management	6	Digitalization in Facility and Real Estate Management (G)	L/E	4		EoT	6

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Table 4: Modules in Study Focus Technology and Management in Construction (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M4S20:	Digital Technologies in Field Information Modeling	6	Digital Technologies in Field Information Modeling (E)	L/E		4	EoT	6
M4S21:	Digital Engineering and Construction	6	Digital Engineering and Construction (E)	L/E	4		EoT	6
M4S22:	Leadership and Communication 1b)	6	Leadership and Communication (G)	L/E		4	wE	6
M4S23:	Real Estate and Facility Management - on Site Lectures **#)**	6	Real Estate and Facility Management - on Site Lectures (G)	L/E		4	EoT	6
M4S24:	Facility Management	6	Facility and Service Management (G)	L/E	3		wE	6
			Facility and Real Estate Management II (G)	L/E	1			
M4S25:	Technology and Production Methods in Turnkey Construction and Civil Engineering Works 1c)	6	Turnkey Construction (G)	L/E		2	wE	6
			Civil Engineering Structures and Regenerative Energies (G)	L/E		2		
M4S26:	Lean Integrated Project Delivery (Lean IPD)	6	Lean Integrated Project Delivery (G)	L/E		3	EoT wE	3 3
M4S27:	Agile Projekt Management in Facility and Real Estate Management	6	Agile Projekt Management in Facility and Real Estate Management (E)	L/E		4	EoT	6
M4S28:	Seminar Construction Machinery	6	Seminar Construction Machinery (G)	S/E		4	EoT	6
M4S29:	Facility Management in Hospitals 1d)	6	Facility Management in Hospitals (G)	L/E	4		EoT	6
Sum compulsory elective modules		**120**			**40**	**39**		

#) for this module specific preconditions are defined (see module description)

explanations to Table 4:

in general:

M4PX	Study Focus IV, compulsory modules
M4SXX	Study Focus IV, compulsory elective modules
LC	learning control
CP	credit point
HpW / SWS	hours per week
W / S	winter term / summer term
G / E	language German / English
1a)	Module must not be selected together with the module M4P3 not offered anymore.
1b)	Module must not be selected together with the module M4S01 not offered anymore.
1c)	Module must not be selected together with the module M4S15 not offered anymore.
1d)	Module must not be selected together with the module M4S13 not offered anymore.

type of course:

L	lecture
L/E	lecture and exercise, separate or integrated
S	seminar

type of learning control:

wE	written examination
oE	oral examination
EoT	examination of other type
ngA	not graded accomplishment

2.2.5 Study Focus 'Geotechnical Engineering' (SF 5)

Civil engineers working in geotechnics deal with all aspects of the interaction between (underground) structures or infrastructures and the surrounding soil or rock. By their broad professional expertise in material science and construction, graduates of the study focus '*Geotechnical Engineering*' are very well prepared for the interface of civil engineering and geosciences regarding problems of preservation, utilization and design of the ground as living and cultural space, in particular for planning, designing and constructing underground structures and infrastructure.

All modules offered in the study focus 'Geotechnical Engineering' are summarized in Table 5. This table also provides information about which semester the associated courses are in and the corresponding course assessment.

Study Focus
Geotechnical Engineering (SF 5)

5 PM are fixed:

PM1	**M5P1 - Theoretical Soil Mechanics**	SS	6 CP
PM2	**M5P2 - Earthworks and Foundation Engineering**	WS	6 CP
PM3	**M5P5 - Rock Mechanics and Rock Engineering**	SS	6 CP
PM4	**M5P4 - Basics in Numerical Modelling**	WS	6 CP
PM5	**M1P1 - Design and Construction of Components in Reinforced Concrete *)**	WS	6 CP

*) If PM5 is covered by selection of the Study Focus 'Construction Engineeering' (SF 1), SM1 or SM2 has to be selected instead:

SM1	**M5S02 - Ground Investigation**	SS	6 CP
SM2	**M5S03 - Applied Geotechnics**	SS	6 CP

In this study focus five compulsory modules are predetermined:

- Theoretical Soil Mechanics
- Earthworks and Foundation Engineering
- Rock Mechanics and Rock Engineering
- Basics in Numerical Modeling
- Design and Construction of Components in Reinforced Concrete

In case that the compulsory module Design and Construction of Components in Reinforced Concrete (M1P1) is already allocated by the selection of Construction Engineering (SF 1) as second study focus one of the compulsory elective modules M5S02 or M5S03 has to be selected instead.

Starting the studies in the winter term it is recommended to attend the compulsory module Basics in Numerical Modeling (M5P4) in advance to the compulsory module Theoretical Soil Mechanics (M5P1) if the basics in mathematics and continuum mechanics are not obtained otherwise. Generally, the studies can be started with M5P2, M5P4 and M1P1 in winter term and likewise with M5P1, M5P3 and eventually M5S02 or M5S03 in summer term.

A few compulsory elective modules are depending in content and difficulty on compulsory modules, so that the compliance of an order is recommended. These are:

- Special Issues of Soil Mechanics (M5S01) following Theoretical Soil Mechanics (M5P1)
- Applied Geotechnics (M5S03) following Earthworks and Foundation Engineering (M5P2)
- Ground Water and Earth Dams (M5S04) following Earthworks and Foundation Engineering (M5P2)
- Tunneling and Underground Construction (M5S11) following Rock Mechanics and Rock Engineering (M5P5)
- Numerical Modeling in Geotechnics (M5S06) following Basics in Numerical Modeling (M5P4)
- Coupled Geomechanical Processes (M5S10) following Rock Mechanics and Rock Engineering (M5P5)

The attendance of the annual Whitsun excursion of the Institute of Soil Mechanics and Rock Mechanics (IBF) is recommended at least once during the master program.

Table 5: Modules in Study Focus Geotechnical Engineering

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
Compulsory modules:								
M5P1:	Theoretical Soil Mechanics	6	Theoretical Soil Mechanics (G)	L/E		4	oE	6
M5P2:	Earthworks and Foundation Engineering	6	Foundation Types (G)	L/E	2		ngA wE	2 4
			Basics in Earthworks and Embankment Dams (G)	L/E	2			
M5P3:	Rock Mechanics and Tunnelling [1)]	6	Basics in Rock Mechanics (G)	L/E		2	ngA wE	1 5
			Basics in Tunnel Construction (G)	L/E		2		
M5P4:	Basics in Numerical Modelling [3)]	6	Continuum Mechanics (G)	L	2		oE	3
			Numerics in Geotechnics (G)	L	2		oE	3
M5P5:	Rock Mechanics and Rock Engineering [2)]	6	Rock Mechanics and Rock Engineering (G)	L/E		4	ngA wE	1 5
M1P1:	Design and Construction of Components in Reinforced Concrete *)	6	Design and Construction of Components in Reinforced Concrete (G)	L/E	2/2		ngA wE	2 4
Sum compulsory modules		**30**			**12**	**8**		
Compulsory elective modules:								
M5S01:	Special Issues of Soil Mechanics	6	Unsaturated, Viscous and Cyclic Soil Behavior - Theory and Element Tests (G)	L/E	2		oE	6
			Soil Dynamics (G)	L/E	2			
M5S02:	Ground Investigation *)	6	Soil Mechanical Laboratory Exercises (G)	E		2	oE	6
			Geomechanical Field Exercise (G)	E		2		
M5S03:	Applied Geotechnics *)	6	Foundations and Retaining Structures (G)	L/E		2	wE	6
			Special Foundation Engineering and Design (G)	L/E		2		
M5S04:	Ground Water and Earth Dams	6	Geotechnical Ground Water Problems (G)	L/E		2	oE	6
			Embankment Dams (Advanced) (G)	L/E		2		
M5S05:	Rock Engineering and Underground Construction [1)]	6	Aboveground Rock Engineering (G)	L/E	2		wE	6
			Tunnel Construction in Soils and in Existence (G)	L/E	2			
M5S06:	Numerical Modelling in Geotechnics	6	Exercises in Numerical Modelling (G)	E		2	oE	6
			FEM Applications in Geotechnical Modelling (G)	L		2		
M5S07:	Geotechnical Testing and Measuring Technology	6	Rock Testing (G)	L	1		oE	6
			Testing in Dam and Wastefill Engineering (G)	L	1			
			Geotechnical Measuring Technology (G)	L/E	2			
M5S08:	Special Underground Engineering	6	Ground Improvement, Grouting and Soil Freezing (G)	L/E		2	oE	3
			Anchoring, Piling and Slurry Wall Technology (G)	L/E		2	oE	3

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*) Since module M1P1 is already taken by combination with Study Focus I 'Construction Engineering', module M5S02 or M5S03 has to be selected instead.

Table 5: Modules in Study Focus Geotechnical Engineering (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M5S09:	Environmental Geotechnics	6	Landfills (G)	L/E	2		oE	3
			Brownfield Sites - Investigation, Evaluation, Rehabilitation (G)	L	2		oE	3
M5S10:	Coupled Geomechanical Processes [4)]	6	Special Issues in Rock Mechanics (G)	L/E	2		EoT	3
			Transport of Heat and Fluids [5)] (E)	L	2		wE	3
			Applied Geothermics [5)] (E)	L		2	wE	3
M5S11:	Tunneling and Underground Construction [2)]	6	Tunneling and Underground Construction (G)	L/E	4		wE	6
Sum compulsory elective modules		**60**			**20**	**22**		

explanations to Table 5:

in general:

- M5PX Study Focus V, compulsory modules
- M5SXX Study Focus V, compulsory elective modules
- LC learning control
- CP credit point
- HpW / SWS hours per week
- W / S winter term / summer term
- G / E language German / English
- 1) Module will not be offered anymore as from summer term 2025.
- 2) Module will be offered newly as from summer term 2025 and must not be selected together with one of the module M5P3 and M5S05 not offered anymore.
- 3) As this module is a compulsory module, module M1S49 (SF 1) cannot be selected.
- 4) In the module two examinations have to be taken, one of these can be selected.
- 5) Course with examination selectable.

type of course:

- L lecture
- L/E lecture and exercise, separate or integrated
- E exercise

type of learning control:

- wE written examination
- oE oral examination
- ngA not graded accomplishment

2.3 Mentoring, module selection, individual curriculum

The selection options within the studies require that each student must compile an individual curriculum (comp. ER/SPO § 19 Par. 4). This includes selecting two study foci with the corresponding modules and selecting modules within the Supplementary Studies (supplementary modules). This selection has to be supervised by a **mentor** chosen by the student (comp. ER/SPO § 17a). The mentor has to be a professor of the KIT Department Civil Engineering, Geo and Environmental Sciences and to be involved in one of the selected study foci. Possible mentors are:

SF 'Construction':	Prof. P. Betsch, Prof. F. Dehn, Prof. P. Dietsch, Prof. S. Freitag, Prof. T. Seelig, Prof. A. Stark, Prof. T. Ummenhofer, PD M. Frese, PD C. Sandhaas
SF 'Water':	Prof. O. Eiff, Prof. M. Franca, Prof. M. Uhlmann, Prof. E. Zehe, PD U. Ehret, PD S. Fuchs, PD U. Mohrlok
SF 'Mobility':	Prof. P. Vortisch, PD M. Kagerbauer, Dr.-Ing. M. Zimmermann
SF 'Construction Management':	Prof. S. Gentes, Prof. S. Haghsheno, Prof. K. Lennerts, Jun.-Prof. R. Maalek
SF 'Geotechnics':	Prof. H. Stutz

The selected study foci determine the corresponding **compulsory modules** (s. Tab. 1 - 5). According to the predefined number of compulsory modules within the selected study foci **compulsory elective modules** are selected from the corresponding lists (s. Tab. 1 - 5) to the extent of 30 CP within each study focus. Within the Supplementary Studies four **compulsory or compulsory elective modules**, if not already selected, are selected freely from all study foci of the master degree program 'Civil Engineering' or any related master degree program.

The forms for selecting modules within the study foci and the supplementary studies is available on the Examination Committee Master Civil Engineering web page, https://www.tmb.kit.edu/english/5583.php (*in German*). This has to be filled in by the student, signed by both student and mentor, and forwarded to the study program coordinator via the mentor for it to be entered into the Campus Management System. The modules must be entered in time to register for the exams in the first semester of the master degree program (comp. ER/SPO § 19 Par. 4). This ensures that the examination management (registration, deregistration if applicable, result booking etc.) can be processed smoothly. The individual curriculum is accessible at any time via the portal Campus Management for Students, https://campus.studium.kit.edu/english/index.php.

The modules should be chosen with care. Firstly, the assignment of the modules to the corresponding part of the program, Focus Studies or Supplementary Studies, is later transferred to the master degree certificate. Secondly, changes in the module selection have to be in agreement with the selected mentor and should be limited to exceptional cases only, e.g. if a compulsory elective module is not offered at short notice. As long as the corresponding module has not yet begun, changes to the module selection are generally possible.

2.4 Interdisciplinary Qualifications

Students compile their own module **Interdisciplinary Qualifications** (comp. also ER/SPO § 15a) to an extent of 6 CP from the offers on key competences of the KIT House of Competence (HoC) as well as the 'General Studies. Forum Science and Society' (FORUM, formerly ZAK), from the offer of General Studies of FORUM (formerly ZAK) or language courses of the 'Sprachenzentrum' (SpZ, center of language studies). All courses from the civil engineering programs offered by FORUM (formerly ZAK) as key competences or in the General Studies are excluded. Courses accepted generally by the Examination Committee can be selected directly in the module. In special cases the Examination Committee Master Civil Engineering can accept or recognize further suitable courses as interdisciplinary qualifications beyond the mentioned options. Supporting by the mentor is presumed.

Registering for courses on key competences of HoC and FORUM (formerly ZAK) as well as the language courses of SpZ takes place directly at HoC, FORUM (formerly ZAK) or SpZ. The examinations results are typically uploaded as 'Not assigned grades'. The students can **assign them in two steps**. Firstly, they **select** the corresponding 'Teilleistungen' with the title 'Self Assignment HoC-FORUM-SpZ ...' in the module Interdisciplinary Qualifications according to the grading scale, not graded or graded. Then, they **assign** the corresponding not assigned exam to one of the selected 'Teilleistungen'. The title and credit points are automatically transferred from the exam when credited. To credit exams that could not be assigned by oneself, the form assignment of non-assigned activity statements (*in German*) has to be submitted to the Study Program Service of the department.

Registering for a learning control takes place online for courses offered by General Studies of FORUM (formerly ZAK) or other courses accepted by the Examination Committee Bachelor Civil Engineering. The Study Program Service of the department has to be informed in time, so that the corresponding learning control can be selected in the campus management system within the registration period. Approval has to be provided for the courses accepted by the Examination Committee Master Civil Engineering.

The module Interdisciplinary Qualifications is completed non-graded. A grade can be disclosed in consultation with the lecturer but is not included in the calculation of the module grade.

2.5 Begin and complete a module

Every module and every examination is allowed to be credited once only (comp. ER/SPO § 7 Par. 5). The binding decision whether a module is selected is made by the student at the time of registering for the corresponding examination or partial examination (comp. ER/SPO § 5 Par. 2). The student can revoke this binding selection by deregistering in time. After attendance of the examination, especially of a partial examination, a module cannot be replaced by another one any more. The assignment can be changed on request to the Examination Committee Master Civil Engineering.

A module is **completed** if the general examination of the module has been passed (grade min. 4.0). If a module examination consists of several partial examinations, then the module is completed if all partial examinations are passed (grade min. 4.0) and the minimum credit requirement of this module are met.

2.6 Registration, deregistration, repetition of examinations

Registration for examinations, not graded accomplishments and examination prerequisites takes place online via the portal Campus Management for Students, https://campus.studium.kit.edu/english/index.php. After logging in students can:

- register to and deregister for examinations
- retrieve examination results
- assign key competences of HoC, FORUM (formerly ZAK), SpZ by themselves
- print a transcript of records

A successful online registration covers the admission to the examination. The portal Campus Management for Students provides the confirmation, which can serve as proof of registration in case of doubt. If problems occur with an online registration, the Study Program Service of the department as well as the examiner have to be informed as soon as possible to solve the problem in advance of examination date. In the case of an oral examination, the online registration has directly to be combined with the negotiation of an examination date with the examiner.

A registered examination either has to be taken or **deregistered** in advance to the deregistration deadline. This also applies if the date for an oral examination is moved to the following semester as the examinations are managed for each semester individually. The rules for deregistering from an examination are set by the ER/SPO § 10. Deregistration from examinations of other kinds as well as from not graded accomplishments (ER/SPO § 10 Par. 3) must be done by the deadline for the submission or presentation at the latest.

Generally, a failed examination can be repeated once, at the latest by the end of the examination period of the next but one semester to this examination (comp. ER/SPO § 8). If a written repeat examination is failed, a specific oral repeat examination can be taken. This is part of the repeat examination and will not be evaluated independently. After the specific oral repeat examination the overall grade of the repeat examination is either grade 4.0 (passed) or grade 5.0 (failed).

If the **repeat examination** (including a specific oral repeat examination) is failed as well, the **entitlement to the examination** is lost. A potential request for a **second repetition** has to be made without delay after loosing the examination entitlement. Requests for a second repetition of an examination (see https://www.tmb.kit.edu/english/5583.php; *in German*) require the approval of the Examination Committee Master Civil Engineering. A counseling interview is mandatory. The second repetition is registered at the Study Program Services by submitting the approval. As long as the second repetition of the exam has not been passed, further exams can only be taken with reservation. Also, such exams with reservation are registered at the Study Program Services by submitting the approval.

Further information is available in the examination and study regulation (ER/SPO, https://www.sle.kit.edu/english/vorstudium/master-civil-engineering.php; *in German*), and from the Examination Committee Master Civil Engineering or the 'Fachschaft' (student council).

2.7 Students in special circumstances

Students in special circumstances are students with disabilities or chronic diseases, or on maternity leave, with children or dependents in need of care. The regulations on compensation for disadvantages include preferential access to courses with limited attendance, taking examinations under individually designed conditions, or adjustments to deadlines. These are described in detail in the Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) (*in German*; see also SPO § 12 and 13 according to Satzung zur Änderung der Regelungen über den Nachteilsausgleich in den Studien- und Prüfungsordnungen, Artikel 36; *in German*).

For compensation for a disadvantage, the student should submit an informal application to the Examination Committee Master Civil Engineering and provide the appropriate proof. The Examination Committee Master Civil Engineering decides on the application as well as on the kind and extent of the individually necessary measures and informs the student.

2.8 Crediting and recognition of already obtained accomplishments

In general, accomplishments already obtained can be recognized under the conditions of the ER/SPO (comp. ER/SPO § 18). The recognition has to be made with the corresponding recognition form of the Examination Committee Master Civil Engineering (https://www.tmb.kit.edu/english/5583.php, *in German*). It must unambiguously state at which place in the curriculum the recognized accomplishment is to be credited.

If the accomplishments are mainly **identical** with modules from the curriculum (name, objectives, content) the corresponding lecturer confirms this on the form.

If the accomplishments are **not identical** with modules from the curriculum they can be recognized as well, if the obtained competences contribute to achieve the qualification goals of the study program. These are included into the individual curriculum in agreement with the mentor. The Examination Committee Master Civil Engineering decides in these cases. Usually, modules to the extent of max. 12 CP can be credited for Subject-Specific Supplements. Additional credit points are dropped.

The recognition form has to be submitted to the Examination Committee Master Civil Engineering, which then transfers the creditable the accomplishments.

Recognizing accomplishments obtained **outside the higher education system** is possible if the obtained competences contribute to achieving the qualification goals of the study program. For this purpose, an informal request has to be sent to the Examination Committee Master Civil Engineering and a counseling interview has to be arranged. Then, the Examination

Committee Master Civil Engineering examines to which extent the obtained knowledge and skills can be recognized and which parts of the higher education study can be replaced by them. No more than than 50 % of the higher education study can be replaced. These accomplishments are to be included in the individual curriculum in agreement with the mentor.

For crediting passed **prior master's examinations** the form Transfer of prior master's examinations (*in German*) has to be filled and transfered to the Study Program Service of the department.

Further information about recognitions is on the Examination Committee Master Civil Engineering (https://www.tmb.kit.edu/english/PAM.php) web page.

2.9 Admission, preparation and completion of the master's thesis

The **Master's Thesis** is usually carried out in the fourth semester in one of the selected study foci (comp. ER/SPO § 14). The topic of the master's thesis has to be assigned by a professor either of the KIT Department of Civil Engineering, Geo- and Environmental Sciences or of a domestic or foreign institution of higher education of the state or officially recognized by the state. A topic assigned by a person who is not member of the KIT Department of Civil Engineering, Geo- and Environmental Sciences needs permission of the Examination Committee Master Civil Engineering using the corresponding form (s. https://www.tmb.kit.edu/english/5583.php; *in German*). Students' wishes can be considered when drafting the topic. If the master's thesis is written outside of KIT, consider the instructions on ’Merkblatt - Externe Abschlussarbeiten’ (http://www.haa.kit.edu/downloads/KIT_ALLGEMEIN_Merkblatt_Externe_Abschlussarbeiten.pdf; *in German*).

Students are admitted to the master's thesis after successfully passing modules to an extent of a minimum 42 CP within the master program Civil Engineering. Results obtained in the module Interdisciplinary Qualifications do not count for this purpose. The supervisor initiates the master's thesis to be uploaded to the campus management system. After notification via e-mail, the master's thesis has to be **registered online** in the portal Campus Management for Students. The **admission** follows after the required prerequisites and eventual further conditions are verified. As these steps have to be completed **before starting** the thesis (scheduled starting date), they should be initiated at least two weeks in advance.

The preparation time is six months. The master's thesis can be written in another language than German if accepted by the supervisor. Within one month after submission it has to be completed with a **presentation** which is considered in the grading. It is highly recommended to have gained all technical and soft skills required to prepare the master's thesis topic in advance.

Further information about the processes related to the master's thesis can be found in "Handreichung Masterarbeiten Bauingenieurwesen" (*in German*) on the website of the Study Program Service under the link "Abschlussarbeiten".

2.10 Semester abroad

The department recommends students to study for one to two semesters at a foreign university. KIT offers a variety of exchange programs. Within Europe, this is the well-known ERASMUS program. General information on planning a stay abroad is available on the website of the International Student Office (IStO), https://www.intl.kit.edu/ostudies/index.php, and specific information is available on the website of the KIT-Department of Civil Engineering, Geo and Environmental Sciences, https://bgu.kit.edu/english/outgoing.php. It is compulsory to agree on the intended accomplishments with the personal mentor in advance particularly with regard to the possibility of crediting in the personal curriculum. The proposed Learning Agreement has to be approved and signed by the Erasmus Coordinator.

2.11 Additional accomplishments

An **additional accomplishment** is a voluntary examination, which is not considered in the overall grade (comp. ER/SPO § 15). In total, additional accomplishments can be taken to the extent of max. 30 CP from offers within KIT.

The examination in the desired additional accomplishment should be registered online by the student within the registration period. The online registration to one of these exams requires first the selection of the module and the desired 'Teilleistungen'. The additional module for the Accompanying Studies of FORUM (formerly ZAK) can be selected directly. If selecting this module it has to be considered that the extent of possible further additional accomplishments is reduced by the extent of the FORUM module even if this is not completed. Additional accomplishments available in the module Further Examinations can be also selected directly. If the designated additional accomplishment or additional module are not available in that list then this must be conveyed to the Study Program Service at the department via e-mail. The desired selection will then be available in the campus management system enabling the online exam registration within the registration period.

Usually, a passed additional accomplishment cannot be transferred subsequently to the individual curriculum. In special cases the Examination Committee Master Civil Engineering can approve an exception.

All additional accomplishments are listed in the transcript of records. Completed modules can be included in the master degree certificate as additional modules if requested by the student. This also applies to additional accomplishments recognized by the Examination Committee Master Civil Engineering.

3 Further information

3.1 About the module handbook . . .

The **module handbook** is the key document describing the structure of the program, providing assistance and guidance during the study time. It contains the descriptions of all program modules and information on:

- the structure of the modules,
- the extent of the modules (in CP),
- the interdependencies between the modules,
- the learning outcomes of the modules,
- the type of assessment and examinations,
- the calculation of the module's grade, and
- the integration of the module in the course of study.

Each module consists of one or more interrelated courses, which are completed with one or more **examinations** or **not graded accomplishment**. Each module comprises 6 CP, which will be credited after the module is successfully completed. The module handbook provides the necessary information for the students to customize the content and time schedule of their interdisciplinary studies according to personal needs, interest and job perspectives.

In addition to the module handbook, the **course catalog** and the institutes (web pages) provide important up-to-date information concerning variable course details (e.g. time and location of the course) as well as short-term modifications.

3.2 About module examinations, examination committee . . .

The module examinations are either a general examination or are split into several partial examinations. If the module examination is a **general examination**, the entire content of the module is reviewed in a single examination. If the module examination consists of **partial examinations**, the content of each course will be reviewed in corresponding partial examinations. Then, the module examinations can be spread out over several semesters. Not graded accomplishments can also be part of the module examination, e.g. as examination prerequisites.

The Examination Committee Master Civil Engineering (https://www.tmb.kit.edu/english/PAM.php) is responsible for all legal questions concerning examinations. Applications, e.g. for a second repetition, extension of deadlines or recognitions, must be submitted to this committee as it decides on and approves all requests.

3.3 About changes in module offered . . .

The range of modules changes in the course of the semesters. Modules may be discontinued or added or the module examination may change. When possible, such changes are announced in the module handbook with sufficient time in advance, at latest at the beginning of the semester they are valid from (see Chapt. Current changes).

As a rule, students who started a module (see selection and completion of a module) can complete it in the format it was started. The corresponding examinations are provided onwards over a certain time period usually at least one semester after it has changed. In general, a consultation with the examiner is recommended in such a case.

3.4 Contact persons

Dean of Study Affairs:

Prof. Dr.-Ing. Steffen Freitag
Institute for Structural Analysis, Bldg. 10.50, 2nd floor
consultation: on appointment
Phone: 0721/608-42280
Email: steffen.freitag@kit.edu

Study Program Coordination:

PD Dr. Ulf Mohrlok
KIT Department of Civil Engineering, Geo and Environmental Sciences, Bldg. 10.81, R. 311
consultation: on appointment
Phone: 0721/608-46517
Email: ulf.mohrlok@kit.edu

Examination Committee Master Civil Engineering:

Prof. Dr.-Ing. Kunibert Lennerts (chairperson)
Dr.-Ing. Heike Schmidt-Bäumler (person in charge)
Institute of Technology and Management in Construction, Bldg. 50.31, R. 005 (ground floor)
consultation: on appointment
Phone: 0721/608-46008
Email: pam@bgu.kit.edu
Web: https://www.tmb.kit.edu/english/PAM.php

Students' Advisory Service:

Dr.-Ing. Harald Schneider
Institute of Technology and Management in Construction, Bldg. 50.31, R. 008 (ground floor)
consultation: on appointment
Phone: 0721/608-43881
Email: harald.schneider@kit.edu

Study abroad:

Prof. Dr. Olivier Eiff (Erasmus Coordinator)
Mrs. Angelika Fels (person in charge)
Institute for Water and Environment, Bldg. 10.81, R. 128 (1st floor)
consultation: on appointment
Phone: 0721/608-47245
Email: erasmus-civil@bgu.kit.edu
Web: https://www.bgu.kit.edu/english/outgoing_erasmus.php

Study Program Service ('Studiengangservice Bau-Geo-Umwelt'):

KIT Department of Civil Engineering, Geo and Environmental Sciences, Bldg. 10.81, R. 312
consultation: s. http://www.bgu.kit.edu/english/studiengangservice.php
Email: studiengangservice@bgu.kit.edu
Web: http://www.bgu.kit.edu/english/studiengangservice.php

Fachschaft:

Students in Civil Engineering
Bldg. 10.81 (Altes Bauing. Geb.), R. 317.1 (3rd floor)
consultation: s. http://www.fs-bau.kit.edu
Phone: 0721/608-43895
Email: info@fs-bau.kit.edu
Web: http://www.fs-bau.kit.edu

3.5 Abbreviations, translations

CP/LP	credit points	Leistungspunkte
ER/SPO	examination regulations	Studien- und Prüfungsordnung
HpW/SWS	contact hour per week	Semesterwochenstunde
PM	compulsory module	Pflichtmodul
S	summer term	Sommersemester
Sem.	semester	Semester
SM	compulsory elective module	Schwerpunktmodul
W	winter term	Wintersemester

4 Current changes

Major changes will be listed here as from summer term 2025. Despite the fact that this process is mapped with great care, other/ minor changes may occur.

modules not offered anymore as from summer term 2025:

- Subsurface Flow and Contaminant Transport [bauiM2S03-HY3]
- Hydraulic Structures [bauiM2S36-WB9]
- Rock Mechanics and Tunneling [bauiM5P3-FMTUB]
- Rock Engineering and Underground Construction [bauiM5S05-FELSHOHL]

modules newly offered as from summer term 2025:

- Construction Chemistry II [bauiM1S55-BCHEM2]
- Surface and Subsurface Contaminant Transport [bauiM2S54-HY10], replaces module Subsurface Flow and Contaminant Transport [bauiM2S03-HY3]
- Hydraulic Interactions [bauiM2S55-SM7]
- Rock Mechanics and Rock Engineering [bauiM5P5-FMFB]
- Tunneling and Underground Construction [bauiM5S11-TBUHB]

changed examinations and not graded accomplishments as from summer term 2025:

- Traffic Management and Simulation Methods [bauiM3S03-VERMANAGE]:
  - The 'Exercise Transportation Data Analysis', 0 CP, is not graded examination prerequisite.

5 Modules

M 5.1 Module: Design and Construction of Components in Reinforced Concrete (bauiM1P1-BEMISTB) [M-BGU-100033]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Modules)
Study Focus I / Geotechnical Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Modules)
Study Focus II / Geotechnical Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100170	Student Research Project 'Reinforced Concrete'	2 CR	Stark
T-BGU-100015	Design and Construction of Components in Reinforced Concrete	4 CR	Stark

Competence Certificate
- 'Teilleistung' T-BGU-100170 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100015 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
Based on the module 'Basics in Reinforced Concrete' and cross-cutting modules such as 'Structural Analysis' the students can recognize complex subjects of reinforced concrete and apply their methods. They can assign given problems to the respective design problems, conduct these subsequently and apply the current standards. Furthermore, the students can interpretate the results of a design and evaluate them with respect to their correctness and profitability.

Content

- design and construction of structural members at the ultimate and serviceability limit states
- discontinuity regions and truss models
- punching shear design
- introduction prestressed concrete

Module grade calculation
grade of module is grade of the exam

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- preparation of student research project: 60 h
- examination preparation: 30 h

total: 180 h

Recommendation
courses Basics of Reinforced Concrete I+II (6200509, 6200601)

Literature

scriptum (slides of the lecture) and notes by the students are required;

DIN EN 1992-1-1 + national appendix for Germany, current issue

5.2 Module: Steel and Composite Structures (bauiM1P2-STAHLBAU) [M-BGU-100034]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Modules)
Study Focus II / Structural Engineering (Compulsory Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100171	Student Research Project 'Steel Structures'	2 CR	Ummenhofer
T-BGU-100016	Steel and Composite Structures	4 CR	Ummenhofer

Competence Certificate
- 'Teilleistung' T-BGU-100171 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100016 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
Students will be able to design load-bearing structures in steel and steel composite construction. They will have mastered the procedure for the design and structural analysis of beams, floors and columns in composite construction. Furthermore, students can analyse flat steel elements with regard to the risk of stability and carry out plate buckling analyses. They can also calculate load-bearing structures and components made of thin-walled cold-formed steel components. They will be familiar with the main fasteners used in lightweight steel construction and will be able to design them. Students will be able to perform fire protection analyses using the hot design method for steel structures and design torsionally stressed components with any cross-sections.

Content

- basics of steel composite: composite beams, composite floors, composite columns
- plate buckling
- lightweight steel construction: cold-formed components and sheets, fasteners for lightweight construction
- fire protection in steel construction, hot design
- torsion theory: Saint-Venant's torsion, arching force torsion

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 20 h
- preparation of student research project: 60 h
- examination preparation: 40 h

total: 180 h

Recommendation
lecture Basics in Steel Structures (6200504)

Literature

DIN EN 1993-1-1, Dezember 2010: Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 1-1: Allgemeine Bemessungsregeln und Regeln für den Hochbau: Beuth Verlag GmbH, Berlin.

DIN EN 1993-1-2, Dezember 2010: Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 1-2: Allgemeine Regeln - Tragwerksbemessung für den Brandfall: Beuth Verlag GmbH, Berlin.

DIN EN 1993-1-3, Dezember 2010: Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 1-3: Allgemeine Regeln - Ergänzende Regeln für kaltgeformte Bauteile und Bleche: Beuth Verlag GmbH, Berlin.

DIN EN 1994-1-1, Dezember 2010: Eurocode 4: Bemessung und Konstruktion von Verbundtragwerken aus Stahl und Beton - Teil 1-1: Allgemeine Bemessungsregeln und Anwendungsregeln für den Hochbau: Beuth Verlag GmbH, Berlin.

5.3 Module: Surface Structures and Dynamics of Structures (bauiM1P3-FTW-BD) [M-BGU-100035]

Responsible: Prof. Dr.-Ing. Peter Betsch
Prof. Dr.-Ing. Steffen Freitag

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

Part of: Study Focus I / Structural Engineering (Compulsory Modules)
Study Focus II / Structural Engineering (Compulsory Modules)
Subject-Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-107818	Student Research Project 'Surface Structures'	1 CR	Freitag
T-BGU-107819	Student Research Project 'Dynamics of Structures'	1 CR	Betsch
T-BGU-100017	Surface Structures	2 CR	Freitag
T-BGU-100077	Dynamics of Structures	2 CR	Betsch

Competence Certificate
- 'Teilleistung' T-BGU-107818 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-107819 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100017 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-100077 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
The students gain the ability to write up and apply the essential principles for surface structures (theory, models, analytical and numerical solution procedures and error analysis) as basis for design and construction. They are further able to analyze the vibration behavior of structures in the context of mechanical modeling. The students can apply concepts for the avoidance of vibrations and the reduction of vibrations to a tolerable extent and can describe fundamental vibration phenomena by means of small scale building models.

Content
Surface Structures:

- panel structures models and basic equations
- PDE and BCs for panel structures and analytical solutions
- FEM for panel structures (general/rot. symmetry)
- practical related solutions for panel structures with truss models
- plate structures models and basic equations
- PDE and simplifications for plate structures
- analytical solutions for plate structures, incl. serial solutions
- FEM for plate structures (general/rot. symmetry)
- practical related solutions for plate structures
- elastic foundation, temperature load and influence surfaces
- introduction to shell structures

Dynamics of Structures:

Vibratory structural-mechanical constructions with finite degrees of freedom are considered. The vibration analysis is based on linearized equations of motion and their solutions. Non-damped and damped free oscillations caused by different kinds of excitations are discussed. This includes measures avoiding and reducing vibrations of structures.

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

Annotation
none

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

- Surface Structures lecture: 30 h
- Dynamics of Structures lecture: 30 h

independent study:

- preparation and follow-up lectures Surface Structures: 15 h
- preparation of student research project 'Surface Structures' (not graded accomplishment): 20 h
- examination preparation Surface Structures (partial exam): 25 h
- preparation and follow-up lectures Dynamics of Structures: 15 h
- preparation of student research project 'Dynamics of Structures' (not graded accomplishment): 20 h
- examination preparation Dynamics of Structures (partial exam): 25 h

total: 180 h

Recommendation
lectures in Structural Analysis I+II (6200401, 6200501);
laboratory course Dynamics of Structures (6215905) in addition to the lecture Dynamics of Structures (6215701), can be selected as additional accomplishment in the module Further Examinations (M-BGU-103951)

Literature
Surface Structures:
lecture notes Flächentragwerke
Hake, E. , Meskouris, K. (2001): Statik der Flächentragwerke, Springer.
Altenbach, H., Altenbach, J., Naumenko, K. (1998): Ebene Flächentragwerke, Grundlagen der Modellierung und Berechnung von Scheiben und Platten, Springer.

Dynamics of Structures:
lecture notes: P. Vielsack: Grundlagen der Baudynamik

M 5.4 Module: Bracing and Stability in Reinforced Concrete (bauiM1S01-STABISTB) [M-BGU-100003]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100018	Bracing and Stability in Reinforced Concrete	6 CR	Stark

Competence Certificate
- 'Teilleistung' T-BGU-100018 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Based on the module 'Basics in Reinforced Concrete', 'Design and Construction of Components in Reinforced Concrete' and cross-cutting modules such as 'Structural Analysis' the students can transfer and apply the methods from the module 'Non-linear Analysis of Beam Structures' to the subject of reinforced concrete with respect to bracing and stability of buildings. Furthermore, the students can analyse and solve problems in special issues of reinforced concrete. Given problems can be assigned to the respective design problems, be conducted subsequently and the current standards can be applied.

Content

- bracing and stability of buildings
- design of columns
- non-linear methods for internal force analysis
- time-dependent material behaviour
- serviceability limit state
- fire protection
- joints and WU structures

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

Recommendation
module Design and Construction of Components in Reinforced Concrete [bauiM1P1-BEMISTB]

Literature
scriptum (slides of the lecture) and notes by the students are required;

DIN EN 1992-1-1 + national appendix for Germany, current issue

DIN EN 1992-1-2 + national appendix for Germany, current issue

M 5.5 Module: Basics of Prestressed Concrete (bauiM1S02-GDLSPANNB) [M-BGU-100036]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100019	Basics of Prestressed Concrete	6 CR	Stark

Competence Certificate
- 'Teilleistung' T-BGU-100019 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students know the basics and can reconstruct the functional principle of prestressed concrete. The students can explain the already obtained knowledge in the subjects 'Strength of Materials', 'Structural Analysis' and 'Design and Construction of Components in Reinforced Concrete' and can transfer these to the methods in prestressed concrete. The students are able to conduct design of buildings in structural engineering safely and economically by reference to current standards.

Content

- types and systems for prestressing
- prestressing losses (friction, time-variant, instantaneous, etc.)
- verification of ultimate and serviceability limit states

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

Recommendation
module Design and Construction of Components in Reinforced Concrete [bauiM1P1-BEMISTB]

Literature
scriptum (slides of the lecture) and notes by the students are required;

DIN EN 1992-1-1 + national appendix for Germany, current issue

M 5.6 Module: Solid Construction Bridges (bauiM1S03-MASSBRUE) [M-BGU-100037]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-113070	Examination Prerequisite Conceptual Design of Concrete Bridges	1 CR	Stark
T-BGU-100020	Solid Construction Bridges	5 CR	Stark

Competence Certificate
- 'Teilleistung' T-BGU-113070 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100020 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
Based on the module 'Basics of Prestressed Concrete' the students can explain the peculiarity of bridge constructions. In addition, they can describe the principle procedure of the design of solid construction bridges and can conduct these. Hence, the students can describe the differences to classical structural engineering and the introduction to current standards.

Content

- design basis
- construction methods, fabrication and impacts
- verification of ultimate and serviceability limit states
- bearing types

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- preparation of the term paper Conceptual Design of Concrete Bridges (examination prerequisite): 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
module Basics of Prestressed Concrete [bauiM1S02-GDLSPANNB]

Literature
scriptum (slides of the lecture) and notes by the students are required;

DIN EN 1992-2 + national appendix for Germany, current issue

M 5.7 Module: Applied Dynamics of Structures (bauiM1S04-BAUDYN) [M-BGU-100038]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100021	Applied Dynamics of Structures	6 CR	Stark

Competence Certificate
- 'Teilleistung' T-BGU-100021 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can transfer their basic knowledge in dynamics to field of solid construction. They are able to evaluate buildings with respect to their susceptibility to vibrations and to identify the relevant dynamic loads. Further, the students are able develop possible countermeasures and to investigate the efficiency of the measures. The student can describe the basic seismological relationships regarding soil-building-interaction, so that they can design basic structures under impact of earthquake loads.

Content
Applied Dynamics of Structures:

- basics of dynamics of structures
- man-made excited, machinery excited, wind excited vibrations and counteractions

Earthquake Engineering:

- basics in earthquake engineering
- presentation of practical relevant calculation methods
- modeling, calculation, designing, and construction of buildings

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

Annotation
none

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

- Applied Dynamics of Structures lecture, exercise: 30 h
- Earthquake Engineering lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Applied Dynamics of Structures: 30 h
- preparation and follow-up lectures, exercises Earthquake Engineering: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
beginning the module in summer term

Literature
scriptum (slides of the lecture) and notes by the students are required

M 5.8 Module: Material Science, Welding and Fatigue (bauiM1S06-SCHWEISSEN) [M-BGU-100039]

Responsible: Dr.-Ing. Philipp Weidner
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100023	Material Science, Welding and Fatigue	6 CR	Weidner

Competence Certificate
- 'Teilleistung' T-BGU-100023 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can

- assess the usability of different steel materials for different requirements,
- design constructionally weld joints and define requirements for their production and quality assurance,
- differentiate the usability of different welding techniques,
- design and construct steel components stressed by fatigue,
- evaluate failures of steel components.

Content

- materials: denotation of steels, physical and technological properties
- fatigue: influencing parameters, calculation concepts
- welding technology: welding techniques, welding instructions
- quality management: building law, implementation categories, competences
- fracture toughness: linear fracture mechanics
- designing of welded constructions: internal stresses, welding distortion
- material testing: non-destructive testing, material and weld joint failures

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
courses Theory of Building Materials (6200206), Basics in Steel Structures (6200504)

Literature

lecture accompanying documents
DIN EN 1993-1-9: Bemessung und Konstruktion von Stahlbauten - Teil 1-9: Ermüdung
DIN EN 1993-1-10: Bemessung und Konstruktion von Stahlbauten - Teil 1-10: Stahlsortenauswahl im Hinblick auf Bruchzähigkeit und Eigenschaften in Dickenrichtung
DIN EN 1090: Ausführung von Stahltragwerken und Aluminiumtragwerken

M 5.9 Module: Construction of Steel and Composite Bridges (bauiM1S07-STAHLBRÜ) [M-BGU-100040]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100024	Construction of Steel and Composite Bridges	6 CR	Ummenhofer

Competence Certificate
- 'Teilleistung' T-BGU-100024 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students will be able to assess steel and steel composite bridges with regard to design, construction and production, carry out dimensioning and design structural details taking sustainability aspects into account. They will be able to carry out the specific load assumption for bridges. They will also be able to name and differentiate between the main load-bearing systems and consider their load-bearing behaviour in the design. Students will also be able to name requirements for bridge-specific structures, such as bearings and transition structures, and select suitable details.

Content

- historical development
- basics of bridge design, load assumptions traffic loads
- main girder systems, cable-stayed bridges and suspension bridges
- canal bridges, temporary bridges, movable bridges
- bridge bearings, transition structures, bridge assembly
- sustainability of road bridges
- design examples

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

Recommendation
course Basics in Steel Structures (6200504), module Steel and Composite Structures [bauiM1P2-STAHLBAU]

Literature

lecture accompanying documents
DIN EN 1993-1-1, Dezember 2010: Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 1-1: Allgemeine Bemessungsregeln und Regeln für den Hochbau: Beuth Verlag GmbH, Berlin.
DIN EN 1993-2 (Dezember 2010): Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 2: Stahlbrücken. Beuth Verlag GmbH. Berlin.
DIN EN 1994-1-1, Dezember 2010: Eurocode 4: Bemessung und Konstruktion von Verbundtragwerken aus Stahl und Beton - Teil 1-1: Allgemeine Bemessungsregeln und Anwendungsregeln für den Hochbau: Beuth Verlag GmbH, Berlin.
DIN EN 1994-2 (Dezember 2010): Eurocode 4: Bemessung und Konstruktion von Verbundtragwerken aus Stahl und Beton - Teil 2: Allgemeine Bemessungsregeln und Anwendungsregeln für Brücken. Beuth Verlag GmbH. Berlin.
Mehlhorn, Gerhard: Handbuch Brücken - Entwerfen, Konstruieren, Berechnen, Bauen und Erhalten. Springer-Verlag. Berlin. 2007

M 5.10 Module: Hollow Section Structures (bauiM1S08-HOHLPROFIL) [M-BGU-100004]

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100086	Hollow Section Structures	6 CR	N.N.

Competence Certificate
- 'Teilleistung' T-BGU-100086 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students will be able to design predominantly static and predominantly non-static loaded structures made of hollow sections, taking into account the connections between components. They know the specific properties of hollow sections and their manufacturing process and are able to carry out load-bearing capacity analyses for hollow sections and hollow section composite columns. In addition, students will be able to design and calculate connections of hollow sections (especially welded connections) and will be in a position to make design recommendations.

Content

- application in steel and bridge construction
- cross-section analyses
- hollow section columns and hollow section composite columns
- structural node design
- fatigue behaviour
- calculation examples

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

Annotation
IMPORTANT:

The module was not offered in winter term 2024/25.

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

Recommendation
course Basics in Steel Structures (6200504)

Literature
lecture notes: 'Hohlprofilkonstruktionen', Karlsruher Institut für Technologie (KIT), Versuchsanstalt für Stahl, Holz und Steine

M 5.11 Module: Glass, Plastic and Cable Structures (bauiM1S09-GlaKunSe) [M-BGU-100041]

Responsible: Dr.-Ing. Daniel Ruff

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100025	Glass, Plastic and Cable Structures	6 CR	Ruff

Competence Certificate
- 'Teilleistung' T-BGU-100025 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can describe the historical evolution of glass materials, the material characteristics of currently used glass products in construction engineering as well as structural behavior of products of glass and glass-steel structures considering the specific properties of stainless steels. They are able to conduct proofs of load-carrying capacity according to current technical standards (e.g. DIN 18008).

The students can explain the manufacturing, characteristics, processing capacities and applications of plastics in construction engineering. In addition, the students can describe the principles of construction and design of adhesive bonds.

The students can describe the assembly, production and characteristics of high-strength tension members (steel cables, cords, tension bar members), the associated end-connections and their application in construction engineering. They are able to conduct simple proofs of structural safety for high-strength tension members according to Eurocode for predominantly statically stresses structures. In addition, they can explain the assembly of large structures with cables (stadium roofs, suspension bridges).

Content

- glass in civil engineering
- stainless steels, upgrading products
- construction details, design of glass structures
- plastics in civil engineering, adhesive bonds, construction details
- design of wires, cables, cords
- tension bar systems
- end-connections, buffles
- static structural behavior
- dynamic structural behavior
- design of structures with high-strength tension members
- construction details of high-strength tension members
- assembly of cable structures

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

Recommendation
course Basics in Steel Structures (6200504)

Literature
lecture accompanying documents
Siebert, G., Maniatis, I: Tragende Bauteile aus Glas: Grundlagen, Konstruktion, Bemessung, Beispiele. Verlag Ernst & Sohn, Berlin, 2012.
DIN 18008 Teil 1 bis Teil 6: Glas im Bauwesen. Beuth-Verlag, Berlin, 2010 bis 2015.
Domininghaus, H. et. al.: Kunststoffe: Eigenschaften und Anwendungen. Springer-Verlag, Berlin, 2012.
Hellerich, W.: Werkstoff-Führer Kunststoffe. Springer-Verlag, Berlin, 2010.
DIN EN 1993-1-11: 2010-12: Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-11: Bemessung und Konstruktion von Tragwerken mit Zuggliedern aus Stahl. Beuth-Verlag, Berlin.
Feyrer, K: Drahtseile: Bemessung, Betrieb, Sicherheit. Springer-Verlag, Berlin, 2001.
Seidel, M: Textile Hüllen - Bauen mit biegeweichen Tragelementen: Materialien, Konstruktion, Montage. Verlag Ernst & Sohn, Berlin, 2008.

M 5.12 Module: Building Preservation of Steel and Timber Structures (bauiM1S11-BAUING-BSH) [M-BGU-100043]

Responsible: Dr.-Ing. Matthias Frese
Prof. Dr.-Ing. Thomas Ummenhofer

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-110856	Building Preservation in Steel Structures	3 CR	Ummenhofer
T-BGU-110857	Building Preservation in Timber Structures	3 CR	Frese

Competence Certificate
- 'Teilleistung' T-BGU-110856 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-110857 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
The module must not be taken together with the modules Building Preservation and Innovations in Metal and Lightweight Structures [bauiM1S46-BWE-INNO-MLB] as well as Building Preservation and Innovations in Timber Structures [bauiM1S47-BWE-INNO-HB].

Competence Goal
The students can explain the procedure of investigation and evaluation of old building fabric. They can describe the characteristics of old steel and cast productions made of iron materials as well as the timber quality (in-situ strength grading of timber). They are able to name typical defects of steel and timber structures. They conduct realistic static computations of old constructions and determine the remaing lifetime. They can explain methods for repairing and strengthening of steel and timber structures on the base of concepts conserving cultural heritage and taking into consideration carpentry and engineered solutions.

Content

- historical overview
- properties of old steels, cast materials and old, built-in timber
- investigation of structures and building parts
- damage-mechanisms in steel and timber structures
- investigation of bearing capacity and remaining lifetime
- restoration and strengthening procedures

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

Annotation
none

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

- Preservation of Steel Structures lecture: 30 h
- Preservation of Timber Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lectures Preservation of Steel Structures: 30 h
- examination preparation Preservation of Steel Structures (partial examination): 30 h
- preparation and follow-up lectures/exercises Preservation of Timber Structures: 30 h
- examination preparation Preservation of Timber Structures (partial examination): 30 h

total: 180 h

Recommendation
participation in module Timber Structures [bauiM1S12-BAUING-HB]

Literature
lecture accompanying documents

M 5.13 Module: Timber Structures (bauiM1S12-BAUING-HB) [M-BGU-100044]

Responsible: Prof. Dr.-Ing. Philipp Dietsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100028	Timber Structures	6 CR	Dietsch

Competence Certificate
- 'Teilleistung' T-BGU-100028 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
After the successful completion of the module, the students are able to differentiate construction types, used in modern timber buildings, and to design wall, floor and roof elements used in timber frame construction. The students know the state-of-the-art in construction with plane timber elements including cross-laminated timber and timber-concrete composites. The students are able to design plane timber elements under special consideration of shear deformations, including gamma-method and shear analogy.

The students are able to design large-span timber structures under consideration of the special characteristics of timber as a construction material, i.e. taking into account the anisotropic behavior of wood and its reaction to moisture. The students are able to understand the particularities in the design of beams with special structural forms and to perform stability verifications under consideration of the stiffness of connections. They are able to design important details, connections and related reinforcement.

Content
Based on the contents taught on Bachelors level (e.g. Basics in Timber Structures), the students receive further insight into the design of elements used in modern timber construction. Within this, the first focus is given to plane elements made of cross-laminated timber and timber-concrete composites. The second focus is on the design of large-span timber structures.

The subjects covered can be defined as follows.

- timber houses: structural typologies and development
- wall and floor elements
- cross-laminated timber: Characteristics and design
- timber-concrete-composite structures
- timber products and structural elements in timber engineering
- connections and stiffness of connections
- glued connections
- reinforcement of connections
- stability and bracing systems
- notched beams and holes in beams
- structural fire design

All topics are accompanied by exercise sessions in which the essential design methods are applied.

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

Recommendation
none

Literature
PowerPoint slides. Scriptum of exercise session. Notes of the students, taken during lectures, are necessary.

Scriptum to specific course contents

EN 1995-1-1 with DIN EN 1995-1-1/NA:2013-08

Secondary literature:

Blaß, H.-J., Sandhaas, C.; Timber Engineering; KIT Scientific Publishing; 2017

Wallner-Novak, M. et al.; Cross-laminated timber; Part 1: Structural design, Part 2: Applications; pro Holz; 2014 / 2018

M 5.14 Module: Non-linear Analysis of Beam Structures (bauiM1S14-NILI-STAB) [M-BGU-100046]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100030	Non-linear Analysis of Beam Structures	6 CR	Freitag

Competence Certificate
- 'Teilleistung' T-BGU-100030 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students will be able to formulate and apply the essential methods of non-linear calculation of beam structures as a basis for design and construction. They will gain a sound understanding of material and geometric non-linearity, including the fundamentals of load-bearing capacity methods and second-order theory. In particular, students should be able to assess the limits of the theories in order to apply them in a targeted manner. Students will be able to use modern software tools for non-linear structural analysis and to interpret and verify the results obtained. They learn to develop critical thinking and should be able to identify potential problems in the application of non-linear models and propose solutions. The theoretical foundations taught will enable students to verify non-linear models of engineering structures and apply the associated design guidelines with confidence. Students will be able to carry out realistic modeling of non-linear beam structures. In particular, cross-section and system reserves can be utilized in order to realize sustainable engineering solutions for beam structures.

Content

- material nonlinearity: basics of ultimate load design, plastic hinge 1st order theory
- incremental and direct calculation of the ultimate load, limit value theorems
- geometrical nonlinearity: equilibrium of 2nd order theory
- displacement methods
- predeformation
- iteration procedures
- stability problems
- combination of geometrical and material nonlinearity

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

Recommendation
courses Structural Analysis I+II (6200401, 6200501)

Literature
lecture notes 'Nichtlineare Modellierung von Stabtragwerken'

M 5.15 Module: Computational Analysis of Structures (bauiM1S15-CTWM) [M-BGU-100047]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100174	Student Research Project 'Computational Analysis of Structures'	2 CR	Freitag
T-BGU-100031	Computational Analysis of Structures	4 CR	Freitag

Competence Certificate
- 'Teilleistung' T-BGU-100174 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100031 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
Students acquire the competence to correctly create models, taking into account the different properties of beam and plate structures. They acquire the ability to critically evaluate modeling results and identify potential sources of error. They develop an understanding of the accuracy of modeling and the ability to apply various numerical methods to improve solutions. Students learn how to use a finite element program from research to investigate scientific problems. They acquire skills in the use of commercial software for structural analysis, including the ability to select suitable software for specific problems.

Content

- numerical simulation of 2D/3D beams, surface structures
- modeling of 2D/3D beams, surface structures
- exactness and improvement of the solutions
- folded plates
- rotational shells
- adaptive mesh generation
- stationary heat conduction 2D/3D and further problems of building physics
- commercial software for design and construction

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- preparation of student research project (exam prerequisite): 50 h
- examination preparation: 40 h

total: 180 h

Recommendation
module Surface Structures and Dynamics of Structures [bauiM1P3-FTW-BD]

Literature

lecture notes 'Computergestützte Tragwerksmodellierung'
Krätzig, W.B., Basar, Y. (1997): Tragwerke 3 - Theorie und Anwendung der Methode der Finiten Elemente, Springer.
Werkle, H. (2007): Finite Elemente in der Baustatik, Statik und Dynamik der Stab- und Flächentragwerke, Vieweg.

5.16 Module: FE-Applications in Practical Engineering (bauiM1S16-FE-PRAXIS) [M-BGU-100048]

Responsible: Prof. Dr.-Ing. Steffen Freitag

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100032	FE-Applications in Practical Engineering	6 CR	Freitag

Competence Certificate
- 'Teilleistung' T-BGU-100032 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students learn how to work with digital structural models. They acquire the ability to carry out and check computer-aided modeling of structures (beam and surface structures) using commercial FE programs on the basis of practical construction projects. In addition to the advantages, the weak points of commercial FE software are also highlighted. In this way, students should develop critical thinking and learn to carry out plausibility checks. They discuss different modeling variants in project work within a team and acquire the ability to present and defend jointly developed results.

Content

- application of commercial software for the modeling of beam- and surface structures
- structural analysis and design
- discussion of the approximation quality of the numerical methods by means of examples
- analytical comparative calculations
- control options
- FE-BIM interfaces

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- home and project work and preparation of final presentation: 75 h

total: 180 h

Recommendation
module Surface Structures and Dynamics of Structures [bauiM1P3-FTW-BD]

Literature
to be announced in the course

5.17 Module: Shell Structures and Stability of Structures (bauiM1S17-STABISHELL) [M-BGU-100049]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100254	Student Research Project 'Shell Structures and Stability of Structures'	2 CR	Freitag
T-BGU-100033	Shell Structures and Stability of Structures	4 CR	Freitag

Competence Certificate
- 'Teilleistung' T-BGU-100254 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100033 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
Students will be able to formulate and apply the theory and analytical and computer-aided modeling of shell structures and stability problems. They should be able to use basic knowledge of membrane bending theory for shells to assess the limits of load-bearing capacity. One goal is to acquire the ability to recognize and analyze stability problems of load-bearing structures. In particular, students are taught various methods for solving stability problems analytically and numerically. Students should be able to analyze and understand the effects of imperfections on beam and shell structures. Students should be able to develop analytical solutions for shell structures and stability problems in order to use them as a control option for finite element calculations. They will be able to use modern engineering software for shells and stability problems and to interpret and verify the results obtained. The fundamentals taught will enable students to confidently solve practical examples of shell structures and stability problems of load-bearing structures.

Content

- shell structures in nature and technique
- membrane and bending theory of rotational shells
- analytical solutions for rotational shells
- force value method for rotational shells,
- FE-modeling of shell structures
- basics of stability theory for structures
- analytical solutions for stability endangered structures
- sensitivity and imperfections for beam and surface structures
- numerical models for path following
- bifurcation
- buckling of shells
- practical examples

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

Annotation
none

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

- Shell Structures lecture, exercise: 30 h
- Stability of Structures lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Shell Structures: 15 h
- preparation and follow-up lectures, exercises Stability of Structures: 15 h
- preparation of student research project (exam prerequisite): 50 h
- examination preparation: 40 h

total: 180 h

Recommendation
course Surface Structures (6214701)

Literature
lecture notes Schalentragwerke
lecture notes Stabilität der Tragwerke

M 5.18 Module: Numerical Methods in Structural Analysis (bauiM1S18-FEM-BS) [M-BGU-100050]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100034	Numerical Methods in Structural Analysis	6 CR	Freitag

Competence Certificate
- 'Teilleistung' T-BGU-100034 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students gain an overview of the structure of finite element programs for various structural elements, e.g. beam and plate structures. They will be able to integrate different numerical methods. This enables them to better understand the structure of commercial software and expand it if necessary. Students acquire basic programming skills. They can efficiently implement nonlinear FE formulations in software and learn strategies for analyzing and checking the software. Students acquire the ability to efficiently process data for numerical calculation and to display the results via interfaces to graphics programs. They learn to check the numerical results using known structural methods.

Content

- development of a program for truss structures with VBA
- input and output of data
- element stiffness matrices, transformation, solving of equations
- calculation of stress resultants
- numerical implementation of non-linear finite element formulations of beam structures, e.g. geometrically non-linear truss and beam elements
- solution algorithms for non-linear FE equations, e.g. Newton method
- visualization of results
- FEM for surface structures
- numerical integration for surface structures
- discussion of FEM with approximation with low order interpolation functions
- elimination of numerical stiffness effects using specific integration and interpolation techniques

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
module Computational Analysis of Structures [bauiM1S15-CTWM]

Literature
lecture notes Computational Analysis of Structures

5.19 Module: Non-linear Analysis of Surface Structures (bauiM1S19-NILI-FTW) [M-BGU-100051]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100035	Non-linear Analysis of Surface Structures	6 CR	Wagner

Competence Certificate
- 'Teilleistung' T-BGU-100035 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can classify and apply the essential principles of nonlinear analysis of surface structures. Hence, they are able to conduct even difficult static computations and use the required tools therefore methodically in an appropriate manner.

Content

- geometric nonlinear models of surface structures
- nonlinear material models for thin structures
- analytical and numerical surface structure analysis
- introduction to the modeling of shell structures
- application of stability and dynamic problems
- modeling of laminated structures
- practical examples

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
course Surface Structures (6214701), module Computational Analysis of Structures [bauiM1S15-CTWM]

Literature
lecture notes

5.20 Module: Basics of Finite Elements (bauiM1S20-GRUNDFE) [M-BGU-100052]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-109908	Homework 'Basics of Finite Elements'	1 CR	Betsch
T-BGU-100047	Basics of Finite Elements	5 CR	Betsch

Competence Certificate
- 'Teilleistung' T-BGU-109908 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100027 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
The students can describe the structure and the functionality of FE codes. They can formulate the basics of variational principles of FEM as well as the Lagrangian element family of different order of projection for one-dimensional, planar and spatial problems in the fields of linear strength of materials and heat transport. They know, that it is an approximate solution method for boundary value problems, and they are aware of its limits. They can get familiar quickly with commercial FE codes and can use them reasonably.

Content
The theoretical principles as well as the numerical implementation of Finite Element Methods are covered. The major terms are discussed such as weak form of the boundary value problem, test function, projection function, continuity requirements, domain discretization, Galerkin approximation, stiffness matrix, assembly,iso-parametric concept, numerical integration and accuracy of finite element approximation.

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- processing exercises sheets: 30 h
- examination preparation: 45 h

total: 180 h

Recommendation
none

Literature
[1] Cook, Malkus, Plesha: Concept and Applications of Finite Element Analysis, 1989.
[2] Hughes: The Finite Element Method, 1987.
[3] Zienkiewicz, Taylor: The Finite Element Method, Volume 1,2 & 3, 2000.
[4] Bathe: Finite-Elemente-Methoden, 2001.

M 5.21 Module: Fracture and Damage Mechanics (bauiM1S21-BRUCHMECH) [M-BGU-100053]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100087	Fracture and Damage Mechanics	6 CR	Seelig

Competence Certificate
- 'Teilleistung' T-BGU-100087 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students are able to apply the basic principles and methods of fracture and damage mechanics as used for the analysis of fissured structures and the description of complex material behavior. They can establish relationships between continuum mechanical descriptions and material specific aspects.

Content

- phenomenology and mechanisms of fracture
- linear elastic fracture mechanics (crack tip fields, K-concept, energy balance, J-integral, small scale yielding)
- elastic plastic fracture mechanics (Dugdale model, HRR-field, J-controlled crack growth)
- dynamic fracture mechanics (dynamic loading, fast running cracks)
- micromechanics of heterogeneous solids (defects and eigenstrain, RVE-concept, homogenization)
- damage mechanics (mechanisms of brittle and ductile damage, micromechanical and phenomenological models, softening and localization)

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
course Introduction to Continuum Mechanics (6200421)

Literature

[1] Anderson, T.L.: Fracture Mechanics - Fundamentals and Application. CRC Press, 1995
[2] Gdoutos, E.E.: Fracture Mechanics - An Introduction. Kluwer Acad. Publ., 1993
[3] Gross, D., Seelig, Th: Bruchmechanik - mit einer Einführung in die Mikromechanik, Springer, 2016
[4] Knott, J.F.: Fundamentals of Fracture Mechanics. Butterworth, 1973
[5] Krajcinovic, D.: Damage Mechanics. Elsevier, 1996
[6] Kuna, M.: Numerische Beanspruchungsanalyse von Rissen. Springer, 2008
[7] Mura, T.: Micromechanics of Defects in Solids. Martinus Nijhoff Publishers, 1982
[8] Nemat-Nasser, S., Hori, M.: Micromechanics - Overall Properties of Heterogeneous Materials. North-Holland, 1993
[9] Zehnder, A.T.: Fracture Mechanics. Springer, 2012

M 5.22 Module: Material Models in Solid Mechanics (bauiM1S22-MATTHEO) [M-BGU-100054]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100044	Material Models in Solid Mechanics	6 CR	Seelig

Competence Certificate
- 'Teilleistung' T-BGU-100044 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students are familiar with the classification of solid mechanical material behaviour into elasticity, viscoelasticity and plasticity, and they are able to explain related phenomena. They know how to formulate constitutive equations for the mathematical description of material behaviour and can evaluate these in the context of multiaxial loading and deformation processes. The students know suitable stress and strain tensors for the formulation of material models in case of large deformations.

Content

- general purpose of material theories and constitutive laws
- elasticity (isotropic / anisotropic material models)
- phenomenology of inelastic material behavior (residual deformation, rate-dependence / creep, plastic incompressibility / dilatancy, pressure-dependence / independence, damage)
- concepts of constitutive modeling (internal variables, yield condition, flow rule, hardening laws, incremental constitutive equations)
- material theories: viscoelasticity, plasticity, viscoplasticity
- applications (metals, geomaterials, concrete, thermoplastic polymers, wood)

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
course Introduction to Continuum Mechanics (6200421)

Literature

[1] Chen, W.F., Hahn, D.J.: Plasticity for Structural Engineers. Springer, 1988
[2] de Souza Neto, E.A., Peric, D., Owen, D.R.J.: Computational Methods for Plasticity. Wiley, 2008
[3] Doghri, I.: Mechanics of Deformable Solids. Springer, 2000
[4] Khan, A.S., Huang, S.: Continuum Theory of Plasticity. Wiley,1995
[5] Lemaitre, J., Chaboche, J.L.: Mechanics of Solid Materials. Cambridge University Press, 1990
[6] Lubliner, J.: Plasticity Theory. Macmillan, 1990; Dover, 2008
[7] Seelig, Th.: Anwendungsorientierte Materialtheorien. Lecture notes

M 5.23 Module: Concrete Construction Technology (bauiM1S24-BETONTECH) [M-BGU-100056]

Responsible: Prof. Dr.-Ing. Frank Dehn
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100036	Concrete Construction Technology	6 CR	Dehn, Patel

Competence Certificate
- 'Teilleistung' T-BGU-100036 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- Concrete Technology lecture/exercise: 45 h
- Modeling in Concrete Technology lecture: 15 h

independent study:

- preparation and follow-up lecture/exercises Concrete Technology: 45 h
- preparation and follow-up lectures Modeling in Concrete Technology: 15 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

M 5.24 Module: Durability and Service Life Design (bauiM1S25-DAUERLEB) [M-BGU-100057]

Responsible: Dr.-Ing. Michael Vogel

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100037	Durability and Service Life Design	6 CR	Vogel

Competence Certificate
- 'Teilleistung' T-BGU-100037 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- Corrosion Processes and Life Time lecture/exercise: 45 h
- Analytic Methods lecture: 15 h

independent study:

- preparation and follow-up lecture/exercises Corrosion Processes and Life Time: 45 h
- preparation and follow-up lectures Analytic Methods: 15 h
- examination preparation: 60 h

total: 180 h

Recommendation
course Building Chemistry (6200108)

M 5.25 Module: Building Preservation of Concrete and Masonry Constructions (bauiM1S26-BBM) [M-BGU-100058]

Responsible: Dr.-Ing. Michael Vogel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100175	Student Research Project 'Building Preservation of Concrete and Masonry Constructions'	1 CR	Vogel
T-BGU-100038	Building Preservation of Concrete and Masonry Constructions	5 CR	Vogel

Competence Certificate
- 'Teilleistung' T-BGU-100175 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100038 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
After successful completion of the module the students have detailed knowledge about the relevant causes and processes of degradation in concrete and masonry constructions. Thus they are able to take appropriate measures to enhance the durability of solid buildings and to plan and execute effective measures to repair damaged concrete and masonry constructions. Moreover the students have also the knowledge about the main aspects and basic techniques of building reinforcement.

Content
This course provides fundamental knowledge of the possibilities to preserve concrete and masonry constructions. Besides an introduction into the characteristics of masonry, plaster, concrete and reinforced concrete structures, various damage patterns and their origins are discussed. Based on the knowledge of the essential damage processes, efficient measures for the increase of the durability are described, which include material and constructional precautions as well as additional preventive measures. Furthermore the course focuses on the repair of already damaged concrete and masonry constructions. In this connection different research methods for the analysis of damages are presented and various possibilities are shown to predict the time-development of these damages. Finally repair materials as well as procedures are described which are necessary for the realization of a durable repair measure. A further main part of the course covers the different possibilities of an additional reinforcement of concrete and masonry constructions. Applicable materials and their characteristics in design and construction are introduced and discussed. In the accompanying exercises the subject matter shall independently be developed and the practical realization will be practised by means of several design problems.

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

Annotation
none

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

- Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions lecture, exercise: 45 h
- Building Analysis lecture: 15 h

independent study:

- preparation and follow-up lectures, exercises Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions: 25 h
- preparation and follow-up lectures Building Analysis: 15 h
- preparation of student research project "Building Preservation of Concrete and Masonry Constructions": 40 h
- examination preparation: 40 h

total: 180 h

Recommendation
none

Literature
Hand-outs and (selection):
[1] Blaich, J.: Bauschäden - Analyse und Vermeidung; EMPA; Stuttgart, 1999
[2] Pfefferkorn, W.: Rißschäden an Mauerwerk, Ursachen erkennen - Rißschäden vermeiden; Stuttgart, IRB Verlag, 1994
[3] Reichert, H.: Konstruktiver Mauerwerksbau, Bildkommentar zur DIN 1053-1, Rudolf Müller Verlag, Köln, 1999
[4] Ruffert, G.: Ausbessern und Verstärken von Betonbauteilen; 2. Aufl.; Beton Verlag, 1982
[5] SIVV - Handbuch: Schützen, Instandsetzen, Verbinden und Verstärken von Betonbauteilen; Verarbeiten von Kunststoffen im Betonbau beim Deutschen Beton- und Bautechnik-Verein E.V.; IRB Verlag, Stuttgart, 2008
[6] Stark, J.; Wicht, B.: Dauerhaftigkeit von Beton - Der Baustoff als Werkstoff, Hrsg.: Bauhaus-Univ. Weimar, F.A. Finger-Institut für Baustoffkunde -FIB-; 2001
[7] Tausky, R.: Betontragwerke mit Außenbewehrung; Birkhäuser Verlag, Basel, 1993

M 5.26 Module: Building Physics I (bauiM1S27-BAUPH-I) [M-BGU-103950]

Responsible: Prof. Dr.-Ing. Frank Dehn
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100039	Applied Building Physics	3 CR	Altmann
T-BGU-100040	Building Technology	3 CR	Wirth

Competence Certificate
- 'Teilleistung' T-BGU-100039 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100040 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- Applied Building Physics lecture: 30 h
- Building Technology lecture: 30 h

independent study:

- preparation and follow-up lectures Applied Building Physics: 30 h
- examination preparation Applied Building Physics (partial exam): 30 h
- preparation and follow-up lectures Building Technology: 30 h
- examination preparation Building Technology (partial exam): 30 h

total: 180 h

Recommendation
none

5.27 Module: Building Physics II (bauiM1S28-BAUPH-II) [M-BGU-100060]

Responsible: Prof. Dr.-Ing. Frank Dehn
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-108024	Practical Noise Control	3 CR	Zander
T-BGU-100042	Practical Fire Protection	3 CR	Egelhaaf

Competence Certificate
- 'Teilleistung' T-BGU-108024 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100042 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- Practical Noise Control lecture: 30 h
- Practical Fire Protection lecture: 30 h

independent study:

- preparation and follow-up lectures Practical Noise Control: 30 h
- examination preparation Practical Noise Control (partial exam): 30 h
- preparation and follow-up lectures Practical Fire Protection: 30 h
- examination preparation Practical Fire Protection (partial exam): 30 h

total: 180 h

Recommendation
none

M 5.28 Module: Materials Testing and Measuring Techniques (bauiM1S29-MATPRÜF) [M-BGU-100061]

Responsible: Dr.-Ing. Nico Herrmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100043	Materials Testing and Measuring Techniques	6 CR	Herrmann

Competence Certificate
- 'Teilleistung' T-BGU-100043 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can explain the basic knowledge of materials testing in the field of construction materials and concrete structures connected with the application in engineering constructions (e.g. bridges, power plants, etc.). They can name the basics of measuring techniques and are able to record the relevant measuring parameters for high-level material testing. The students develop self-reliantly a measurement concept, which they apply and evaluate.

Content

- introduction to different measurement techniques and their principles
- material testing of construction materials and elements
- basics in testing techniques and concepts
- examples from current research projects

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

Annotation
The number of participants in the courses is limited to 12 persons. In case of selection of participants participation will be preferentially provided to students further advanced in their studies.

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

- Measuring Techniques in Civil Engineering lecture, exercise: 30 h
- Materials Testing in the Field of Concrete lecture: 30 h

independent study:

- preparation and follow-up lectures, exercises Measuring Techniques in Civil Engineering: 30 h
- preparation and follow-up lectures Materials Testing in the Field of Concrete: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

5.29 Module: Finite Elements in Solid Mechanics (bauiM1S37-FEFKM) [M-BGU-100578]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100998	Finite Elements in Solid Mechanics	6 CR	Betsch

Competence Certificate
- 'Teilleistung' T-BGU-100998 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- lectures, exercises: 60 h

independent study:

- preparation and follow-up: 45 h
- working on programming exercises: 30 h
- examination preparation and examination: 45 h

total: 180 h

Recommendation
module 'Basics in Finite Elements' [bauiM1S20-GRUNDFE]

5.30 Module: Numerical Structural Dynamics (bauiM1S38-NUMSTRDYN) [M-BGU-100579]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100999	Computational Structural Dynamics	6 CR	Betsch

Competence Certificate
- 'Teilleistung' T-BGU-100999 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- lectures, exercises: 60 h

independent study:

- preparation and follow-up: 45 h
- working on programming exercises: 30 h
- examination preparation and examination: 45 h

total: 180 h

Recommendation
module Basics in Finite Elements [bauiM1S20-GRUNDFE]

M 5.31 Module: Tank Construction (bauiM1S39-BEHBAU) [M-BGU-100580]

Responsible: Dr.-Ing. Peter Knödel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-101001	Term Paper Tank Construction	3 CR	Knödel
T-BGU-101000	Tank Construction	3 CR	Knödel

Competence Certificate
- 'Teilleistung' T-BGU-101001 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-101000 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
The students can design and construct tank and silo structures and they can assess the influences on the structural behavior of shell structures:

- They can apply scientific methods for the system analysis of tanks.
- They can develop problem solutions beyond the application of the regulations for tank constructions.
- They have the ability to work intterdisciplinarily at the interface to plant engineering and construction.
- They can compile complex technical facts and impart them to a plenary assembly.

Content

- classification of tank and silo types
- application related material selection
- actions on storage structures: characteristics of wind loads (e.g. flow around cylinders), filling, internal pressure, earthquakes and explosions
- structural behavior of shell structure
- strength and stability check by linear and non-linear calculations under comparison of handouts with FE models
- design and construction
- specific problems

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

Annotation
none

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

- lecture, exercise: 45 h
- discussion on term paper: 15 h

independent study:

- preparation and follow-up lectures, exercises: 20 h
- preparation of term paper (partial exam): 80 h
- examination preparation (partial exam): 20 h

total: 180 h

Recommendation
The contents of the lecture Basics in Steel Structures (6200504) are required. Contens of the modules Surface Structures and Dynamics of Structures [bauiM1P3-FTW-BD] as well as Steel and Composite Structures [bauiM1P2-STABISTB] are recommended.

Literature
lecture notes
DIN EN 1993-1-6: Bemessung und Konstruktion von Stahlbauten - Teil 1-6: Festigkeit und Stabilität von Schalen.
DIN EN 1993-4-1: Bemessung und Konstruktion von Stahlbauten - Teil 4-1: Silos.
DIN EN 1993-4-2: Bemessung und Konstruktion von Stahlbauten - Teil 4-2: Tankbauwerke.
Knödel, P.; Heß, A.; Ummenhofer, T.: Stählerne Tankbauwerke nach DIN EN 1993-4-2. In: Stahlbau-Kalender 2013, S. 523-563.
Radlbeck, C.; Knödel, P.; et al.: Bemessung und Konstruktion von Aluminiumtragwerken. In: Stahlbau Kalender 2016, S. 175-309.
Knödel, P.; Ummenhofer, T.; Ruckenbrod, C.: Silos und Tanks. In: Stahlbau Kalender 2017, S. 595-692.
Knödel, P.; Ummenhofer, T.: Regeln für die Berechnung von Behältern mit der FEM. Stahlbau 86 (2017), S. 325-339.

M 5.32 Module: Modeling in Solid Mechanics (bauiM1S40-MODFEST) [M-BGU-101673]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules)
Study Focus II / Structural Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-103223	Modeling Techniques in Solid Mechanics	6 CR	Konyukhov

Competence Certificate
- 'Teilleistung' T-BGU-103223 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can explain and classify various numerical analysis of engineering structures based on geometrical models of different dimensionality bars, beams, shells and solids. They know the derivation of finite element models from the geometrical point of view together with corresponding hypothesis of deformation. They know, that this procedure is a model reduction and a continuous transformation from 3D continuum to the shell, beams and bar models. They can assign and use different computational methods and the corresponding set of finite elements for practical engineering problems.

Content
One- and multidimensional bodies are presented by differential geometry: provision of line and surface descriptions on the one hand and of selected curvilinear coordinate system for the description of three-dimensional solid bodies on the other hand. The kinematics of deformation is imparted in all cases with the associated forces on the one hand and the appropriate Dirichlet and Neumann boundary conditions on the other hand.

Available computational methods are explained: static methods with a-posteriori error estimation and mesh refinement; eigen value analyses and modal methods as well as their applications, e.g. with respect to stability problems; dynamic computations in implicit and explicit formulations; harmonic methods with application of resonance phenomena.

All models are illustrated with FEM software, including practical programming in ANSYS APDL.

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

Recommendation
course Introduction to Continuum Mechanics (6200421); module Basics of Finite Elements [bauiM1S20-GRUNDFE]

Literature

1. P. Wriggers, Nichtlineare Finite-Element-Methoden, Springer, 508 p., 2008.
2. P. Wriggers, Nonlinear Finite Element Methods, Springer, 560 p., 2008.
3. O. C. Zienkiewicz, R. L. Taylor, J. Z. Zhu, The Finite Element Method. Its Basis and Fundamentals, ITS Basisand Fundamentals, Elsevier Ltd, Oxford; Auflage: 6th ed. 752 p., 2005.
4. Thomas J. R. Hughes, The Finite Element Method: Linear Static and Dynamic Finite Element Analysis, Dover Civil and Mechanical Engineering publication, 672 p., 2000.
5. T. Belytschko, W.K. Liu, B. Moran, Nonlinear Finite Elements for Continua and Structures, Wiley, 300 p., 2000.
6. http://www.ansys.com/Support/Documentation7. http://www.lstc.com/download/manuals

M 5.33 Module: Contact Mechanics (bauiM1S41-KONTMECH) [M-BGU-104916]

Responsible: Dr.-Ing. Marlon Franke
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2019)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2019)
Subject-Specific Supplements (Usage from 4/1/2019)

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

Mandatory			
T-BGU-109947	Contact Mechanics	6 CR	Franke

Competence Certificate
- 'Teilleistung' T-BGU-109947 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students gain the ability to name the basics for the numerical simulation of contact problems. They can transfer these capabilities to the discussion of deformable bodies in contact. The students can describe the handling of general interface problems, non-smooth dynamics and inequality constraints. The students are able to apply formulations of interfaces based on collocation methods and recent integral formulations.

Content
The continuum mechanical description of deformable bodies (continua) with second-order condition is imparted. The formulation of contact conditions and friction laws is discussed. Further, methods for claiming of constraints is discussed. The contact contribution is emphasised particularly by the subsequent numerical implementation.

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

Recommendation
course Introduction to Continuum Mechanics (6200421), module Basics of Finite Elements [bauiM1S20-GRUNDFE]

Literature
[1] Laursen: Computational Contact and Impact Mechanics
[2] Wriggers: Computational Contact Mechanics

5.34 Module: Digital Planning and Building Information Modeling (bauiM1S42-DIGIPLAN) [M-BGU-105135]

Responsible: Dr.-Ing. Tim Zinke
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2019)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2019)
Subject-Specific Supplements (Usage from 10/1/2019)

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

Mandatory			
T-BGU-110382	Digital Planning and Building Information Modeling	6 CR	Zinke

Competence Certificate
- 'Teilleistung' T-BGU-110382 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
see German version

Content
see German version

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

Annotation
further information see German version

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures/exercises, tutorials: 40 h
- project work, modeling, preparation of BIM flat pattern plan and report with presentation: 80 h

total: 180 h

Recommendation
course Computer Aided Design (CAD) (6200520)

course Steel and Composite Structures (6212801 und 6212802)

Literature
[1] Borrmann, A.; König, M.; Koch, C.; Beetz, J. (Hrsg.) (2015): Building Information Modeling – Technologische Grundlagen und industrielle Praxis. Wiesbaden: Springer Vieweg (VDI-Buch).
[2] Baldwin, M. (2018): Der BIM-Manager – Praktische Anleitung für das BIM-Projektmanagement. Berlin, Wien, Zürich: Beuth.
[3] Hausknecht, Kerstin; Liebich, Thomas (2017): BIM-Kompendium: Building Information Modeling als neue Planungsmethode. Stuttgart: Fraunhofer IRB.

M 5.35 Module: Design and Construction in Metal and Lightweight Structures (bauiM1S43-ENTW-MLB) [M-BGU-105370]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2020)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2020)
Subject-Specific Supplements (Usage from 4/1/2020)

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

Mandatory			
T-BGU-110852	Design and Construction in Metal and Lightweight Structures	6 CR	Ummenhofer

Competence Certificate
- 'Teilleistung' T-BGU-110852 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
The module must not be taken together with the former module Structures in Steel and Timber [bauiM1S10-BAUING-TSH].

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- lecture/exercise: 15 h
- feedback meetings: 10 h

independent study:

- working on design problems and strctural details: 75 h
- preparation of report and final presenatation: 75 h

total: 180 h

Recommendation
course Basics in Steel Structures (6200504); module Steel and Composite Structures [bauiM1P2-STAHLBAU]

M 5.36 Module: Timber Structures: Materials and Appropriate Design (bauiM1S44-BST-HB) [M-BGU-105371]

Responsible: Dr.-Ing. Matthias Frese
Dr. Carmen Sandhaas

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2020)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2020)
Subject-Specific Supplements (Usage from 4/1/2020)

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

Mandatory			
T-BGU-110853	Timber Structures: Materials and Appropriate Design	6 CR	Frese, Sandhaas

Competence Certificate
- 'Teilleistung' T-BGU-110853 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
The module must not be taken together with the present modules Timber and Wood-Based Materials [bauiM1S13-BAUING-HHW] as well as Structures in Steel and Timber [bauiM1S10-BAUING-TSH].

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- Building Materials of Timber Structures lecture/exercise: 30 h
- Material Adapted Constructions of Timber Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lectures/exercises Building Materials of Timber Structures: 30 h
- preparation and follow-up lectures/exercises Material Adapted Constructions of Timber Structures: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
participation in module Timber Structures [bauiM1S12-BAUING-HB]

Literature
lecture accompanying documents as well as lecture notes 'Timber and Wood-Based Materials' and 'Structures in Timber'

M 5.37 Module: Innovations and Developments in Steel and Timber Structures (bauiM1S45-INNO-MHB) [M-BGU-105372]

Responsible: Dr.-Ing. Matthias Albiez
Dr. Carmen Sandhaas

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2020)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2020)
Subject-Specific Supplements (Usage from 4/1/2020)

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

Mandatory			
T-BGU-110854	Innovations and Developments in Metal and Lightweight Structures	3 CR	Albiez
T-BGU-110855	Innovations and Developments in Timber Structures	3 CR	Sandhaas

Competence Certificate
- 'Teilleistung' T-BGU-110854 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-110855 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
The module must not be taken together with the modules Building Preservation and Innovations in Metal and Lightweight Structures [bauiM1S46-BWE-INNO-MLB] as well as Building Preservation and Innovations in Timber Structures [bauiM1S47-BWE-INNO-HB].

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- Innovation and Development in Metal and Lightweight Structures lecture/exercise: 30 h
- Innovation and Development in Timber Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lectures/exercises Innovation and Development in Metal and Lightweight Structures: 30 h
- examination preparation Innovation and Development in Metal and Lightweight Structures (partial examination): 30 h
- preparation and follow-up lectures/exercises Innovation and Development in Timber Structures: 20 h
- preparation of a Paper Assignment: 20 h
- examination preparation Innovation and Development in Timber Structures (partial examination): 20 h

total: 180 h

Recommendation
participation in module Timber Structures [bauiM1S12-BAUING-HB]

Literature
lecture accompanying documents

M 5.38 Module: Building Preservation and Innovations in Metal and Lightweight Structures (bauiM1S46-BWE-INNO-MLB) [M-BGU-105373]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2020)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2020)
Subject-Specific Supplements (Usage from 4/1/2020)

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

Mandatory			
T-BGU-110856	Building Preservation in Steel Structures	3 CR	Ummenhofer
T-BGU-110854	Innovations and Developments in Metal and Lightweight Structures	3 CR	Albiez

Competence Certificate
- 'Teilleistung' T-BGU-110856 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-110854 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
The module must not be taken together with the modules Building Preservation of Steel and Timber Structures [bauiM1S11-BAUING-BSH] as well as Innovations and Developments in Steel and Timber Structures [bauiM1S45-INNO-MHB].

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- Building Preservation of Steel Structures lecture: 30 h
- Innovation and Development in Timber Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lectures Building Preservation of Steel Structures: 30 h
- examination preparation Building Preservation of Steel Structures (partial examination): 30 h
- preparation and follow-up lectures/exercises Innovation and Development in Metal and Lightweight Structures: 30 h
- examination preparation Innovation and Development in Metal and Lightweight Structures (partial examination): 30 h

total: 180 h

Recommendation
none

Literature
lecture accompanying documents

M 5.39 Module: Building Preservation and Innovations in Timber Structures (bauiM1S47-BWE-INNO-HB) [M-BGU-105374]

Responsible: Dr.-Ing. Matthias Frese
Dr. Carmen Sandhaas

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2020)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2020)
Subject-Specific Supplements (Usage from 4/1/2020)

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

Mandatory			
T-BGU-110857	Building Preservation in Timber Structures	3 CR	Frese
T-BGU-110855	Innovations and Developments in Timber Structures	3 CR	Sandhaas

Competence Certificate
- 'Teilleistung' T-BGU-110857 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-110855 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
The module must not be taken together with the modules Building Preservation of Steel and Timber Structures [bauiM1S11-BAUING-BSH] as well as Innovations and Developments in Steel and Timber Structures [bauiM1S45-INNO-MHB].

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- Building Preservation of Timber Structures lecture/exercise: 30 h
- Innovation and Development in Timber Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lectures Building Preservation of Timber Structures: 30 h
- examination preparation Building Preservation of Timber Structures (partial examination): 30 h
- preparation and follow-up lectures/exercises Innovation and Development in Timber Structures: 20 h
- preparation of a Paper Assignment: 20 h
- examination preparation Innovation and Development in Timber Structures (partial examination): 20 h

total: 180 h

Recommendation
participation in module Timber Structures [bauiM1S12-BAUING-HB]

Literature
lecture accompanying documents

M 5.40 Module: Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis (bauiM1S48-KNN) [M-BGU-105929]

Responsible: Prof. Dr.-Ing. Steffen Freitag

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2022)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2022)
Subject-Specific Supplements (Usage from 4/1/2022)

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

Mandatory			
T-BGU-111932	Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis	6 CR	Freitag

Competence Certificate
- 'Teilleistung' T-BGU-111932 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students achieve competences in structural analysis with uncertain data. They are trained to consider uncertain information for the modeling and the computation of structures. Additionally, the students get competences in the handling of artificial neural networks and optimization approaches in structural mechanics.

Content
Uncertainty models are presented for the quantification of uncertain data and the consideration of uncertain model assumptions. The computation with uncertain numbers is introduced by analytical approaches. But the focus is on numerical approaches, which can be applied to structural analyses, e.g., based on the finite element method. To reduce the computation time and the required computational resource, numerically efficient surrogate models are presented. Especially, artificial neural network models are discussed, which are also applied to the optimization of structures. The module consists of the following courses:

- Structural Analysis with Uncertain Data
- Artificial Neural Networks in Structural Analysis
- Structural Optimization

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

Annotation
none

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

- Structural Analysis with Uncertain Data, lecture: 30 Std.
- Artificial Neural Networks in Structural Analysis, lecture: 15 Std.
- Structural Optimization, lecture: 15 Std.

independent study:

- preparation and follow-up lectures Structural Analysis with Uncertain Data: 30 h
- preparation and follow-up lectures Artificial Neural Networks in Structural Analysis: 15 h
- preparation and follow-up lectures Structural Optimization: 15 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

5.41 Module: Continuum Mechanics and Wave Propagation (bauiM1S49-KMWAVE) [M-BGU-106115]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2022)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2022)
Subject-Specific Supplements (Usage from 10/1/2022)

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

Mandatory			
T-BGU-106196	Continuum Mechanics	3 CR	Franke, Seelig
T-BGU-112375	Wave Propagation in Solids	3 CR	Seelig

Competence Certificate
- 'Teilleistung' T-BGU-106196 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-112375 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
This module must not be selected together with the module Basics of Numeric Modeling [bauiM5P4-NUMGRUND].

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-100070 - Basics of Numeric Modeling must not have been started.

Competence Goal
see German version

Content
see German version

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

Annotation
none

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

- Continuum Mechanics lecture: 30 h
- Wave Propagation in Solids lecture: 30 h

independent study:

- preparation and follow-up lectures Continuum Mechanics: 30 h
- examination preparation Continuum Mechanics: 30 h
- preparation and follow-up lectures Wave Propagation in Solids: 30 h
- examination preparation Wave Propagation in Solids: 30 h

total: 180 h

Recommendation
course Introduction to Continuum Mechanics (6200421);

beginning the module in winter term

Literature

Becker, E., Bürger, W.: Kontinuumsmechanik. Teubner, 1975
Bedford, A., Drumheller, D.S.: Introduction to Elastic Wave Propagation. Wiley, 1994
Bonet, J., Wood, R.D.: Nonlinear Continuum Mechanics for Finite Element Analysis. Cambridge, 1997
Chadwick, P.: Continuum Mechanics. Dover, 1998
Doghri, I.: Mechanics of Deformable Solids. Springer, 2000
Fung, Y.C.: Foundations of Solid Mechanics. Prentice Hall, 1965
Hagedorn, P., DasGupta, A.: Vibrations and Waves in Continuous Mechanical Systems. Wiley, 2007
Malvern, L.: Introduction to the Mechanics of a Continuous Medium. Prentice Hall, 1969
Seelig, T.: Kontinuumsmechanik. lecture notes

M 5.42 Module: Practical Course in Experimental Solid Mechanics (bauiM1S50-PRAKTFKM) [M-BGU-106116]

Responsible: Dr.-Ing. Martin Helbig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2022)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2022)
Subject-Specific Supplements (Usage from 10/1/2022)

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

Mandatory			
T-BGU-113137	Experimental Report Fundamentals in Experimental Solid Mechanics	1 CR	Helbig
T-BGU-113138	Experimental Report Advanced Experimental Solid Mechanics	1 CR	Helbig
T-BGU-113139	Practical Course in Experimental Solid Mechanics	4 CR	Helbig

Competence Certificate
- 'Teilleistung' T-BGU-113137 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-113138 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-113139 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
The students are familiar with methods of experimental solid mechanics, especially for the determination of material properties. They can apply this expertise to carry out their own experiments for deformation analysis and determining material parameters.

Content
part 1: Fundamentals of Experimental Solid Mechanics (WS)

- brief overview of documentation and evaluation of experiments
- brief overview of test standards of material properties determination
- determination of basic mechanical material parameters for small deformations
- strain measurement
- determination of Young's modulus, yield stress
- tensile and bending tests with metallic materials and polymers
- creep and relaxation tests

part 2: Advanced Experimental Solid Mechanics (SS)

- strain and stress measurements at large deformations
- optical strain measurement with digital image correlation (DIC)
- cyclic loading tests
- fracture-mechanical tests (CT, SENT specimens)

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

Annotation
The oral examination should normally be taken at the end of the summer term.

The dates of the classes will be provided at the beginning of the semester.

The number of course participants is limited to 10. If necessary, participants are selected according to their progress of study.

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

- Fundamentals in Experimental Solid Mechanics practical course: 30 h
- Advanced Experimental Solid Mechanics practical course: 30 h

independent study:

- preparation and follow-up practical course Fundamentals in Experimental Solid Mechanics: 20 h
- preparation of an experimental report Fundamentals in Experimental Solid Mechanics (not graded examination prerequisite): 25 h
- preparation and follow-up practical course Advanced Experimental Solid Mechanics: 20 h
- preparation of an experimental report Advanced Experimental Solid Mechanics (not graded examination prerequisite): 25 h
- examination preparation: 30 h

total: 180 h

Recommendation
courses Introduction to Continuum Mechanics (6200421) and Continuum Mechanics (6215702);

beginning the module in winter term for logical reason.

Literature
(1) Eden, K., Gebhard, H., 2006. Dokumentation in der Mess- und Prüftechnik. Spektrum, 3. Auflage.
(2) Rölssler, J., Harders, H., Bäker, M., 2016. Mechanisches Verhalten der Werkstoffe, Springer, 5. Auflage
(3) Grellmann, W., Seidler, S., 2015, Kunststoffprüfung, Carl Hanser Verlag GmbH & Co. KG
(4) lecture notes of the Institute of Mechanics

5.43 Module: Interdisciplinary Design of Timber Structures (bauiM1S51-TWEHOLZ) [M-BGU-106119]

Responsible: Prof. Dr.-Ing. Philipp Dietsch
Prof. Dr.-Ing. Riccardo La Magna

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2022)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2022)
Subject-Specific Supplements (Usage from 10/1/2022)

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

Mandatory			
T-BGU-112392	Interdisciplinary Design of Timber Structures	6 CR	Dietsch, La Magna

Competence Certificate
- 'Teilleistung' T-BGU-112392 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
After participating in the module **Interdisciplinary Design of Timber Structures**, students will be able to understand and apply the following governing requirements in the design process of a structure:

- recognize the relationship between architectural design, material selection, support structure and structural details.
- develop structural concepts, identify promising variants based on considerations of material, function, design and plausibility, and finally detail a structural design in a progressive process up to feasibility
- integrate divergent requirements from different disciplines into their structural design (teamwork and interdisciplinarity)
- present their results precisely, clearly and within the given time frame using the usual means of presentation (lecture, plans, reports, models)
- to be able to quickly abstract meaningful answers to design-specific questions within the framework of the interim and final presentations on the basis of the specialist knowledge acquired by then
- to recognize and understand other, among others discipline-specific perspectives and to derive practical consequences for a good interdisciplinary cooperation (supported by House of Competence)

Content
The module is aimed at students of architecture and civil engineering and promotes integrative work between the closely related disciplines. Constructive design is practiced on the basis of an annually changing design task, which is worked on in teams of two to four students from the different disciplines. Each brings his or her special knowledge to the design process in order to develop a detailed project together from the beginning. The groups are supervised by teaching assistants from the two participating institutions. Structural design and development is divided into three phases:

- structural concept (design planning): Presentation and explanation of the selected primary load-bearing systems for the individual parts of the building, as well as delimitation and evaluation against optional load-bearing systems.
- elaboration and dimensioning (approval planning): Structure of the supporting structure/positioning; determination of the actions, loads and internal forces on the supporting structure; dimensioning and sizing of the primary support system, if necessary pre-dimensioning of other necessary supporting elements; presentation as well as dimensioning of the bracing system; dimensioning and sizing of selected detail points
- representation, detailing and construction planning (detailed design): Floor plan, elevations, sections, if necessary axonometry and presentation model of the load-bearing and bracing system, presentation of 2-3 selected detail points, explanations on prefabrication, transport and assembly, explanations on possibilities of disassembly/reusability and recycling.

Each of the three phases will be concluded with a presentation of the intermediate results (phases 1 and 2) or the final result.

The project is accompanied by the House of Competence through workshops on interdisciplinary cooperation, teamwork and communication skills.

The module takes place weekly. During this time, the individual groups are supervised by staff members of the participating chairs. At least 30 minutes of meeting time are scheduled per group. In addition, collective consultation hours are offered with all groups on global issues concerning design, construction, structural analysis and detailing. In addition, the lecturers will give impulse presentations.

Module grade calculation
grade of the modul is grade of the exam

Annotation
The work on the design project will be done in teams of students of Architecture an Civil Engineering.

The number of participants is limited. 12 participants will be selected according to thier progress of study of the master programs *Engineering Structures* and *Civil Engineering*.

For the parts on teamwork, which are accompanied by the House of Competence (HoC), 1 LP can be acquired as 'Interdisciplinary Qualification' or as additional accomplishment.

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

- seminar, feedback meetings, interim presentations: 25 h

independent study:

- working out the design project in a team: 75 h
- preparation of the requested deliverables, preparation of the final presentation (examination): 80 h

total: 180 h

Recommendation
course 'Basics in Timber Structures' (6200507);

<u>strongly recommended:</u>
module Timber Structures [bauiM1S12-BAUING-HB] or module "Timber Structures: Materials and Appropriate Design" [bauiM1S44-BST-HB] should be completed

Literature
Herzog, T., Natterer, J.; Holzbau Atlas, Detail Verlag, 2003
Kaufmann, H., Krötsch, S., Winter, S.; Atlas Mehrgeschossiger Holzbau, Edition Detail, 2021
Kolb, J.; Holzbau mit System, Birkhäuser Verlag, 2020

M 5.44 Module: Fire Behavior of Building Materials, Components and Constructions (bauiM1S52-BRAND) [M-BGU-105936]

Responsible: Prof. Dr.-Ing. Frank Dehn

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2023)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2023)
Subject-Specific Supplements (Usage from 4/1/2023)

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

Mandatory			
T-BGU-111947	Fire Behavior of Building Materials, Components and Constructions	6 CR	Dehn

Competence Certificate
- 'Teilleistung' T-BGU-111947 with oral examination according to § 4 Par. 2 No. 2

Prerequisites
none

Competence Goal
The students master the theoretical basics of fire theory and can describe the risk of fire occurrence, the temporal processes and the consequences of a fire. They know the essential laws and standards for preventive, structural fire protection. Using the building inspection regulations, the students can name the requirement criteria for building materials and building products. In addition, they are familiar with the test procedures for demonstrating compliance with these criteria.

The students are able to describe the fire behavior of the relevant elements of the supporting structure, building envelope and interior fittings and have extensive knowledge of the common building materials and components in reinforced concrete, masonry, steel, wood and composite construction. Students will be able to describe how building structures fail in the event of fire and the conditions that promote component failure. Students will have a basic knowledge of materials for high temperature applications, such as structural and civil engineering.

Students learn how to proactively reduce structural risks prior to a fire event. They learn how structural components behave in a composite structure during fire. And they learn how to perform post-fire structural restoration.

Students will know the basics of fire protection engineering methods and how to simulate material behavior under high temperatures. They also have basic knowledge of experimental methods in fire protection research.

Content
Building on the fundamentals of building physics acquired in the bachelor's program, in-depth theoretical knowledge of the effects of fires in building construction and civil engineering is taught.

Starting with scientific fundamentals of combustion processes, followed by the practical view of the fire department on fires, a deeper understanding of the risk of fire occurrence, temporal fire sequence and fire consequences for the natural and built environment is first conveyed.

Taking into account the most relevant laws, standards and test specifications, the aspects of structural fire protection planning are comprehensively clarified.

One focus is on the material-scientific consideration of the high-temperature behavior of building materials and building products. The framework is provided by the building material and component characteristics in the construction types of reinforced concrete, masonry, steel, wood and composite construction. These are supplemented by selected building materials and building products of particular relevance, such as insulation materials, roofs, facades, dry construction and elements of building services. The knowledge imparted on material behavior forms a triad with the topics of material testing and methods of material research. The unusual load case of fire always forms the core of the content. However, building materials and building products under planned, long-term temperature loads, such as in power plant construction, are also addressed.

As a second focal point, in addition to the material-scientific consideration of building materials and building products, the fire event is considered from the point of view of building design. With the explanation of relevant solution approaches for manual as well as computer-aided dimensioning and simulation tools, basic competences for fire protection planning are imparted. Under the headings of design, construction, operation and refurbishment, the course then looks at the relationship between the properties of insulated building materials and building products and the requirements of preventive structural fire protection over several life cycles. The knowledge imparted includes building code and building product law as well as the correct planning and execution of building details, including comprehensive pre-fire quality management. Furthermore, the behavior of the structure is considered with regard to component failure and temperature-related deformations as well as the consequences of preloads and use-related previous damage to the structure during the fire. The last point of the lecture is the restoration of damage after the fire.

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

Annotation
none

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

- lecture/exercise: 60 Std.

independent study:

- preparation and follow-up lecture/exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

M 5.45 Module: Mechanics of Composite Materials (bauiM1S53-MVW) [M-BGU-106817]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2024)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2024)
Subject-Specific Supplements (Usage from 10/1/2024)

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

Mandatory			
T-BGU-113679	Mechanics of Planar Laminates	3 CR	Seelig
T-BGU-113680	Micromechanics of Heterogeneous Solids	3 CR	Seelig

Competence Certificate
- 'Teilleistung' T-BGU-113679 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-113680 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
Students are familiar with the mechanical relationships and methods that make it possible to derive the macroscopic ('effective') behavior of composite materials from their structure and the properties of the individual components. They are able to apply the respective techniques specifically to composite materials with a regular layered microstructure (laminates) as well as to those with an irregular microstructure with regard to practical engineering issues.

Content
Mechanics of Planar Laminates:

- anisotropic elasticity of a single laminate layer
- structure of laminates
- kinematics and constitutive behavior of laminates
- laminate edge effects
- strength criteria

Micromechanics of Heterogeneous Solids:

- representative volume element, averages, effective material properties
- basic analytical solutions of micromechanical boundary value problems
- development of approximation methods (e.g. self-consistency method)
- energy methods and bounds (e.g. Hashin-Shtrikman variational principle)
- applications for the homogenization of multiphase, porous and damaged materials

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

Annotation
will be offered newly as from winter term 2024/25

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

- Mechanics of Planar Laminates lecture: 30 h
- Micromechanics of Heterogeneous Solids lecture: 30 h

independent study:

- preparation and follow-up lectures Mechanics of Planar Laminates: 30 h
- examination preparation Mechanics of Planar Laminates (partial examination): 30 h
- preparation and follow-up lectures Micromechanics of Heterogeneous Solids: 30 h
- examination preparation Micromechanics of Heterogeneous Solids (partial examination): 30 h

total: 180 h

Recommendation
course Introduction to Continuum Mechanics (6200421)

Literature
Aboudi, J., Arnold, S.M., Bednarcyk, B.A.: Micromechanics of Composite Materials. Elsevier, 2013

Becker, W. und Gross, D.: Mechanik elastischer Körper und Strukturen. Springer, 2002

Christensen, R.M.: Mechanics of composite materials. Dover, 2005

Dvorak, G.J.: Micromechanics of Composite Materials. Springer, 2013

Hull, D. and Clyne, T.W.: An introduction to composite materials. Cambridge University Press, 1981

Jones, R.M.: Mechanics of composite materials. Taylor & Francis, 1999

Mura, T.: Micromechanics of Defects in Solids, Martinus Nijhoff Publishers, 1982

Nemat-Nasser, S., Hori, M.: Micromechanics - Overall Properties of Heterogeneous Materials, North-Holland, 1993

Gross, D., Seelig, Th.: Bruchmechanik - Mit einer Einführung in die Mikromechanik, Springer, 2016

5.46 Module: Practical FE Analyses in Strength Analysis (bauiM1S54-FEAFEST) [M-BGU-106818]

Responsible: Dr.-Ing. Martin Helbig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2024)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 10/1/2024)
Subject-Specific Supplements (Usage from 10/1/2024)

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

Mandatory			
T-BGU-113681	Student Research Project 'Practical FE Analyses in Strength Analysis'	1 CR	Helbig
T-BGU-113682	Practical FE Analyses in Strength Analysis	5 CR	Helbig

Competence Certificate
- 'Teilleistung' T-BGU-113681 with not grade accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-113682 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
The students can deal with problems of higher strength theory with the help of a common, commercial finite element program (Abaqus). Based on a practical structural-mechanical problem (e.g. stress concentration), they can identify the necessary input variables of a finite element analysis (geometry description, material, bearing/boundary conditions, load and discretization) and feed them into the calculation program. Furthermore, students are able to critically interpret the results of the FE analysis.

Content

- program structure: menu navigation, unit systems, modeling of the problem
- stress and strain measures
- stress concentrations at notches, holes
- geometry description: plane, spatial, rotationally symmetric problems
- applications of different materials: linear elastic, hyperelastic, inelastic, anisotropic material behavior
- modeling of support and boundary conditions
- discretization of components
- parameter identification and optimization: inelastic material parameters, geometry optimization
- comparison of numerical results with experimental deformation analyses (DIC)

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

Annotation
will be offered newly as from winter term 2024/25

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

- FE Analyses in Strength Analysis lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises FE Analyses in Strength Analysis: 45 h
- preparation student research project (examination prerequisite): 25 h
- examination preparation: 50 h

total: 180 h

Recommendation
course Introduction to Continuum Mechanics (6200421)

Literature

Gross, D., Hauger, W., Wriggers, P.: Technische Mechanik IV. Springer, 2007

Fish, J., Belytschko, T.: A first course in finite elements

Unterlagen des Instituts für Mechanik

M 5.47 Module: Construction Chemistry II (bauiM1S55-BCHEM2) [M-BGU-107000]

Responsible: Dr. rer. nat. Andreas Bogner
Dr. Peter Thissen

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

Part of: Study Focus I / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2025)
Study Focus II / Structural Engineering (Compulsory Elective Modules) (Usage from 4/1/2025)
Subject-Specific Supplements (Usage from 4/1/2025)

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

Mandatory			
T-BGU-113961	Construction Chemistry II	6 CR	Bogner, Thissen

Competence Certificate
- 'Teilleistung' T-BGU-113961 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The aim of the module Construction Chemistry II is to qualify students for research-oriented work in the fields of interfacial chemistry and materials science. Graduates of the module are able to independently and systematically investigate chemical and physical processes at interfaces. They have acquired in-depth knowledge of surface energy, molecular interactions and important interfacial phenomena such as wetting, adhesion and capillarity. On this basis, they can describe, analyze and explain complex interactions and stability mechanisms in colloids and emulsions.

- Students can independently analyze and experimentally investigate physical and chemical processes at interfaces.
- They have an in-depth understanding of surface energy and its significance for wetting and capillarity phenomena.
- They can explain molecular interactions as well as adhesion and friction effects at interfaces and evaluate their influence on materials.
- They are proficient in modern experimental techniques such as atomic force microscopy and surface tension measurements and use these to investigate interfaces.
- They are able to evaluate the stability of colloids and emulsions and analyze the corresponding interfacial forces.
- Students can describe and evaluate interfacial phenomena in self-organization and pattern formation in materials.
- They have the ability to identify and analytically evaluate applications of interfacial chemistry in areas such as nanotechnology and biology.
- They will be able to apply theoretical concepts to real building materials and overcome the particular challenges of analyzing interfaces in building materials.
- Students develop analytical thinking and practical research skills to work independently on scientific issues in interfacial chemistry.
- They are able to holistically understand complex interactions between physical and chemical properties at interfaces and develop proposals for solutions.

Content
The module Construction Chemistry II deals with the physical and chemical properties of interfaces. It begins with the basics of surface energy, describes molecular interactions and explains important interfacial phenomena such as wetting and capillarity. Adhesion, friction and the mechanisms that influence these processes are also discussed. Another central topic is the stability of colloids and emulsions as well as the forces acting at interfaces. Modern experimental techniques for the investigation of surfaces, such as atomic force microscopy and surface tension measurements, are also described in detail. The module explains the role of interfaces in processes such as self-organization and pattern formation. Applications in various fields such as nanotechnology, biology and materials science are demonstrated. The module places particular emphasis on practical examples. Finally, more complex topics such as interfacial phenomena in real building materials are covered.

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

Annotation
Module will be offered newly as from summer term 2025.

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

Literature
[1] Physics and Chemistry of Interfaces, Second Revised and Enlarged Version (2006), Hans-Jürgen Butt, Karlheinz Graf, Michael Kappl, WILEY-VCH GmbH & Co. KGaA.

M 5.48 Module: Urban Water Infrastructure and Management (bauiM2P10-URBIM) [M-BGU-103358]

Responsible: PD Dr.-Ing. Stephan Fuchs
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Modules)
Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	3

Mandatory			
T-BGU-112369	Presentation 'Urban Water Infrastructure and Management'	2 CR	Azari Najaf Abad, Fuchs
T-BGU-106600	Urban Water Infrastructure and Management	4 CR	Azari Najaf Abad, Fuchs

Competence Certificate
- 'Teilleistung' T-BGU-112369 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-106600 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
Students analyze and evaluate basic methods of urban water management. They recognize the interactions between natural and technical systems. They acquire knowledge necessary to identify process engineering solutions and to implement them into functional systems (infrastructure elements). Students are able to describe urban water management issues in the context of watersheds and to take appropriate and environmentally-sound decisions in terms of energy efficiency and costs.

Content
This module provides a deep understanding of basic principles needed for the design, analysis and evaluation of urban water systems. The concept of system analysis is introduced to develop models that consider the most important biological, chemical and physical processes and are used to solve water management problems. Based on a detailed consideration of individual elements (subsystems), an overall picture of the water management system Urban Settlement and its interaction with surface and groundwater bodies can be gained. For this purpose, theoretical tools are developed and modeling approaches are reviewed. Students consider the factors energy and costs in the analysis and assessment of water management systems.

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 30 h
- preparation Presentation 'Urban Water Infrastructure and Management' (examination prerequisite): 60 Std.
- examination preparation: 30 h

total: 180 h

Recommendation
basic knowledge in sanitary engineering

Literature

Imhoff, K. u. K.R. (1999) Taschenbuch der Stadtentwässerung, 29. Aufl., Oldenbourg Verlag, München, Wien

Metcalf & Eddy, Abu-Orf, M., Bowden, G., Burton, F.L., Pfrang, W., Stensel, H.D., Tchobanoglous, G., Tsuchihashi, R. and AECOM (Firm), (2014). Wastewater engineering: treatment and resource recovery. McGraw Hill Education.

M 5.49 Module: Numerical Fluid Mechanics (bauiM2P5-NUMFLMECH) [M-BGU-103375]

Responsible: Prof. Dr.-Ing. Markus Uhlmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Modules)
Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106758	Numerical Fluid Mechanics	6 CR	Uhlmann

Competence Certificate
- 'Teilleistung' T-BGU-106758 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students are enabled to describe the fundamental approaches of numerical solution of flow problems. They are capable of evaluating the advantages and disadvantages of these approaches in the various areas of application, enabling them to make an appropriate choice. Participants are able to apply the numerical methods to simple flow problems; this involves the generation and application of basic computer programs. They are able to analyze the results with respect to precision, stability and efficiency.

Content
This module constitutes a general introduction to the numerical solution of flow-related problems. The mathematical properties of the conservation equations are analyzed. The principles of numerical discretization are studied with the aid of the finite-difference and the finite-volume method. The concept of numerical stability is introduced, and various techniques of error analysis are presented theoretically and by way of examples

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
modules Hydromechanics [bauiBGP04-HYDRO] (understanding of physical processes of advektion and diffusion, handling of Navier-Stokes equations) and Advanced Mathematics [bauiBGP05-HM1, bauiBGP06-HM2, bauiBGP08-HM3, bauiBFW1-PDGL] (analysis - partial differential equations, Fourier analysis, series expansion, complex numbers; linear algebra - matrices, determinants, eigenvalue analysis, numerics - discrete number representation, round-off, floating point operations, numerical treatment of partial differential equations)

M 5.50 Module: Hydraulic Engineering (bauiM2P6-ADVHYENG) [M-BGU-103376]

Responsible: Prof. Dr. Mario Jorge Rodrigues Pereira da Franca
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Modules)
Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-111928	Design Exercise River Engineering	1 CR	Rodrigues Pereira da Franca
T-BGU-111929	Design Exercise Hydraulic Structures	1 CR	Rodrigues Pereira da Franca
T-BGU-106759	Hydraulic Engineering	4 CR	Rodrigues Pereira da Franca

Competence Certificate
- 'Teilleistung' T-BGU-111928 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-111929 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-106759 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
Students will be able to describe and analyse basic processes linked to the hydraulics of rivers and hydraulic structures. They are able to carry the design of engineering works in rivers and the dimensioning of hydraulic structures with suitable approaches.

Based on the acquired process knowledge, they are able to analyse the results of the design in a critical manner.

Students are able to use and link their knowledge logically. They can work in a reflexive and self-critical manner.

Content
The module provides students with theoretical and practical knowledge of hydraulics applied to problem solving in the context of river engineering and for the design of hydraulic structures.

The course *River Engineering* contains the following topics:

- overview of catchment and river network basic processes and in the context of human usage and safety considering at the same time preservation of natural processes;
- sediment management;
- calculation and design of river engineering works such channels, riverbank protection, levees, groynes, detention basins; river restoration works.

In the course *Design of Hydraulics Structures* a focus will be set on hydraulic structures and their application in managing water resources. We will analyze the design procedure taking engineering standards and state of the art into account.

The content of the module/course pursue the following UN Sustainable Goals:

- SDG 6 Clean Water and Sanitation
- SDG 7 Affordable and Clean Energy

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

Annotation
Further information on the course/module can be found at: https://wb.iwu.kit.edu/education.php.

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

- River Engineering lecture/exercise: 30 h
- Design of Hydraulic Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises River Engineering: 15 h
- working on the 'Design Exercise River Engineering' (examination prerequisite): 25 h
- preparation and follow-up lecture/exercises Design of Hydraulic Structures: 15 h
- working on the 'Design Exercise Hydraulic Structures' (examination prerequisite): 25 h
- examination preparation: 40 h

total: 180 h

Recommendation
none

Literature
Dey, Subhasisch. Fluvial hydrodynamics. Berlin: Springer, 2014.

Hager, Willi H., et al. Hydraulic engineering of dams. CRC Press, 2020.

United States. Bureau of Reclamation. Design of small dams. US Department of the Interior, Bureau of Reclamation, 1987.

5.51 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: Study Focus I / Water and Environment (Compulsory Modules)
Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

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

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

details about the learning control see at the 'Teilleistung'

Prerequisites
none

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

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

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

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

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

total: 180 h

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

Literature

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

5.52 Module: Advanced Fluid Mechanics (bauiM2P9-ADVFM) [M-BGU-103359]

Responsible: Prof. Dr. Olivier Eiff

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

Part of: Study Focus I / Water and Environment (Compulsory Modules)
Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106612	Advanced Fluid Mechanics	6 CR	Eiff

Competence Certificate
- 'Teilleistung' T-BGU-106612 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students acquire a firm understanding of the fundamental mechanics of fluids with emphasis towards environmental flows on the basis of the local conservation laws. They are able to differentiate and apply the different set of assumptions and methods in order to better understand the different flow classes and solutions. They are capable of solving basic flow problems after forming the relevant assumptions. Participants are able to use the knowledge and competence gained for more detailed and applied studies of environmental flows.

Content
This module covers the fundamental mechanics of fluids forming the foundation of environmental fluid mechanics. The approach is based on the basic local conservation laws. Emphasis is on the phenomena and the possible analytical solutions associated with the various flow classes. Topics covered include the general and special forms of the governing equations, flow kinematics, viscous incompressible flows, ideal-fluid flows, shallow flows, and buoyancy effects in fluids. Waves and turbulence are also addressed as well as different methods of analysis such as scaling.

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 30 h
- home work on exercises: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
modules Hydromechanics [bauiBGP04-HYDRO] and Advanced Mathematics for Civil Engineers [bauiBGP05-HM1, bauiBGP06-HM2, bauiBGP08-HM3, bauiBFW1-PDGL] (analysis, differential and integral calculus, ordinary and partial differential equations, linear algebra, Fourier analysis, complex numbers)

Literature
I.G. Currie, Fundamental Mechanics of Fluids, Fourth Edition 2012

5.53 Module: Analysis of Spatial Data (bauiM2S04-HY4) [M-BGU-103762]

Responsible: Prof. Dr.-Ing. Erwin Zehe
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106605	Geostatistics	6 CR	Mälicke, Zehe

Competence Certificate
- 'Teilleistung' T-BGU-106605 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students can explain and apply methods for analysis and simulation of spatially and temporally distributed environmental data. Based on this, they are capable of setting up experimental designs for environmental monitoring and evaluate the suitability of available data for different tasks.Students are able to critically assess the results of analysis and simulation tools and to quantify and evaluate the related uncertainties.

Content

- fundamentals of environmental systems theory, environmental monitoring and experimental design (data types, scale triplet, measuring methods)
- experimental variograms, directional variograms, indicator variograms, variogram fitting, anisotropy
- Kriging techniques: Ordinary Kriging, screening properties of Kriging, BLUE, pure nugget effect, cross validation, RMSE
- estimation of spatial patterns in nonstationary data (External Drift Kriging, Simple Updating)
- simulation of spatial patterns: turning Bands Simulation, smoothing problems of interpolation

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises inlc. presenation of an exercise (part of the examination): 60 h
- working on a project and preparation of a report (part of the examination): 60 h

total: 180 h

Recommendation
basic knowledge in statistics

module Hydrological Measurements in Environmental Systems [bauiM2S05-HY5]

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

Literature

Bárdossy, A. (2001): Introduction into Geostatistics. Inst. f. Wasserbau, Universität Stuttgart.
Kitanidis, P. K. (1999): Introduction into Geostatistics. Applications in Hydrogeology. Cambridge University Press.
Bras, R. L. and Rodriguez-Iturbe, I. (1985): Random Functions and Hydrology. Addison-Wesley Massachusetts.
Brooker, I. (1982): Two-dimensional simulation by turning bands. Math. Geology 17 (1).

M 5.54 Module: Hydrological Measurements in Environmental Systems (bauiM2S05-HY5) [M-BGU-103763]

Responsible: Dr. Jan Wienhöfer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106599	Hydrological Measurements in Environmental Systems	6 CR	Wienhöfer

Competence Certificate
- 'Teilleistung' T-BGU-106599 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students know and understand measurement principles for catchment properties, catchment states, and water fluxes. They are able to independently plan and conduct measurements on various scales (soil column, plot, hillslope, catchment) in the field and the laboratory. Students can analyze observation data with statistical methods, and are able to quantify and evaluate the related uncertainties. Students are able to present the related results in teamwork.

Content
- introduction to environmental observations (scales, uncertainties), statistical data analysis and error analysis
- seminar on hydrological measurement devices in field and laboratory: Discharge, soil moisture, infiltration, hydraulic conductivity
- lab and field work (several days) where students conduct hydrological measurements

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

Annotation
The course requires a minimum number of 6 and a maximum number of 30 participants. Please register online for the course (not exam!), 6224807, via the Campus portal (in exceptional cases via e-mail to the responsible lecturer). Participants are selected according to their progress of study considering the following order: students of *Water Science and Engineering*, students of *Civil Engineering*, students of *Geoecology*.

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

- laboratory and field exercise: 70 h

independent study:

- preparation and follow-up laboratory and field exercises: 10 h
- preparation of presentations and reports (exam): 100 h

total: 180 h

Recommendation
knowledge in hydrology

Literature
notes for field exercises

M 5.55 Module: Environmental Communication (bauiM2S07-HY7) [M-BGU-101108]

Responsible: Dr. rer. nat. Charlotte Kämpf
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106620	Examination Prerequisite Environmental Communication	0 CR	Kämpf
T-BGU-101676	Environmental Communication	6 CR	Kämpf

Competence Certificate
- 'Teilleistung' T-BGU-106620 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-101676 with examination of other type according to § 4 Par. 2 No. 3

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

Prerequisites
none

Competence Goal
(see German version)

Content
(see German version)

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

Annotation
none

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

- seminar (lecture): 20 h

independent study:

- preparation and follow-up seminar: 40 h
- preparation of literature annotations and short presentation (exam prerequisite): 45 Std.
- preparation of presentation, manuscript and poster (exam): 75 Std.

total: 180 h

Recommendation
none

Literature
(see German version)

5.56 Module: Groundwater Management (bauiM2S08-HY8) [M-BGU-100340]

Responsible: Dr. Ulf Mohrlok
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100624	Groundwater Hydraulics	3 CR	Mohrlok
T-BGU-100625	Numerical Groundwater Modeling	3 CR	Mohrlok

Competence Certificate
- 'Teilleistung' T-BGU-100624 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100625 with examination of other type according to § 4 Par. 2 No. 3

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

Prerequisites
none

Competence Goal
Based on the understanding of hydrogeological settings and fluid-mechanical processes in the subsurface students can characterize different kinds of groundwater systems by means of hydraulics. They can quantify the relevant flow and transport processes with simple analytical and numerical methods for different problems regarding groundwater quantity and quality. Thereby, they are able to conceive and evaluate the relations important for the management of groundwater resources.

Content

- groundwater systems
- fluid-mechanical processes in porous media
- methods of balancing groundwater flow and solute transport processes
- examples of groundwater management
- project work

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

Annotation
none

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

- Groundwater Hydraulics lecture/exercise: 30 h
- Numerical Groundwater Modeling presentations/project discussions: 15 h

independent study:

- preparation and follow-up lecture/exercises, working on exercises Groundwater Hydraulics: 40 h
- examination preparation Groundwater Hydraulics (partial exam): 20 h
- project work Numerical Groundwater Modeling, incl. presentation and preparation of the report (partial exam): 80 h

total: 185 h

Recommendation
basic knowledge in fluid mechanics, hydrology, solute transport and numerical methods;

beginning the module in summer term

Literature

Bear, J. (1979). Hydraulics of Groundwater. McGraw Hill.

Chiang, W.H. (2005). 3D - Groundwater Modeling with PMWIN: A Simulation System for Modeling Groundwater Flow and Transport Processes, 2/e, incl. CD-Rom. Berlin, Heidelberg, D.: Springer.

Fetter, C.W. (1999). Contaminant Hydrogeology , 2/e. Upper Saddle River, NJ, U.S.A.: Prentice Hall.

Mohrlok, U. (2009). Bilanzmodelle in der Grundwasserhydraulik: quantitative Beschreibung von Strömung und Transport im Untergrund, Karlsruhe, D.: Universitätsverlag.

Schwartz, F. and H. Zhang (2003). Fundamentals of Ground Water. New York, NY, U.S.A.: John Wiley & Sons.

M 5.57 Module: Hydro Power Engineering (bauiM2S11-WB3) [M-BGU-100103]

Responsible: Dr.-Ing. Peter Oberle
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100139	Hydro Power Engineering	6 CR	Oberle

Competence Certificate
- 'Teilleistung' T-BGU-100139 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students are able to describe the different turbine types and can define selection criteria for their usage. They are able to reproduce the basic approaches in the planning and design of hydropower plants and to make own calculations to select turbines. They can select and apply the necessary tools in a methodical matter. Students are able to discuss the current political conditions in terms of energy policy with other students and support their personal opinion on these issues with technical arguments.

Content
The course explains the technical background for planning and designing waterpower plants. Among others, it covers the constructional characteristics of river and high-pressure power plants, the operating modes and selection criteria of different types of turbines as well as electro-technical aspects of the plants` operation. In addition, ecological aspects and energy policy are considered as frame conditions. The lecture sessions are complemented by the presentation of current projects and excursions.

The content of the module/course pursue the following UN Sustainable Goals:

- SDG 6 Clean Water and Sanitation
- SDG 7 Affordable and Clean Energy

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

Annotation
Further information on the course/module can be found at: https://wb.iwu.kit.edu/education.php.

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
course Hydraulic Engineering and Water Management (6200511)

Literature
Folienumdrucke;

Giesecke J., Mosonyi E., 2005, Wasserkraftanlagen, Planung, Bau und Betrieb, Springer Verlag, Berlin

M 5.58 Module: Waterway Engineering (bauiM2S12-WB4) [M-BGU-103392]

Responsible: Dr.-Ing. Andreas Kron
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106779	Seminar Paper 'Waterway Engineering'	1 CR	Kron
T-BGU-106780	Waterway Engineering	5 CR	Kron

Competence Certificate
- 'Teilleistung' T-BGU-106779 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-106780 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
Students are knowledgeable about the various types of navigable waterways and their hydraulic structures. They are able to describe and apply the hydraulic basics for the design of these hydraulic structures and the interaction between ship and waterway. Students can assign the tasks and responsibilities of waterway engineering to the administrative structure of the waterways and shipping.

Content
Inland shipping is an important mode of transport, accounting for around 20% of inland freight transport. Around 230 million tonnes of goods are transported annually over a total length of around 7,300 km. Thanks to its high capacity and low energy requirements, inland shipping contributes to reducing transport emissions compared to other means of transport. In order to be able to secure the transport performance of inland shipping in the long term, a large number of aspects of water transport engineering must be taken into account, which will be discussed in the lecture. In addition to the necessary structural facilities, economic and ecological aspects of inland shipping are also addressed.

The contents of the module/course pursue the following UN Sustainable Goals:

- SDG 7 Affordable and Clean Energy
- SDG 9 Industry, Innovation and Infrastructure
- SDG 13 Climate Action

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

Annotation
Further information on the course/module can be found at: https://wb.iwu.kit.edu/education.php.

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lectures/exercises: 30 h
- preparation of the seminar paper (exam prerequisite): 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
course Hydraulic Engineering and Water Management (6200511)

5.59 Module: Environmental Fluid Mechanics (bauiM2S19-SM5) [M-BGU-103383]

Responsible: Prof. Dr. Olivier Eiff
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106767	Environmental Fluid Mechanics	6 CR	Eiff

Competence Certificate
- 'Teilleistung' T-BGU-106767 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students identify fundamental hydrodynamic processes in the natural environment in water and air applications and solve related problems. They can relate the observed phenomena to fundamental principles of hydrodynamics and to the specific nature of the flow conditions. They can critically evaluate the different models and approximations made to obtain solutions and predictions and can make first estimates.

Content
This module covers the fundamental concepts and flow models of environmental fluid mechanics in both water and air. The topics include turbulence structure in rivers and open channels, diffusion and dispersion, atmospheric boundary layers, internal waves, instabilities and mixing, stratified turbulence, buoyant jets and plumes.

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
modules Advanced Fluid Mechanics [bauiM2P9-ADVFM], Fluid Mechanics of Turbulent Flow [bauiM2S45-NS4]

5.60 Module: Advanced Computational Fluid Dynamics (bauiM2S21-NS2) [M-BGU-103384]

Responsible: Prof. Dr.-Ing. Markus Uhlmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106769	Parallel Programming Techniques for Engineering	3 CR	Uhlmann
T-BGU-106768	Numerical Fluid Mechanics II	3 CR	Uhlmann

Competence Certificate
- 'Teilleistung' T-BGU-106768 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-106769 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
module Numerical Fluid Mechanics [bauiM2P5-NUMFLMECH] must be completed

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-103375 - Numerical Fluid Mechanics must have been passed.

Competence Goal
Students are able to numerically solve simplified flow problems based upon the Navier-Stokes equations in an independent fashion. This involves the design of a solution method, the analysis of its properties (concerning stability, precision, computational effort), the algorithmic implementation, the validation with respect to appropriate test cases, and the final documentation of the results. Furthermore, participants of this course are enabled to judge techniques for the use of massively parallel computer systems to solve fluid mechanics problems as to their efficiency and applicability. They are capable of applying the appropriate parallel programming techniques to selected model problems.

Content
In the present module, advanced skills in the numerical solution of fluid mechanics problems are imparted, building upon the material of the course Numerical Fluid Mechanics I. Here, various numerical solution methods for the time-dependent Navier-Stokes equations in several spatial dimensions are demonstrated with the aid of practical examples. This includes the following aspects: coupling and decoupling of velocity and pressure fields in incompressible flows, numerical treatment of discontinuities (shock waves, hydraulic jumps), computation of scalar transport, numerical tracking of inertial particles, linear stability analysis.

The course Parallel Programing Techniques for Engineering Problems conveys the fundamental programming concepts for massively-parallel computer systems. First, the common parallel computer architectures and the most widely used programming paradigms are introduced. Then techniques for implementing standard algorithms of numerical fluid mechanics (and other disciplines involving field problems) are presented, analyzed and practiced with the aid of the Message Passing Interface (MPI) standard.

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

Annotation
none

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

- Parallel Programming Techniques for Engineering Problems lecture, exercise: 30 h
- Numerical Fluid Mechanics II lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Parallel Programming Techniques for Engineering Problems: 30 h
- examination preparation Parallel Programming Techniques for Engineering Problems (partial exam): 30 h
- preparation and follow-up lectures, exercises Numerical Fluid Mechanics II: 30 h
- examination preparation Numerical Fluid Mechanics II (partial exam): 30 h

total: 180 h

Recommendation
Programing skills in at least one compiler language (C,C++, FORTRAN or equivalent)

Literature
C. Hirsch “Numerical computation of internal and external flows” Butterworth-Heinemann, 2nd edition, 2007.
J.H. Ferziger and M. Peric “Computational Methods for Fluid Dynamics”, Springer, 3rd edition, 2001.
N. Carriero “How to Write Parallel Programs: A First Course”, MIT Press, 1990.
T.G. Mattson, B.A. Sanders, B.L. Massingill “Patterns for Parallel Programming” Addison-Wesley, 2004.
M. Snir, S. Otto, S. Huss-Lederman, D. Walker, J. Dongarra “MPI: The Complete Reference”, MIT Press, 1995.

M 5.61 Module: Project Studies in Water Resources Management (bauiM2S33-WB6) [M-BGU-103394]

Responsible: Dr.-Ing. Frank Seidel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106783	Project Studies in Water Resources Management	6 CR	Seidel

Competence Certificate
- 'Teilleistung' T-BGU-106783 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
see German version

Content
see German version

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

Annotation
Further information on the course/module can be found at: https://wb.iwu.kit.edu/education.php.

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

- lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- preparation of term paper (exam): 120 h

total: 180 h

Recommendation
module River Processes [bauiM2S49-WB9]

M 5.62 Module: Numerical Flow Modeling in Hydraulic Engineering (bauiM2S34-WB7) [M-BGU-103390]

Responsible: Dr.-Ing. Peter Oberle
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106776	Numerical Flow Modeling in Hydraulic Engineering	6 CR	Oberle

Competence Certificate
- 'Teilleistung' T-BGU-106776 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
see German version

Content
see German version

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

Annotation
Further information on the course/module can be found at: https://wb.iwu.kit.edu/education.php.

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
basic knowledge of hydrology, hydraulic engineering and water management as well as open channel hydraulics

Literature
lecture notes

M 5.63 Module: Water Distribution Systems (bauiM2S38-WB11) [M-BGU-104100]

Responsible: Dr.-Ing. Peter Oberle
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2018)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2018)
Subject-Specific Supplements (Usage from 4/1/2018)

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

Mandatory			
T-BGU-108485	Project Report Water Distribution Systems	2 CR	Oberle
T-BGU-108486	Water Distribution Systems	4 CR	Oberle

Competence Certificate
- 'Teilleistung' T-BGU-108485 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-108486 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
Students will have profound knowledge of the components and operational requirements of water supply systems. They are enabled to plan, design and optimize water distribution systems. They are capable to critically analyze concepts and designs based on their knowledge. Participants are able to set up and apply numerical models of water distribution systems for planning and analysis. Students have competences in work organization, presentation and discussion of results.

Content
This course teaches the basics and methods for analyzing and planning water distribution systems using hydraulic simulation models. The modeling and application of hydraulic models for the analysis and planning of water distribution networks are learned in a project work during the semester. In the project work, a given distribution network is to be modeled and analyzed. Solutions are to be developed for any deficiencies. Furthermore, a network extension is to be planned and dimensioned. The necessary specialist knowledge (basics of water distribution, modeling and pipe network calculation as well as application of ArcGIS and EPANET, determination of water losses and water demand values, model calibration and dimensioning) is taught in individual course units. The relevant technical regulations (DIN, DVGW) are also presented.

The content of the module/course pursue the following UN Sustainable Goals:

- SDG 6 Clean Water and Sanitation
- SDG 9 Industry, Innovation and Infrastructure

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

Annotation
Further information on the course/module can be found at: https://wb.iwu.kit.edu/education.php.

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 30 h
- project work water distribution (exam prerequisite): 60 h
- examination preparation: 30 h

total: 180 h

Recommendation
hydromechanics (specifically pipe hydraulics)

Literature

Mutschmann und Stimmelmayr (2007). Taschenbuch der Wasserversorgung, 14. Auflg., Vieweg.
Walski, T. M., Chase, D. V., Savic, D. A., Grayman, W., Beckwith, S. und Koelle, E. (2003). Advanced Water Distribution Modeling Management, Haestad Methods Inc., Waterbury.
Schrifttum zur Vorlesung (auf Deutsch und Englisch)

M 5.64 Module: Experiments in Fluid Mechanics (bauiM2S39-SM6) [M-BGU-103377]

Responsible: Prof. Dr. Olivier Eiff
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106760	Experiments in Fluid Mechanics	6 CR	Eiff

Competence Certificate
- 'Teilleistung' T-BGU-106760 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students relate the hydrodynamics theory and physical concepts to the observed physical reality. They apply their knowledge and skills for the comparative analysis of basic flow situations in physical models, using appropriate measurement technologies. They assess and evaluate the results and limitations by comparing their results with theoretical deductions. They extend their results of phenomena-oriented experiments with regard to practical applications in technical hydraulics and environmental flows. Acquired competence: operation of test facilities and instrumentation, data analysis and basic statistical error analysis, team work, written and oral communication.

Content
Lecture:

- typical set-up of hydraulic and aerodynamic models
- dimensional analysis, dimensionless parameters
- measurement instrumentation
- introduction to statistical error analysis
- analogy numerical/physical modeling, model distortion
- technical writing and oral presentation

Physical experiments:

- pipe flow with orifice plate
- open channel flow with gates and hydraulic jumps
- Venturi pipe flow with cavitation- Settling velocities of spheres
- diffusion of a turbulent air jet
- turbulent wake
- dam leakage

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

Annotation
none

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

- lecture/lab exercise: 60 h

independent study:

- preparation and follow-up lectures: 30 h
- preparation of laboratory reports (part of the examination): 60 h
- preparation of oral examination (part of the examination): 30 h

total: 180 h

Recommendation
module Advanced Fluid Mechanics [bauiM2P9-ADVFM]

Literature
Tropea, C. et.al., 2007, Springer Handbook of Experimental Fluid Mechanics, Springer Verlag Berlin

Muste, M., Aberle, J., Admiraal, D., Ettema, R., Garcia, M. H., Lyn, D., Nikora, V., Rennie, C., 2017, Experimental Hydraulics: Methods, Instumentation, Data Processing and Management, Taylor and Francis

M 5.65 Module: Freshwater Ecology (bauiM2S41-SW8) [M-BGU-104922]

Responsible: PD Dr.-Ing. Stephan Fuchs
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2019)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2019)
Subject-Specific Supplements (Usage from 4/1/2019)

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

Mandatory			
T-BGU-109956	Applied Ecology and Water Quality	3 CR	Fuchs, Hilgert
T-BGU-109957	Field Training Water Quality	3 CR	Fuchs, Hilgert

Competence Certificate
- 'Teilleistung' T-BGU-109956 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-109957 with examination of other type according to § 4 Par. 2 No. 3

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

Prerequisites
none

Competence Goal
Students get familiar with the basic principles of water ecology in surface waters. They are able to explain interactions between abiotic control factors (flow, chemistry, structure) and their relevance for the ecological status of standing waters and streams and to evaluate them critically. They become acquainted with field and laboratory techniques to establish water quality. With the help of these methods, they evaluate data-quality of information collected in the field regarding chemical, biological and structural water quality and determine the level of uncertainty intrinsic to the data-collection methods.Using case studies, students are able to convey and evaluate positive results as well as restrictions from water restoration processes.

Content
As part of the module, water ecology principles, their practical significance and implementation of restoring measures are presented. The following topics are covered:

- pollutants loads discharged into water bodies: discharge points, pollutants, sediment problems
- sampling methods
- oxygen content
- methods for the assessment of water quality and water general status
- practical exercises to measure water quality and condition in the field

Students get acquainted with practical examples of water protection and water remediation measures and they interpret and discuss them as part of an individual assignment. For this purpose, they implement their own framework, based on visible requirements and achievable targets.

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

Annotation
The number of participants in the courses is limited to 12 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The attendance at the first meeting is mandatory. In case of absence the place will be assigned to a person on the waiting list.

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

- Applied Ecology and Water Quality lecture/seminar: 30 h
- Field Training Water Quality (block): 30 h

independent study:

- preparation of the seminar paper with presentation (partial examination): 60 h
- preparation of the report on Field Training Water Quality (partial examination): 60 h

total: 180 h

Recommendation
none

Literature
Wetzel, Limnology, 3rd Edition, Academic Press 2001

Jürgen Schwörbel, Methoden der Hydrobiologie, UTB für Wissenschaft 1999

kursbegleitende Materialien

5.66 Module: River Basin Modeling (bauiM2S42-SW9) [M-BGU-103373]

Responsible: PD Dr.-Ing. Stephan Fuchs
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules)
Study Focus II / Water and Environment (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-111061	Mass Fluxes in River Basins	3 CR	Fuchs
T-BGU-106603	River Basin Modeling	3 CR	Fuchs

Competence Certificate
- 'Teilleistung' T-BGU-111061 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-106603 with examination of other type according to § 4 Par. 2 No. 3

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

Prerequisites
none

Competence Goal
Students are able to explain the basic relationships between water-driven material cycles in river basins and their budget in aquatic ecosystems. They are able to analyze the impact of anthropogenic activities on water condition and quality. Students gain knowledge regarding transport pathways of substances and biochemical and physical interactions in water bodies in order to formulate mathematical model approaches. Using simulation models, they are able to quantify substance emissions; to predict the impact from external influences on the water quality relevant processes and; to perform different scenario analysis. Students are capable of evaluating model results in terms of their plausibility and uncertainty.

Content
This module provides students with a broad-based understanding of the fundamentals of materials flows (N, P, pollutants) and their relevant transport pathways in river basins. Different modeling approaches for a quantitative description of the processes will be presented. Students receive a single-user version of the simulation tool MoRE (Modelingof Regionalized Emissions). They have to develop and implement their own model in small groups and interpret simulation results.

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

Annotation
none

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

- Mass Fluxes in River Basins lecture: 30 h
- Modeling Mass Fluxes in River Basins exercise: 30 h

independent study:

- preparation and follow-up lectures Mass Fluxes in River Basins: 30 h
- working on exercises and final presentation Mass Fluxes in River Basins (not graded examination prerequisite): 30 h
- project work on River Basin Modeling (exam): 60 h

total: 180 h

Recommendation
modules Urban Water Infrastructure and Management [bauiM2P10-URBIM], Freshwater Ecology [bauiM2S41-SW8];

beginning the module in summer term

Literature

Schwoerbel, J. (1993): Einführung in die Limnologie, 7. Aufl., Fischer Verlag, Stuttgart
Kummert, R. (1989): Gewässer als Ökosysteme: Grundlagen des Gewässerschutzes, 2. Aufl., Teubner Verlag, Stuttgart
Stumm, W.; Morgan, J.J. (1996): Aquatic Chemistry – Chemical equilibria and rates in natural waters, Wiley Interscience, NY

5.67 Module: Wastewater Treatment Technologies (bauiM2S43-SW10) [M-BGU-104917]

Responsible: Dr.-Ing. Mohammad Ebrahim Azari Najaf Abad
PD Dr.-Ing. Stephan Fuchs

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

Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2019)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2019)
Subject-Specific Supplements (Usage from 4/1/2019)

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

Mandatory			
T-BGU-109948	Wastewater Treatment Technologies	6 CR	Azari Najaf Abad, Fuchs

Competence Certificate
- 'Teilleistung' T-BGU-109948 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students acquire knowledge about typical techniques and facilities in wastewater treatment at local and international level. They are able to perform a technical evaluation and describe dimensioning approaches taking into consideration legal boundary conditions. Students analyze, evaluate and optimize operation of plant technologies. They focus on energy-efficient plant designs considering the most relevant factors affecting the total costs.Students can analyze the situation in emerging and developing countries making a comparison with that in industrialized countries. Based on that, they are able to develop water-related management strategies.

Content
Students gain deep knowledge about design and operation of typical process technologies in municipal wastewater treatment in Germany and abroad. They analyze, evaluate the applied technologies and take decisions when new and more holistic oriented methods can be implemented. Different mechanical, biological and chemical treatment technologies are considered, whereby the treatment of waste water from housholds and industry as well as the treatment of rainwater is discussed. The visit of at least one municipal wastewater treatment plant in Germany completes the course. The course includes lab work in groups to learn about basic measuring and analytical procedures in wastewater treatment plants.

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

Annotation
The number of participants in the course is limited to 30 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering, Chemical and Process Engineering, Geoecology* and further study programs.

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
module Wasser and Environment [bauiBFP4-WASSER]

Literature

ATV-DVWK (1997) Handbuch der Abwassertechnik: Biologische und weitergehende Abwasserreinigung, Band 5, Verlag Ernst & Sohn, Berlin

ATV-DVWK(1997) Handbuch der Abwassertechnik: Mechanische Abwasserreinigung, Band 6, Verlag Ernst & Sohn , Berlin

ATV-DVWK A 131 (2006): Bemessung von einstufigen Belebungsanlagen. Hennef, Germany.

Metcalf & Eddy, Abu-Orf, M., Bowden, G., Burton, F.L., Pfrang, W., Stensel, H.D., Tchobanoglous, G., Tsuchihashi, R. and AECOM (Firm), (2014). Wastewater engineering: treatment and resource recovery. McGraw Hill Education.

van Loosdrecht, M.C., Nielsen, P.H., Lopez-Vazquez, C.M. and Brdjanovic, D. eds., (2016). Experimental methods in wastewater treatment. IWA publishing.

M 5.68 Module: Introduction to Environmental Data Analysis and Statistical Learning (bauiM2S44-ENVDAT) [M-BGU-104880]

Responsible: PD Dr.-Ing. Uwe Ehret
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2019)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2019)
Subject-Specific Supplements (Usage from 4/1/2019)

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

Mandatory			
T-BGU-109950	Homework 'Introduction to Environmental Data Analysis and Statistical Learning'	2 CR	Ehret
T-BGU-109949	Introduction to Environmental Data Analysis and Statistical Learning	4 CR	Ehret

Competence Certificate
- 'Teilleistung' T-BGU-109950 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-109949 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
The students can explain and apply methods for analysis and simulation of environmental data. Based on this they are capable of evaluating the suitability of available data, analysis and simulation methods for different tasks. The students are able to critically assess the results of analysis and simulation tools and to quantify and evaluate the related uncertainties.

Content

- explorative data analysis
- data storage / data bases
- probability theory (short summary)
- statistical tests (short summary)
- Bayesian methods
- information theory
- time series
- statistical learning / machine learning basics
- supervised learning
- unsupervised learning

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 20 h
- preparation of Homework 'Introduction to Environmental Data Analysis and Statistical Learning' (exam prerequisite): 60 h
- examination preparation: 40 h

total: 180 h

Recommendation

preliminary knowledge in statistics and Matlab programming skills, e.g. successful completion of Introduction to Matlab (WSEM-CC772)

Literature

Daniel Wilks (2011): Statistical Methods in the Atmospheric Sciences, Volume 100, 3rd Edition, ISBN 978-0-1238-5022-5, Academic Press.

Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani (2014): An Introduction to Statistical Learning, ISBN 978-1-4614-7137-0, Springer.

Thomas M. Cover, Joy A. Thomas (2006): Elements of Information Theory, 2nd Edition, ISBN: 978-0-471-24195-9, Wiley.

5.69 Module: Fluid Mechanics of Turbulent Flows (bauiM2S45-NS4) [M-BGU-105361]

Responsible: Prof. Dr.-Ing. Markus Uhlmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2020)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2020)
Subject-Specific Supplements (Usage from 4/1/2020)

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

Mandatory			
T-BGU-110841	Fluid Mechanics of Turbulent Flows	6 CR	Uhlmann

Competence Certificate
- 'Teilleistung' T-BGU-110841 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Participants are able to describe the characteristics of turbulent flows, and to quantify their effect upon the transport rates of momentum, heat and mass. They are aware of the problems associated with computationally determining turbulent flow quantities. With this knowledge, they are able to weigh the prosand cons of the different modeling approaches; they are further able to choose an appropriate approach for a given application.

Content
The mathematical description of the physics of turbulence is successively developed. The module presents the phenomenology of turbulent flows, introduces the statistical description of turbulent flow processes, discusses the characteristics of free and wall-bounded shear flows, and presents an analysis of the turbulent energy cascade.

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
basic fluid mechanics (experience in working with the Navier-Stokes equations)
nathematics (analysis – partial differential equations, Fourier series, vectors/tensors, matrices and eigenvalues; statistics)
knowledge in programming with Matlab is recommended; otherwise it is strongly recommended to participate in the course 'Introduction to Matlab'.

5.70 Module: Modeling of Turbulent Flows - RANS and LES (bauiM2S46-NS5) [M-BGU-105362]

Responsible: Prof. Dr.-Ing. Markus Uhlmann

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

Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2020)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2020)
Subject-Specific Supplements (Usage from 4/1/2020)

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

Mandatory			
T-BGU-110842	Modeling of Turbulent Flows - RANS and LES	6 CR	Uhlmann

Competence Certificate
- 'Teilleistung' T-BGU-110842 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Participants are able to weigh the prosand cons of the different modeling approaches; they are further able to choose an appropriate approach for a given application. Participants have the ability to critically evaluate the expected outcome of a range of turbulence models with respect to their predictive capabilities and the required computational effort.

Content
In this module covers the required mathematical tools and the most useful modeling approaches for fluids engineering problems. First the statistical approach to turbulence modeling, based upon Reynolds averaging (RANS) is presented, starting with the simplest algebraic model and ranging up to Reynolds stress transport models. Furthermore, an introduction to the concept of large-eddy simulation (LES) is given.

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

Annotation
none

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

- Modeling of Turbulent Flows - RANS and LES lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises Modeling of Turbulent Flows - RANS and LES: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
basic fluid mechanics (experience in working with the Navier-Stokes equations)
mathematics (analysis – partial differential equations, Fourier series, vectors/tensors, matrices and eigenvalues; statistics)
knowledge in programming with Matlab is recommended; otherwise it is strongly recommended to participate in the course ’Introduction to Matlab’;

taking the module Fluid Mechanics of Turbulent Flows [bauiM2S45] preliminarily is strongling recommended.

5.71 Module: Interaction Flow - Building Structure (bauiM2S47-SM2) [M-BGU-105503]

Responsible: Prof. Dr. Olivier Eiff
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 10/1/2020)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 10/1/2020)
Subject-Specific Supplements (Usage from 10/1/2020)

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

Mandatory			
T-BGU-110404	Interaction Flow - Hydraulic Structures	3 CR	Gebhardt
T-BGU-111060	Building and Environmental Aerodynamics	3 CR	Gromke

Competence Certificate
- 'Teilleistung' T-BGU-110404 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-111060 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
The module must not be selected together with the modules Interaction Flow - Building Structure [bauiM2S16-SM2] and Hydraulic Structures [bauiM2S36-WB9].

Competence Goal
The students have the competence to analyse and calculate steady and unsteady flow loading on hydro-engineering and aerodynamic structures as well as natural structures. They characterize flow induced vibrations and can categorize and pre-estimate them. With typical applications the connection between theory and practice is given.

Content
The particularities of gates (lock gates, weir gates, submerged gate leafs) in hydraulic steel engineering are presented, their construction and calculation of their loading will be discussed.

The course Building- and Environmental Aerodynamics gives an introduction to the natural wind and its interaction with the built and natural environment. In the focus are wind load on buildings and wind induced vibrations as well as flow processes in the natural environment regarding natural wind shelter, fresh air ventilation to urban areas and wind comfort.

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

Annotation
none

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

- Interaction Flow - Hydraulic Structure lecture/exercise: 30 h
- Building and Environmental Aerodynamics lecture, exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Interaction Flow - Hydraulic Structure: 30 h
- examination preparation Interaction Flow - Hydraulic Structure (partial exam): 30 h
- preparation and follow-up lectures, exercises Building and Environmental Aerodynamics: 30 h
- examination preparation Building and Environmental Aerodynamics (partial exam): 30 h

total: 180 h

Recommendation
course Hydromechanics (6200304),
modules Advanced Fluid Mechanics [bauiM2P9-ADVFM]

Literature

Wickert, G., Schmaußer, G.,1971, Stahlwasserbau, Springer Verlag, Berlin
Schmaußer, G., Nölke, H., Herz, E., 2000, Stahlwasserbauten - Kommentar zur DIN 19704, Ernst und Sohn Verlag, Berlin
Naudascher, E., 1991, Hydrodynamic Forces, Balkema Pub., Rotterdam
Naudascher, E., Rockwell, D., 2005, Flow-Induced Vibrations, Dover Publ., N.Y.
Erbisti, P.C.F., 2004, Design of Hydraulic Gates, Balkema Pub., Tokyo
Lewin, J., 1995, Hydraulic Gates and Valves in free surface flow and submerged outlets, Th. Telford Pub., London
Hucho, W., 2002: “Aerodynamik der stumpfen Körper”, Vieweg-Verlag, ISBN 3-528-06870-1
Holmes, J.D., 2007: “Wind Loading on Structures”, Taylor & Francis, ISBN 978-0-415-40946-9
Oertel, H., Ruck, S.: 2012: “Bioströmungsmechanik”, Vieweg - Teubner, ISBN: 978-3-8348-1765-5
Oertel, H. jr. (Hrsg.), 2008: “Prandtl - Führer durch die Strömungslehre”, Vieweg-Teubner, ISBN 978-3-8348-0430-3

M 5.72 Module: Integrated Design Project in Water Resources Management (bauiM2S48-HY9) [M-BGU-105637]

Responsible: PD Dr.-Ing. Uwe Ehret
Dr.-Ing. Frank Seidel

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

Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2021)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2021)
Subject-Specific Supplements (Usage from 4/1/2021)

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

Mandatory			
T-BGU-111275	Integrated Design Project in Water Resources Management	6 CR	Ehret, Seidel

Competence Certificate
- 'Teilleistung' T-BGU-111275 with written examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students are able to independently undergo the basic steps of planning and design in water resources management. They can identify engineering problems and apply the respective design approaches.

Students are able to work in a self-organized and reflexive manner. They are able to use and link their knowledge logically and have organizational skills in the areas of teamwork and presentation.

Content
In this module, students will work in teams to independently plan and design a flood protection measure for a small catchment. This comprises:

- identifying the legally required flood protection level
- establishing and comparing possible flood protection strategies
- setting up a hydrological model for the project catchment
- establishing hydrological design values based on design storms applied to the hydrological model, and designing flood values from extreme value statistics
- designing the outlet works and the flood release system of a flood retention basin based on the hydrological flood values with a special focus in capacity and energy dissipation.

In the lectures, the following topics required to successfully accomplish the design project will be covered:

- basic introduction to Water Resources Management
- basic planning methodology in water management projects
- basic hydrological modeling
- introduction to extreme-value statistics and design storms
- introduction to the related design standards and legal requirements (DIN 19700 and others)
- introduction to the design of hydraulic structures with a special focus on flood retention basins
- principals of Computer Aided Design (AutoCAD)
- background on operation and maintenance of flood retention basins
- practical example: excursion to a build flood retention basin

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

Annotation
none

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

- lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises: 30 h
- preparation of the study project and the report (examination): 120 h

total: 180 h

Recommendation
basic knowledge in hydrology, hydrological modeling, hydromechanics, hydraulic engineering

Matlab skills (for hydrological modeling), e.g. successful completion of Introduction to Matlab (WSE-CC772)

5.73 Module: River Processes (bauiM2S49-WB9) [M-BGU-105927]

Responsible: Prof. Dr. Mario Jorge Rodrigues Pereira da Franca
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2022)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2022)
Subject-Specific Supplements (Usage from 4/1/2022)

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

Mandatory			
T-BGU-111930	River Processes	6 CR	Rodrigues Pereira da Franca

Competence Certificate
- 'Teilleistung' T-BGU-111930 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
This module must not be selected together with the module Flow and Sediment Dynamics in Rivers [bauiM2S35-WB8] not offered anymore.

Competence Goal
The module provides students with theoretical and practical knowledge of landscape and river processes, related to hydromorphodynamics and transported phases. The students will be able to transfer immature scientific knowledge into engineering praxis through the assignment and experimental analysis, which includes:

1. hypotheses formulation,
2. experimental data acquisition, and subsequent
3. analysis of data to support derivation of own findings.

The experimental work will be conducted in a large-scale research infrastructure of the Theodor Rehbock Hydraulics Laboratory at IWU.

After successfully completing the course on *Landscape and River Morphology*, the student will be able to:

- describe the main morphology processes happening at the landscape and river scale
- describe and identify the governing processes of singularities in the river networks such as confluences, bifurcations, bends, among others
- identify possible implications of climate change in morphological processes of the river basin
- identify the main hydromorphodynamic processes relevant to river ecology
- transfer immature knowledge from scientific literature into engineering praxis

After successfully completing the course on *Transport Processes in Rivers*, the student will be able to:

- describe the engineering and ecological implications of different types of moving elements (debris: plastic, wood, sediments) in rivers,
- identify relevant sources and sinks of debris transported by rivers,
- quantify transport processes relative to river debris,
- acquire and analyze hydrodynamic data to inform on a river transport process,
- derive new, own findings based on research-based methods,
- plan monitoring campaigns based on state-of-the-art techniques,
- transfer scientific literature in river debris into practical applications.

Content
The content of the module/course pursues the following UN Sustainable Goals:

- SDG 6 Clean water and sanitation

The course *Landscape and River Morphology* contains the following topics:

- morphology processes at the landscape scale,
- morphology processes at the river scale,
- intersection of hydromorphodynamic processes with engineering praxis,
- safety and stability of river networks,
- fluvial ecomorphology

The course *Transport Processes in Rivers* considers the following topics:

- sediment transport (bed and suspended load),
- plastic and urban (cars and urban furniture) debris,
- experimental analysis of transport/retention processes for sediments or debris such as
- plastic, wood, etc.,
- woody and vegetation debris,
- bubbles and gas transfer,
- heat,
- contaminant plumes.

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

Annotation
More information about the module can be found under https://wb.iwu.kit.edu/education.php.

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

- Landscape and River Morphology lecture/exercise: 30 h
- Transport Processes in Rivers lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Landscape and River Morphology: 10 h
- preparation of the assignment in Landscape and River Morphology: 30 h
- preparation and follow-up lecture/exercises Transport Processes in Rivers: 10 h
- experimental work in Transport Processes in Rivers and preparation of report: 50 h
- preparation of final colloquium: 20 h

total: 180 h

Recommendation
basic knowledge in hydromechanics and hydraulic engineering

Literature
Chapter on Fluvial Geomorphology in Treatise in Geomorphology, 2nd edition. Elsevier.

Muste, M., Lyn, D. A., Admiraal, D., Ettema, R., Nikora, V., & García, M. H. (Eds.). (2017). Experimental Hydraulics: Methods, Instrumentation, Data Processing and Management: Volume I: Fundamentals and Methods. CRC Press.

Aberle, J., Rennie, C. D., Admiraal, D. M., & Muste, M. (2017). Experimental Hydraulics: Methods, Instrumentation, Data Processing and Management: Volume II: Instrumentation and Measurement Techniques. CRC Press.

M 5.74 Module: Deep Learning in Hydrological Modeling (bauiM2S50-MLEARN) [M-BGU-105994]

Responsible: Dr. rer. nat. Ralf Loritz

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

Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 10/1/2022)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 10/1/2022)
Subject-Specific Supplements (Usage from 10/1/2022)

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

Mandatory			
T-BGU-112171	Deep Learning in Hydrological Modeling	6 CR	Loritz

Competence Certificate
- 'Teilleistung' T-BGU-112171 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students have gained a general understanding how machine learning methods, particular artificial neural networks and derivatives, are applied in hydrology and have an overview of the current research in this field. They are able to independently setup different types of artificial neural networks in Python and do understand the core principles of these approaches. This includes that they are able to analyze these neural networks and understand their key limitations. The overall goal is that they are prepared to apply state of the art machine learning methods in the water sciences.

Content
This module is designed to deepen the understanding how machine learning is applied in hydrology. This is done along hands-on examples in combination with state of the art machine learning literature. The content is designed to strengthen the programming and scientific skills of the participating students. Topics of the class are:

- machine learning models as surrogate of environmental models with a focus on hydrological modeling
- basic concepts behind artificial neural networks and derivatives
- promises and key limitations of artificial neural network
- hybrid modelling: ideas, concepts and state of the art
- how to setup, design and validate artificial neural networks with hands-on examples in Python
- how to present scientific results in presentations and in a written form

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

Annotation
The course is limited to 12 participants. Please register via e-mail to the responsible lecturer. Participants are selected according to their progress of study considering the following order: students of *Water Science and Engineering*, that have successful participated in 'Introduction to Environmental Data Analysis and Statistical Learning' and 'Water and Energy Cycles', then students of *Civil Engineering* with focus Water and Environment, then other students.

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 20 h
- preparation of presentation : 40 h
- preparation of report: 60 h

total: 180 h

Recommendation

sound knowledge in basics of hydrology;

interest in reading and reviewing scientific research papers;

good programming skills in Python, MatLab or R, preferably in Python.

successful participation in Introduction to Environmental Data Analysis and Statistical Learning [bauiM2S44-ENVDAT] and Water and Energy Cycles [bauiM2P8-WATENCYC]

M 5.75 Module: Stormwater Management (bauiM2S51-SWMAN) [M-BGU-106112]

Responsible: Dr.-Ing. Mohammad Ebrahim Azari Najaf Abad
PD Dr.-Ing. Stephan Fuchs

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

Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 10/1/2022)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 10/1/2022)
Subject-Specific Supplements (Usage from 10/1/2022)

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

Mandatory			
T-BGU-112370	Stormwater Management	6 CR	Azari Najaf Abad, Fuchs

Competence Certificate
- 'Teilleistung' T-BGU-112370 with examination of other type according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students will learn about principles, operations, and simulation of separate and combined sewer systems. Students get familiar with technical plants for stormwater treatment. They can explain operating principles of individual system components as well as assess their suitability for specific applications and apply basic dimensioning approaches.

Content
Lectures are followed by several guided site visits, descriptions, and evaluations of different stormwater treatment plants: stormwater sedimentation tanks, stormwater overflow tanks, and retention soil filters. Settlement characteristics and dimensioning approaches for the design of stormwater treatment facilities will be discussed and evaluated during the site visits. The course wraps up with group laboratory work to learn measurements for sedimentation column and sedimentation basin experiments to evaluate sedimentation characteristics and conduct relevant measurements.

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

Annotation
The attendance of the site visits and the lab work is mandatory.

The number of participants in the course is limited to 20 persons. The registration is made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering, Geoecology* and further study programs.

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- preparation of report and presentation (examination): 60 h

total: 180 h

Recommendation
basic knowledge in sanitary engineering, module 'Urban Water Infrastructure Management' [bauiM2P10-URBIM]

Literature
ATV-DVWK(1997) Handbuch der Abwassertechnik: Mechanische Abwasserreinigung, Band 6, Verlag Ernst & Sohn , Berlin

Gujer, W. (1997) Siedlungswasserwirtschaft, Springer, Berlin 3.Aufl.

Metcalf & Eddy, Abu-Orf, M., Bowden, G., Burton, F.L., Pfrang, W., Stensel, H.D., Tchobanoglous, G., Tsuchihashi, R. and AECOM (Firm), (2014). Wastewater engineering: treatment and resource recovery. McGraw Hill Education.

5.76 Module: Modeling Wastewater Treatment Processes (bauiM2S52-MODWTP) [M-BGU-106113]

Responsible: Dr.-Ing. Mohammad Ebrahim Azari Najaf Abad

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

Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 10/1/2022)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 10/1/2022)
Subject-Specific Supplements (Usage from 10/1/2022)

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

Mandatory			
T-BGU-112371	Modeling Wastewater Treatment Processes	6 CR	Azari Najaf Abad

Competence Certificate
- 'Teilleistung' T-BGU-112371 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students will be able to learn the basics of wastewater treatment modeling to develop a matrix for a biological model. Another objective is being able to work with several relevant computer software as tools for modeling wastewater treatment processes and running sensitivity analysis, calibration, and validation. At the end of this course, the students will be able to apply the theory concerning modeling practice in case studies with real datasets using one of the relevant software they learned. During the presentation, they will discuss and explain the outcome of the model.

Content
The course deals with the basis of wastewater modeling (kinetics, stoichiometry, mass balances, hydraulics, mixing, and matrix notation), an introduction of existing activated sludge models (ASM1, ASM2, ASM3, ASM2d), and a selection of computer programs (AQUASIM, SIMBA, GPS-X, and SUMO) in which the models can be built in and the protocol for the development of calibrated activated sludge models will be practiced. Different adjustments to basic ASM models for characterization of biofilm and granular sludge model, as well as anaerobic digestion models (ADM), will be also discussed. Besides the presentations, exercises form a part of the course. Finally, case studies with real datasets on modeling wastewater treatment plants will be practiced.

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

Annotation
The number of participants in the course is limited to 20 persons. The registration is made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering*, *Chemical and Process Engineering, Geoecology* and further study programs.

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- preparation of report and presentation (examination): 60 h

total: 180 h

Recommendation
basic knowledge in sanitary engineering, module Urban Water Infrastructure and Management [bauiM2P10-URBIM]

Literature

Chen, G.H., van Loosdrecht, M.C., Ekama, G.A. and Brdjanovic, D. eds., 2020. Biological wastewater treatment: principles, modeling and design. IWA publishing.

Makinia, J. and Zaborowska, E., 2020. Mathematical modelling and computer simulation of activated sludge systems. IWA publishing.

Mannina, G. ed., 2017. Frontiers in Wastewater Treatment and Modelling: FICWTM 2017 (Vol. 4). Springer.

M 5.77 Module: Experimental Hydraulics and Measurement Techniques (bauiM2S53-WB10) [M-BGU-106114]

Responsible: Dr.-Ing. Frank Seidel

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

Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 10/1/2022)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 10/1/2022)
Subject-Specific Supplements (Usage from 10/1/2022)

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

Mandatory			
T-BGU-112374	Experimental Hydraulics	3 CR	Seidel
T-BGU-110411	Flow Measurement Techniques	3 CR	Gromke

Competence Certificate
- 'Teilleistung' T-BGU-112374 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-110411 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
The module must not be selected together with the module Experimental Hydraulics and Measuring Techniques [bauiM2S37-WB10] not offered anymore.

Competence Goal
Students are able to describe the principles of different flow measurement methods and combine this information with the basics of today's flow measurement technology. They have basic knowledge about the structure and can analyze the suitability of measurement methods and set application boundaries.Students have basic knowledge about experimentation in hydraulics. They know the similarity mechanical requirements and assign them to the hydromechanical basics. Students are able to analyze applications in the field of multiphase hydraulics and select suitable model concepts. They can present their own thoughts and ideas in a structured manner and discuss the themes with specialists.

Content
In this module, the following topics will be discussed in depth:

- basic equations in fluid mechanics
- measurement methods and their fields of application
- experimental models with movable beds
- experiments related to multiphase flow problems (water-air, water-solid)

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

Annotation
Further information about the module can be found under https://wb.iwu.kit.edu/education.php.

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

- Flow Measurement Techniques lecture/exercise: 30 h
- Experimental Hydraulics lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Flow Measurement Techniques: 30 h
- examination preparation Flow Measurement Techniques (partial exam): 30 h
- preparation and follow-up lecture/exercises Experimental Hydraulics: 30 h
- preparation of term paper Experimental Hydraulics (partial exam): 30 h

total: 180 h

Recommendation
module Experiments in Fluid Mechanics [bauiM2S39-SM6], hydraulic lab practice

5.78 Module: Surface and Subsurface Contaminant Transport (bauiM2S54-HY10) [M-BGU-107003]

Responsible: Prof. Dr.-Ing. Erwin Zehe

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

Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2025)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2025)
Subject-Specific Supplements (Usage from 4/1/2025)

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

Mandatory			
T-BGU-113965	Surface and Subsurface Contaminant Transport	6 CR	Zehe

Competence Certificate
- 'Teilleistung' T-BGU-113965 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
Module must not selected together with the module 'Subsurface Flow and Contaminant Transport' [bauiM2S03-HY3] not offered anymore.

Competence Goal
Students are able to explain processes of transport and decomposition related to nutrients and pollutants in surface runoff and in the unsaturated zone of rural catchments.

Students are able to independently apply analytical and process-based models: estimation of model parameters from field investigations, estimation of water and substance fluxes and balance in the critical zone, statements on the risks related to contaminant mobilization in natural soils.

Students are able to evaluate the limits of applicability of modeling approaches in natural, heterogeneous soils.

Content
Transport processes in the unsaturated zone related to infiltration, surface runoff, and movement of soil water:

- advective-dispersive transport in homogeneous and heterogeneous soils
- particulate transport by erosion
- adsorption
- chemical and microbial processes of reaction and decay in soils
- modeling contaminant transport (e.g. pesticides) in soils using analytical models
- risk assessment for pesticides in soils (transport, residence times, adsorption, decay)
- estimation of model parameters from field exploration
- parameterization of adsorption isotherms
- breakthrough curve

Computer exercise:

- simulation of water and substance transport with process-based models
- independently conducted risk-assessments for pesticides using simple simulation techniques

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

Annotation
Module will be offered newly as from summer term 2025.

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
modules Water and Energy Cycles [bauiM2P8-WATENCYC] and Hydrological Measurements in Environmental Systems [bauiM2S05-HY5];
knowledge of programming with Matlab; otherwise, it is strongly recommended to attend the course 'Introduction to Matlab' (6224907)

Literature
Jury, W. and Horton, R. (2004): Soil physics. John Wiley
Hillel, D. (1995): Environmental Soil Physics. Academic Press
Fritsche, W. (1998) Umweltmikrobiologie, Grundlagen und Anwendungen. Gustav Fischer Verlag, 248pp.

M 5.79 Module: Hydraulic Interactions (bauiM2S55-SM7) [M-BGU-107026]

Responsible: Prof. Dr. Olivier Eiff
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2025)
Study Focus II / Water and Environment (Compulsory Elective Modules) (Usage from 4/1/2025)
Subject-Specific Supplements (Usage from 4/1/2025)

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

Mandatory			
T-BGU-114086	Interaction Flow – Sediment Bed and Subsurface	3 CR	Dupuis
T-BGU-110404	Interaction Flow - Hydraulic Structures	3 CR	Gebhardt

Competence Certificate
- 'Teilleistung' T-BGU-114086 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-110404 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
The module must not be selected together with the module Interaction Flow - Building Structure [bauiM2S47-SM2] and the module Hydraulic Structures [bauiM2S36-WB9] not offered anymore.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-105503 - Interaction Flow - Building Structure must not have been started.

Competence Goal
Students are able to analyze and calculate steady and unsteady flow forces on hydraulic structures, sediment beds and the subsurface. They can describe subsurface flow processes and derive flow parameters with common design rules. They can characterize and categorize flow-induced structural vibrations. Based on the acquired knowledge, they can analyze concepts for preventing structural damage in a critical manner for application examples.

Content
In this module, the following topics are discussed in depth:

- potential theory
- flow interactions in the underground and hyporheic zones
- structural adjustments
- determination of hydrostatic and hydrodynamic flow forces
- overview of sealing mechanisms: flood sluices, weirs, gates
- flow-induced structural vibrations

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

Annotation
Module will be offered newly as from summer term 2025.

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

- Interaction Flow - Sediment Bed and Subsurface lecture/exercise: 30
- Interaction Flow - Hydraulic Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Interaction Flow - Sediment Bed and Subsurface: 30 h
- examination preparation Interaction Flow - Sediment Bed and Subsurface (partial exam): 30 h
- preparation and follow-up lecture/exercises Interaction Flow - Hydraulic Structures: 30 h
- examination preparation Interaction Flow - Hydraulic Structures (partial exam): 30 h

total: 180 h

Recommendation
module 'Advanced Fluid Mechanics'

Learning type
You can describe flow processes taking place underground and derive flow parameters based on common design rules

Literature
Gonzalez De Vallejo, 2011 L. Geological Engineering, CRC Press
Freeze, A.R., and Cherry, J.A. 1979 Groundwater. Prentice Hall,
Budhu, M. 2015 Soil Mechanics Fundamentals, Wiley Blackwell
Erbisti, P.C.F., 2004, Design of Hydraulic Gates, Balkema Pub., Tokyo
Naudascher; E, 1991, Hydrodynamic Forces, Balkema Pub., Rotterdam
Lang, lecture notes 'Interaktion Strömung - Wasserbauwerk'

M 5.80 Module: Urban and Regional Planning (bauiM3P1-PLSTAREG) [M-BGU-100007]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Modules)
Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100050	Urban and Regional Planning	6 CR	Soylu, Wilske

Competence Certificate
- 'Teilleistung' T-BGU-100050 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The aim is to provide an overview of important tasks for spatial planning, of the legal principles, methods and strategies for solving spatial problems on urban and regional level. The students shall be able to develop planning strategies, particularly in the field of planning on a supra-local level.

Content
In the lectures basic goals and tasks of planning of different levels, procedures and instruments, the relationship between governmental and private planning are taught. The scientific contexts are developed systematically to strengthen the various methodological approaches to understand and evaluate them. Particular attention will be paid inter alia to changing conditions, such as demographic and economic developments.

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

Annotation
none

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

- Urban Planning lectures/exercises: 30 h
- Regional Planning lectures: 30 h

independent study:

- preparation and follow-up Urban Planning lectures/exercises: 30 h
- preparation and follow-up Regional Planning lectures: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
module Mobility and Infrastructure [bauiBFP5-MOBIN]

Literature
list of literature to module

M 5.81 Module: Models and Methods in Traffic Engineering and Transportation Planning (bauiM3P2-VERMODELL) [M-BGU-100008]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Modules)
Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100012	Models and Methods in Traffic Engineering and Transportation Planning	6 CR	Vortisch

Competence Certificate
- 'Teilleistung' T-BGU-100012 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
see German version

Content
Methods and models in transport planning as well as the relevant tools and methods for the traffic engineer. Transport Planning:

- four-Step-Algorithm
- aggregate versus individual models
- choice modeling

Traffic Engineering:

- measuring traffic flow data
- description of traffic conditions / fundamental diagram
- capacity of roads and intersections with and without traffic signals

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

Annotation
none

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

- Methods and Models in Transportation Planning lectures/exercises: 30 h
- Traffic Engineering lectures/exercises: 30 h

independent study:

- preparation and follow-up Methods and Models in Transportation Planning lectures/exercises: 30 h
- preparation and follow-up Traffic Engineering lectures/exercises: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

Literature
lecture notes with additional references / exercises

5.82 Module: Infrastructure Management (bauiM3P3-STRINFRA) [M-BGU-100009]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Modules)
Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106300	Infrastructure Management	6 CR	Zimmermann

Competence Certificate
- 'Teilleistung' T-BGU-106300 with written examination according to § 4 Par. 2 No. 1
details about the learning control see at the respective 'Teilleistung'

Prerequisites
none

Competence Goal
The graduates are able to apply and develop respectively methods and techniques for different tasks related to the life cycle of a road (design, construction, operation and maintenance) and to examine these with regard to their technical suitability and economic feasibility. Further, they have the competence to be able to apply these methods to other problems and in different fields and modify them respectively.

Content
The module addresses further topics about design and construction of roads such as aspects of safety, junctions, construction materials, way of construction and drainage. In the phase of operation of a road after release for traffic logistical and technical aspects of the operation service (road control, snow and ice control, green belt care etc.) as well as the maintenance of roads (status recognition and evaluation, surface and structure properties, pavement management a.o.) come to the fore which are important for smooth and safe traffic flow. These are discussed in the classes fundamentally.

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

Annotation
none

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

- Design and Construction of Highways lectures: 30 h
- Operation and Maintenance of Highways lectures: 30 h

independent study:

- preparation and follow-up Design and Construction of Highways lectures: 30 h
- preparation and follow-up Operation and Maintenance of Highways lectures: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

M 5.83 Module: Laws and Proceedings Concerning Traffic and Roads (bauiM3P5-VERFRECHT) [M-BGU-100011]

Responsible: Prof. Dr.-Ing. Peter Vortisch

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

Part of: Study Focus I / Mobility and Infrastructure (Compulsory Modules)
Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106297	Laws and Proceedings Concerning Traffic and Roads	6 CR	Vortisch, Zimmermann

Competence Certificate
- 'Teilleistung' T-BGU-100050 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The graduates know the legal framework concerning construction and operating of roads and can justify and question decisions. Furthermore, they understand methods concerning environmental impact analysis of infrastructure, they can technically argue and classify evaluations of variants. In addition, they are able to apply assessment and evaluation techniques for the planning of infrastructure projects, to modify them with respect to specific applications and to analyse their results.

Content
Constitutional framework, environmental impact of roads, changing topics concerning mainly procedures in highway engineering Methodologies and application of standardized assessment and decision techniques (Cost-Benefit-Analyses, Value Benefit Analyis etc.) in transport planning

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

Annotation
none

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

- Laws concerning Traffic and Roads lectures: 30 h
- Environmental Impact Assessment lectures: 15 h
- Assessment and Evaluation Techniques lectures: 15 h

independent study:

- preparation and follow-up Laws concerning Traffic and Roads lectures: 30 h
- preparation and follow-up Environmental Impact Assessment lectures: 15 h
- preparation and follow-up Assessment and Evaluation Techniques lectures: 15 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

M 5.84 Module: Urban Renewal (bauiM3S01-PLSTUMB) [M-BGU-100013]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-108441	History of Urban Planning	3 CR	Ross
T-BGU-113672	Examination Prerequisite Urban Management	1 CR	Karmann-Woessner
T-BGU-108442	Urban Management	2 CR	Karmann-Woessner

Competence Certificate
- 'Teilleistung' T-BGU-108441 with oral written according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-113672 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite to 'Teilleistung' T-BGU-108442
- 'Teilleistung' T-BGU-108442 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
The aim is to convey the principles and methods of urban renewal. In the module adaptation strategies are taught, by which cities and city regions react to changing conditions. These changes -such as climate change, demographics or changing economic practices- are encountered by urban concepts city-wide, on the level of city quarters or on the building level. In addition to the urban redevelopment in Germany selected references from Europe are examined.

Content
Based on the core module 'Urban and Regional Planning' the lectures are focused on adaptation strategies of cities and urban regions. In addition to a classification in the current discussions on urban redevelopment basic methods and tools are taught. The students of the module Urban Renewal shall be able to elaborate strategies of urban renewal and redevelopment. The basic methodological framework is the discussion of projects as examples for good practice in the course 'Urban Management'. The module will be supplemented by the course 'History of Urban Planning and the Built Environment' to consider the historical development and cultural heritage.

Module grade calculation
grade of the module average of grades of the partial exams

Annotation
Please note:

The course Urban Management (6231801), 2 HpW/SWS, will exceptionally not be offered in the summer semester 2024 but in the winter semester 2024/25.

As from winter semester 2024/25 there is an examination prerequiste to the examination Urban Management.

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

- Urban Management lectures/exercises: 30 h
- Urban Planning I: History of Urban Planning and the Built Environment lectures: 30 h

independent study:

- preparation and follow-up Urban Management lectures/exercises: 10 h
- preparation of a presentation or seminar paper (examination prerequisite): 30 h
- examination preparation Urban Management (partial examination): 20 h
- preparation and follow-up Urban Planning I: History of Urban Planning and the Built Environment lectures: 30 h
- examination preparation History of Urban Planning (partial examination): 30 h

total: 180 h

Recommendation
none

Literature
list of literature to module

M 5.85 Module: Space and Infrastructure (bauiM3S02-PLRAUMINF) [M-BGU-100014]

Responsible: PD Dr.-Ing. Martin Kagerbauer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-103541	Introduction to GIS for Students of Natural, Engineering and Geo Sciences, Prerequisite	3 CR	Wursthorn
T-BGU-113017	Exercise Logistics, Supply and Disposal	1 CR	Kagerbauer
T-BGU-100056	Space and Infrastructure	2 CR	Kagerbauer, Wursthorn

Competence Certificate
- 'Teilleistung' T-BGU-103541 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-113017 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100056 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
The students have the knowledge of the type and creation, management and presentation of spatial data. They acquire the ability to deal with Geographic Information Systems and to develop and interpret spatial analyses with GIS also using visual programming.

Students will be able to explain the relationships between spatial development and infrastructure planning. They are able to present and analyze spatial data in a meaningful way. They are able to explain the importance of the coupling between the planning task and the use of IT-supported tools in spatial planning and thus to link the theoretical requirement and the planning reality on the one hand and the instruments on the other hand.

Content

- introduction to geographic information systems as well as basics of EDP and cartography
- explanation of different data models (technical and geometric data)
- handling of geodata, spatial analysis of geodata as well as the presentation of results
- introduction to infrastructure and development planning
- basics of supply and disposal planning
- application of computer-aided planning methods

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

Annotation
none

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

- Introduction to GIS for Students of Natural, Engineering and Geo Sciences lectures/exercises: 60 h
- Logistics, Supply and Disposal lecture/exercises: 30 h

independent study:

- preparation and follow-up Introduction to GIS for Students of Natural, Engineering and Geo Sciences lectures, exercises: 10 h
- preparation of the Exercises Introduction to GIS for Students of Natural, Engineering and Geo Sciences (not graded examination prerequisite): 20 h
- preparation and follow-up Logistics, Supply and Disposal lectures: 10 h
- preparation of the Exercises Logistics, Supply and Disposal (not graded examination prerequisite): 20 h
- examination preparation: 30 h

total: 180 h

Recommendation
beginning the module in winter term

Literature
list of literature for module

M 5.86 Module: Traffic Management and Simulation Methods (bauiM3S03-VERMANAGE) [M-BGU-100015]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-113971	Exercise Transportation Data Analysis	0 CR	Vortisch
T-BGU-100008	Traffic Management und Simulation Methods	6 CR	Vortisch

Competence Certificate
- 'Teilleistung' T-BGU-113971 with with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100008 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
Acquisition of the specific and advanced knowledge and the relevant methodologies in the field of traffic engineering. Basic considerations in the development and the application of simulation models in transport planning and traffic engineering.

Content
In excess of the basic module "Model approaches and methods in transportation" more advanced methods of traffic engineering will be dealt with (advanced signalisation, control of routes and networks). Furthermore methods for the development of simulation models as well as their application will be in the focus (application of professional software tools for transport planning and traffic engineering). Another issue are transport telematics and intelligent transportation system.

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

Annotation
As from summer term 2025 the Exercise Transportation Data Analysis will be implmented as examination prerequisite.

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

- Traffic Management and Transport Telematics lectures/exercises: 30 h
- Traffic Flow Simulation lectures/exercises: 30 h

independent study:

- preparation and follow-up Traffic Management and Transport Telematics lectures/exercises: 30 h
- preparation and follow-up Traffic Flow Simulation lectures/exercises: 30 h
- preparation of the Exercises Transportation Data Analysis (not graded examination prerequisite): 10 h
- examination preparation: 50 h

total: 180 h

Recommendation
none

Literature
lecture notes

guidelines ('Handbuch zur Bemessung von Straßen', 'Richtlinien für Lichtsignalanlagen'),

software documentations

M 5.87 Module: Planning of Transportation Systems (bauiM3S04-VERPLAN) [M-BGU-100016]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100013	Planning of Transportation Systems	6 CR	Vortisch

Competence Certificate
- 'Teilleistung' T-BGU-100013 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students know all common means of transport and their properties. They can assess advantages and disadvantages of the means of transport from the perspective of users, operators and the environment, and they can make decisions about the system adapted to the situation. They understand the systemic interrelation of means of transport, infrastructure and mobility behaviour. The students know the methods of transportation planning common in practice and can these critically evaluate and develop further.

Content

- means of transport and their properties: capacity, velocity and energy consumption;
- environmental impacts: pollutant emission, noise and traffic safety;
- origin and evolution of traffic demand;
- examples of transport systems: bicycle traffic as system, planning procedures in public transport,
- boundary conditions of strategic planning: target systems, civic participation, policy influence;
- application of models;
- activity development;
- impact investigation and evaluation;
- examples: federal road plan, international master plans;
- transport development plans

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

Annotation
none

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

- Characteristics of Transportation Systems lectures: 30 h
- Strategic Transport Planning lectures: 30 h

independent study:

- preparation and follow-up Characteristics of Transportation Systems lectures: 30 h
- preparation and follow-up Strategic Transport Planning lectures: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
course Transportation (6200406)

Literature
lecture notes and materials are available for downloading

M 5.88 Module: Highway Design (bauiM3S05-STRENTW) [M-BGU-100017]

Responsible: Dr.-Ing. Matthias Zimmermann

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

Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-109917	Study Project Design of a Rural Road	2 CR	Zimmermann
T-BGU-100057	Highway Design	4 CR	Zimmermann

Competence Certificate
- 'Teilleistung' T-BGU-109917 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100057 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
The graduates can apply methods as well as manual and computer aided procedures for the design of a road in position elevation and cross section and design new roads. Furthermore, they are able to develop and evaluate variants of new roads considering traffic, topographic, ecologic and economic requirements as well as to assess road designs in compliance with the technical regulations.

Content
In this module the procedure of finding the route of a bypass road will be discussed and applied to a specific planning example. After defining the boundary conditions for the draft of this bypass road design solutions are developed in the map, in the gradient diagram and in the cross-section manually by small teams. The results are discussed. Here also, tests are made whether the standards are satisfied and related to requirements of the spatial route planning. In parallel to this manual route planning of the road, the procedure of a computer aided road design is addressed in theory as well as practically at basic design examples. The exercises are conducted by use of the both most popular design codes.

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

Annotation
none

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

- IT-based Road Design lectures/exercises: 30 h
- Highway Design Project Study lectures/exercises: 30 h

independent study:

- preparation and follow-up IT-based Road Design lectures/exercises: 30 h
- preparation and follow-up Highway Design Project Study lectures/exercises: 30 h
- attestation of study project (examination prerequisite): 20 h
- examination preparation: 40 h

total: 180 h

Recommendation
preliminary attendance of the compulsory module Infrastructure Management [bauiM3P3-STRINFRA]

5.89 Module: Road Construction (bauiM3S06-STRBAUT) [M-BGU-100006]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100058	Road Construction	6 CR	Zimmermann

Competence Certificate
- 'Teilleistung' T-BGU-100058 with oral examination according to § 4 Par. 2 No. 2
details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The graduates are able to dimension and to test roadway constructions build of asphalt and concrete empirically and by calculation and to assess the impact of internal and external influencing factors on roadway constructions. Furthermore, they are able to explain mechanisms of failure, to question and to evaluate failures as well as to test material parameters by experimental techniques in the lab.

Content
In this module material models, influencing factors on roadway constructions as well as basics and parameters for an empirical and calculatory dimensioning of transportation routes are addressed deeply. Furthermore, deficiencies and failures of roadway constructions are presented and failure mechanisms are explained. In the practical training experiments on the determination of material parameters of unconsolidated materials, bitumen and asphalt are conducted, analysed and evaluated as well as the application of dimensioning methods are examined at real-world examples.

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

Annotation
none

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

- Practical Laboratory Training in Road Construction lectures/exercises: 30 h
- Pavement Structural Design and Failure Analysis lectures: 30 h

independent study:

- preparation and follow-up Practical Laboratory Training in Road Construction lectures/exercises: 30 h
- preparation and follow-up Pavement Structural Design and Failure Analysis lectures: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
preliminary attendance of the compulsory module Infrastructure Management [mobiM301-STRINFRA]

M 5.90 Module: Project Integrated Planning (bauiM3S09-PROJEKTIP) [M-BGU-100018]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-109916	Group Exercise Project Integrated Planning	5 CR	Vortisch, Zimmermann
T-BGU-100061	Project Integrated Planning	1 CR	Vortisch, Zimmermann

Competence Certificate
- 'Teilleistung' T-BGU-109916 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100061 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
The graduates are able to analyze the planning requirements of the different subject areas in the field mobility and infrastructure and to apply them to a specific example. They identify the weak points, develop realizable solutions and discuss them in the framework of a multi-disciplinary weighing process. Furthermore, they can work self-organized and have organisational and didactic competences with respect to team work and presentation.

Content
A typical practical task in the field of spatial and infrastructure planning has to be elaborated (e.g. ideas contest in town planning). The students have to take charge of certain planning tasks from the fields town planning, transport studies, highway engineering and track guided transport systems and develop different solution concepts based on a conflict and deficiency analysis. In order to obtain an integrated planning concept the requirements of the involved subject areas have to be considered. Subsequent to a weighing process, they select well-founded a acceptable and sustainable concept which they develop further and present in 3 phases to a realizable solution on different levels of detail.

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

Annotation
none

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

- on-site meeting, technical group meetings, presentations: 15 h

independent study:

- preparation and follow-up: 15 h
- team exercise (examination prerequisite, part per person): 135 h
- examination preparation and examination: 15 h

total: 180 h

Recommendation
preliminary attendance of at least 2 compulsory modules in the study focus Mobility and Infrastructure

5.91 Module: Intermodality in Freight, Long-Distance and Air Transport (bauiM3S11-VERINTER) [M-BGU-100020]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106611	Freight Transport	3 CR	Szimba, Vortisch
T-BGU-106301	Long-Distance and Air Traffic	3 CR	Vortisch

Competence Certificate
- 'Teilleistung' T-BGU-106611 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-106301 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
Knowledges about the characteristics of freight transportation, long distance travel and air travel against the background of the globalization and and EU-integration Knowledge about the challenges and the design and of intermodal transport services.

Content

- relevant factors for the demand in freight transport
- methods for demand forecasts and planning in freight transport
- measures for influencing the demand in freight transport as well as their efficiency
- particularities of the airline industry in a global market shown in case studies
- organisation of the airline industry
- particularities of Long Distance Travel
- methodology of the Federal Transport Master Plan
- evolution of Long Distance Transport Systems

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

Annotation
none

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

- Freight Transport lectures/exercises: 30 h
- Long-distance and Air Traffic lectures: 30 h

independent study:

- preparation and follow-up Freight Transport lectures/exercises: 30 h
- examination preparation Freight Transport (partial exam): 30 h
- preparation and follow-up Long-distance and Air Traffic lectures: 30 h
- examination preparation Long-distance and Air Traffic (partial exam): 30 h

total: 180 h

Recommendation
none

Literature
lecture accompanying documents

5.92 Module: Road Safety (bauiM3S12-STRVSICH) [M-BGU-100021]

Responsible: Dr.-Ing. Matthias Zimmermann

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

Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-109915	Seminar Paper Road Safety	3 CR	Zimmermann
T-BGU-100062	Road Safety	3 CR	Zimmermann

Competence Certificate
- 'Teilleistung' T-BGU-109912 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100062 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
The graduates are able to apply methods and techniques for the improvement of road safety, to evaluate the safety of road networks, road sections and junctions, to identify accident black spots, to analyse accidents and their causes as well as to develop measures to improve road safety and evaluate them in their effect. Furthermore, they are able to self-organized and have organisational and didactic competences available related to team work and presentations.

Content
In this course the theoretical basics of road safety are repeated and fundamental improvements are discussed.

During the following seminar in highway engineering changing regional accident black spots are analysed and improvements for the road authorities are worked out and will be presented.

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

Annotation
<u>IMPORTANT:</u>

The courses will not be offered in the winter semester 2024/25. In future, they will always be offered in the summer semester.

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

- Safety Management in Highway Engineering lectures/exercises: 30 h
- Seminar in Highway Engineering: 30 h

independent study:

- preparation and follow-up Safety Management in Highway Engineering lectures/exercises: 30 h
- preparation of seminar paper (examination prerequisite): 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

5.93 Module: Special Topics in Highway Engineering (bauiM3S13-STRSPEZ) [M-BGU-100022]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-106734	Special Topics in Highway Engineering	6 CR	Hess, Zimmermann

Competence Certificate
- 'Teilleistung' T-BGU-106734 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The graduates are able to apply methods and techniques for specific aspects in the life cycle of a road, to modify them for the application case and to analyse the obtained knowledge. They are able to investigate the organisation and implementation of the operation and maintenance of a road, for instance, to reveal the weak points and to develop improvement possibilities.

Content
In this module the duties of the management of existing roads are acquired and the technical and commercial control from the point of view of the road authorities are explained. Further, different methods for the simulation, analysis and evaluation of additional problems and special aspects in highway engineering are presented and discussed by means of varying topics of design, construction, operation and maintenance of roads (e.g. statistical analysis of large data sets, simulation of traffic flow under particular boundary conditions, construction material analysis in lab experiments, innovative contractual forms for construction and operation of roads, econ. privatization).

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

Annotation
IMPORTANT:

The module will not be offered in summer term 2025.

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

- Technical and Economic Management Tools in Highway Engineering lectures: 30 h
- Simulations and Analysis Methods in Highway Engineering lectures: 15 h
- Special Topics in Highway Engineering lectures: 15 h

independent study:

- preparation and follow-up Technical and Economic Management Tools in Highway Engineering lectures: 30 h
- preparation and follow-up Simulations and Analysis Methods in Highway Engineering lectures: 15 h
- preparation and follow-up Special Topics in Highway Engineering lectures: 15 h
- examination preparation: 60 h

total: 180 h

Recommendation
preliminary attendance of the compulsory module Infrastructure Management [bauiM3P3-STRINFRA]

M 5.94 Module: City Transport Facilities (bauiM3S17-STRIVA) [M-BGU-100026]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Modules) (Usage from 10/1/2018)
Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Modules) (Usage from 10/1/2018)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-109912	Exercises and Student Research Project City Transport Facilities	2 CR	Zimmermann
T-BGU-100083	City Transport Facilities	4 CR	Zimmermann

Competence Certificate
- 'Teilleistung' T-BGU-109912 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100083 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
The graduates are able to plan and design city transport facilities related to car, bicycle, pedestrian and public traffic as well as to test, evaluate and optimize existing infrastructure. Further, they are able to assess the different usage requirements of different types of transportation and to consider them appropriately in design planning.

Content
Manifold requirements are put on city transport facilities in contrast to overland roads: usage from transit to access traffic, usage for stationary traffic, weak road users such as bicyclist and pedestrians, the demand of moving traffic, for stay and recreation activities up to the designing of the transport facilities considering the cityscape. Contemporarily, a variety of carriers of traffic are found within urban areas which have to be taken into consideration for designing roads and junctions as well as the network of transportation routes. All aspects are covered, discussed and their handling is practised at practically relevant case studies within this module.

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

Annotation
none

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

- lectures/exercises: 45 h

independent study:

- preparation and follow-up lectures/exercises: 30 h
- preparation of exercises and student research project (examination prerequisite): 70 h
- examination preparation: 40 h

total: 185 h

Recommendation
none

M 5.95 Module: Analysis and Evolution of Mobility (bauiM3S20-VERANAMOB) [M-BGU-100583]

Responsible: PD Dr.-Ing. Martin Kagerbauer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each term	2 terms	German	4	3

Mandatory			
T-BGU-113671	Exercise Transportation Data Analysis	0 CR	Kagerbauer
T-BGU-101004	Analysis and Evolution of Mobility	6 CR	Kagerbauer

Competence Certificate
- 'Teilleistung' T-BGU-113671 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-101004 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students know the methods to capture and to analyse the travel behavior of the people and recognize trends in the behaviour. They know up to date travel options an supply offers and are able to evaluate these from the point of view of users and operators.

Content
- capturing mobility: measurements and surveys, data preparation
- analysis: statistical methods and software tools therefore (SAS, R), also practical exercises at PC
- new forms of travel behavior, e.g. shared mobility
- mobility services: ridesharing and ridepooling services, intermodal information systems etc.
- analysis of functionality, interrelations and backgrounds of these mobility forms

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

Annotation
none

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

- Transportation Data Analysis lectures/exercises: 30 h
- Mobility Services and new Forms of Mobility lectures/exercises: 30 h

independent study:

- preparation and follow-up Transportation Data Analysis lectures/exercises: 20 h
- preparation of the Exercise Transportation Data Analysis (examination prerequisite): 10 h
- preparation and follow-up Mobility Services and new Forms of Mobility lectures/exercises: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
course Transportation (6200406)

M 5.96 Module: Special Issues of Public Transport (bauiM3S22-VERSPEZOEV) [M-BGU-103357]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)
Subject-Specific Supplements

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

Election notes
Two of the courses with the associated examinations are to be selected.

Not more than one of the two seminars can be selected.

Speical Topics (Election: between 1 and 2 items as well as between 3 and 6 credits)			
T-BGU-101005	Tendering, Planning and Financing in Public Transport	3 CR	Vortisch
T-BGU-106608	Information Management for Public Mobility Services	3 CR	Vortisch
T-BGU-111057	Sustainability in Mobility Systems	3 CR	Kagerbauer
Seminars (Election: between 0 and 1 items as well as between 0 and 3 credits)			
T-BGU-100014	Seminar in Transportation	3 CR	Kagerbauer, Vortisch
T-BGU-112552	Seminar on Modeling and Simulation in Transportation	3 CR	Kagerbauer, Vortisch

Competence Certificate
two learning controls have to be selected:

- 'Teilleistung' T-BGU-101005 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-106608 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-111057 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-100014 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-112552 with examination of other type according to § 4 Par. 2 No. 3

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

Prerequisites
One of the two seminars Transportation or Modeling and Simulation in Transportation can only be selected, if the module is not selected together with the module Seminars on Empirical Research, Modeling and Simulation in Transportation [bauiM3S24-VERKSEM].

Competence Goal
Students are able to familiarize themselves with special aspects of transportation particularly of public transport. They can acquire the necessary specialist knowledge, comprehend the methods commonly used in practice and critically question them. They are able to present complex issues in transportation and in particular in public transport transparently in writing or in a presentation.

Content
The legal framework for the organization of public transport in Germany is dealt with in detail. In this context, the financing and the planning procedure in public transport are dealt with in depth.

In addition, an introduction is given to the organizational and technical tasks involved in the planning, organization, operation and quality assurance of public mobility services, which can be solved with the help of approaches from computer science and with information systems.

Sustainability in mobility systems includes the effects of publicly available but alternative forms of mobility on the overall transport system.

In the Seminar in Transportation, current topics in traffic engineering, transport planning and travel behavior research are dealt with on a semester-by-semester basis. Information on current topics can be found on the institute's website.

In the Seminar on Modeling and Simulation in Transportation, current topics related to the microscopic travel modeling software mobiTopp or to new data sources and simulation applications in the field of traffic engineering and traffic flow modeling are dealt with. Information on current topics can be found on the institute's website.

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

Annotation
Not more than one of the two seminars can be selected.

Workload
contact hours (1 HpW = 1 h x 15 weeks), depending on selected courses:

- Tendering, Planning and Financing in Public Transport lectures: 30 h
- Information Management for public Mobility Services lectures/exercises: 30 h
- Sustainability in Mobility Systems lectures: 30 h
- Seminar in Transportation: 30 h
- Seminar Modeling and Simulation in Transportation: 30 h

independent study, depending on selected courses:

- preparation and follow-up Tendering, Planning and Financing in Public Transport lectures: 30 h
- examination preparation Tendering, Planning and Financing in Public Transport (selectable partial exam): 30 h
- preparation and follow-up Information Management for public Mobility Services lectures/exercises: 30 h
- preparation accompanying exercises Information Management for public Mobility Services (selectable partial exam): 30 h
- preparation and follow-up Sustainability in Mobility Systems lectures: 30 h
- examination preparation Sustainability in Mobility Systems (selectable partial exam): 30 h
- preparation of seminar paper in Transportation and presentation (selectable partial exam): 60 h
- work on a practical problem in the Seminar on Modeling and Simulation in Transportation (selectable partial exam): 60 h

total: 180 h

Recommendation
course Transportation (6200406)

M 5.97 Module: Seminars on Empirical Research, Modeling and Simulation in Transportation (bauiM3S24-VERKSEM) [M-BGU-106182]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules) (Usage from 10/1/2022)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules) (Usage from 10/1/2022)
Subject-Specific Supplements (Usage from 10/1/2022)

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

Mandatory			
T-BGU-100014	Seminar in Transportation	3 CR	Kagerbauer, Vortisch
T-BGU-112552	Seminar on Modeling and Simulation in Transportation	3 CR	Kagerbauer, Vortisch

Competence Certificate
- 'Teilleistung' T-BGU-100014 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-112552 with examination of other type according to § 4 Par. 2 No. 3

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

Prerequisites
none

Competence Goal
Students are able to explain methods of empiricism, modeling and simulation in transportation and apply them to topics in transport planning. They will be able to present complex issues in transportation in writing or in a presentation.

Content
In the Seminar in Transportation, current topics from traffic engineering, transport planning and travel behavior research are dealt with on a semester-by-semester basis.

In the Seminar on Modeling and Simulation in Transportation, current topics related to the microscopic travel demand modeling software mobiTopp or to new data sources and simulation applications in the field of traffic engineering and traffic flow modeling are dealt with. Information on current topics can be found on the institute's website.

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

Annotation
Selecting this module no seminars can be selected within the module Special Issues of Public Transport.

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

- Seminar in Transportation: 30 h
- Seminar on Modeling and Simulation in Transportation: 30 h

independent study, depending on selected courses:

- preparation of seminar paper in Transportation and presentation (partial exam): 60 h
- work on a practical problem in the Seminar on Modeling and Simulation in Transportation (partial exam): 60 h

total: 180 h

Recommendation
none

M 5.98 Module: Interdisciplinary Design – Urban and Transportation Planning (bauiM3S25-INTENTW) [M-BGU-106183]

Responsible: Prof. Dr.-Ing. Barbara Engel
Prof. Dr.-Ing. Peter Vortisch

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

Part of: Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules) (Usage from 4/1/2023)
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules) (Usage from 4/1/2023)
Subject-Specific Supplements (Usage from 4/1/2023)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	see Annotations	1 term	German/English	4	1

Mandatory			
T-BGU-112555	Interdisciplinary Design – Urban and Transportation Planning	6 CR	Engel, Vortisch

Competence Certificate
- 'Teilleistung' T-BGU-112555 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students:

- are able to formulate original ideas and concepts and develop planning and strategies based on them and are able to consistently transform the concept based on multi-layered parameters such as context, program, formal and spatial impact, etc. into a traffic concept or streetscape design within the framework of a structured planning process. In particular, this involves balancing urban planning requirements with traffic planning requirements.
- have the ability to continuously develop and sharpen the original concept as the design progresses and to develop variants from this in the planning process and to be able to compare and evaluate them.
- are able to draw with design confidence on the knowledge they have acquired in the course of their studies about the effects of traffic planning measures, design elements of streetscape design, spatial and programmatic strategies; they are able to apply, modify and further develop these for their own work.
- are able to select and develop the necessary level of detail and appropriate representation and visualization depending on the task, developing their own concise language of presentation in drawing, image and model.
- work in an interdisciplinary manner with other disciplines of planning and develop an understanding of the respective challenges and communication needs.

Content
In the course, a planning task is worked on together with architecture students from the field of urban planning. Students create a data basis for sound planning in the context of urban design. The assignments are usually open-ended and require research and original thinking as the basis for concept development. The applied methods include the analysis of the spatial and thematic context, the development of a traffic planning concept on different scale levels taking into account the spatial, functional and constructive structure depending on the theme and typology. For this purpose, the methods learned in the field of traffic planning, traffic engineering and streetscape design are applied. The communication of the results includes the choice of the appropriate representation technique.

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

Annotation
The design task is carried out in teams of students of master programs Architecture as wellas Mobility and Infrastructure. The module and the associated course can therefore only be offered if a task suitable for interdisciplinary collaboration is available in the respective semester. Therefore, the module can only be offered irregularly. Please inform yourself about the current offer on the website of the Institute of Transportation.

The number of participants in the course is limited to 10 persons. A registration is mandatory. Registration modalities will be published on the institute homepage in due time. If necessary, the places are allocated considering the progress in the students' studies, with priority to students from *Mobility and Infrastructure*. The participation will be confirmed by the end of the first lecture week.

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

- seminar, proofreading sessions, interim presentations, final presentation: 20 h

independent study, depending on selected courses:

- working out the design task in a team: 80 h
- preparing the required deliverables, preparing the final presentation (exam): 80 h

total: 180 h

Recommendation
preliminay taking of the modules City Transport Facilities [bauiM3P6-STRIVA], Models and Methods in Traffic Engineering and Transportation Planning [bauiM3P2-VERMODELL] or Traffic Management and Simulation Methods [bauiM3S03-VERMANAGE]

5.99 Module: Sustainability in Real Estate Management (bauiM4P4-) [M-BGU-100112]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Modules)
Study Focus II / Technology and Management in Construction (Compulsory Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100149	Sustainability in Real Estate Management	6 CR	Lennerts

Competence Certificate
- 'Teilleistung' T-BGU-100149 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can present the essential interrelationships within sustainable construction and operation and understand the importance of multi-criteria analyses. The students analyse current scientific publications in this field independently with the aim of arguing thematically and scientifically in society. They can explain the focus of international real estate sustainability certification systems, describe differences in their assessment methodology and highlight their advantages and disadvantages.

Furthermore, the students can apply selected assessment criteria of the systems presented. The students understand questions of economic and ecological assessment along the life cycle of buildings and can independently carry out life cycle analyses. They can interpret the results of life cycle analyses and to evaluate system limits and calculation parameters in published analyses.

Content

- definition and history of the term sustainability
- study of current peer-reviewed papers
- economic, ecological, and socio-cultural significance of the built environment
- costs and environmental impacts of real estate
- national and international sustainability assessment procedures for real estate
- calculation methods for life cycle costs
- life cycle assessment for buildings
- external costs in building construction and their integration in life cycle costing

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

Annotation
none

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

- Sustainability in Real Estate Management lecture/exercise: 45 h
- Life Cycle Management of Real Estate lecture: 15 h

independent study:

- preparation and follow-up lecture/exercises Sustainability in Real Estate Management: 45 h
- preparation and follow-up lectures Life Cycle Management of Real Estate: 15 h
- examination preparation: 60 h

total: 180 h

Recommendation
courses Facility und Real Estate Management I (6200414), Life Cycle Management (6200615)

M 5.100 Module: Project Management in Construction and Real Estate Industry (bauiM4P5-) [M-BGU-100338]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Modules)
Study Focus II / Technology and Management in Construction (Compulsory Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100622	Project Management in Construction and Real Estate Industry	5 CR	Haghsheno
T-BGU-108011	Student Research Project 'Scheduling and Building Site Facilities'	1 CR	Schneider

Competence Certificate
- 'Teilleistung' T-BGU-108011 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100622 with examination of other type according to § 4 Par. 2 No. 3

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

Prerequisites
none

Competence Goal
Students have basic and in-depth knowledge and skills in project management in the construction and real estate industry.

They know the necessary skills for successful project management according to the ICB4 standard of the International Project Management Association (IPMA) in the areas of context, methods, personality and social issues.

They will be able to apply selected project management content (especially project objectives and determination of requirements, project execution implementation strategies and award procedures, schedule management, cost management and quality management) and transfer project management methods to specific construction projects as part of a project setup.

They are also familiar with the job description of project manager/project controller in the German construction and real estate industry and their corresponding tasks in a construction project.

Furthermore, students will be able to collaborate effectively in teams and to present jointly developed content as a group (to a potential client) in the context of project work.

Content
The focus is on the following areas of action and expertise:

- project objectives and determination of requirements
- project execution implementation strategies and award procedures
- schedule management
- cost management
- quality management

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

Annotation
none

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

- Lecture/exercise: 45 h

independent study:

- preparation and follow-up of lecture/exercises: 30 h
- teamwork: working on the case study, report and presentation of results (part of the examination): 60 h
- preparation of colloquium (part of the examination): 15 h
- preparation of student research project (not graded accomplishment): 30 h

total: 180 h

Recommendation
course 'Project Management' (6200106)

Literature

Ahrens, Hannsjörg; Bastian, Klemens; Muchowski, Lucian (Hrsg.) (2021): Handbuch Projektsteuerung - Baumanagement: Ein praxisorientierter Leitfaden mit zahlreichen Hilfsmitteln und Arbeitsunterlagen, 6. Auflage, Fraunhofer IRB Verlag, Stuttgart

Fewings, Peter; Henjewele, Christian (2019): Construction Project Management – An Integrated Approach, 3. Auflage, Routledge, New York (USA)

GPM Deutsche Gesellschaft für Projektmanagement e. V. (Hrsg.) (2017): Individual Competence Baseline für Projektmanagement (Version 4.0), 1. Auflage, GPM Deutsche Gesellschaft für Projektmanagement e. V., Nürnberg

Haghsheno, Shervin; John, Paul Christian (2024): Bauherrnseitige Projektmanagement-Dienstleistungen in Deutschland, Forschungsbericht, DVP – Deutscher Verband für Projektmanagement in der Bau- und Immobilienwirtschaft e. V.

Huemann, Martina; Turner, J. Rodney (Hrsg.) (2024): The Handbook of Project Management, 6. Auflage, Routledge, New York (USA)

Kochendörfer, Bernd; Liebchen, Jens H.; Viering, Markus G. (2021): Bau-Projekt-Management: Grundlagen und Vorgehensweisen, 5. Auflage, Springer Vieweg, Wiesbaden

Schulz, Markus (2020): Projektmanagement: Zielgerichtet. Effizient. Klar., 2. Auflage, UVK Verlag, Tübingen

M 5.101 Module: Machinery and Process Engineering (bauiM4P6-) [M-BGU-100339]

Responsible: Prof. Dr.-Ing. Sascha Gentes
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Modules)
Study Focus II / Technology and Management in Construction (Compulsory Modules)
Subject-Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-100623	Machinery and Process Engineering	5 CR	Gentes
T-BGU-108012	Student Research Project 'Excavation Pit Development and Shuttering Planning'	1 CR	Schneider

Competence Certificate
- 'Teilleistung' T-BGU-108012 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100623 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
The students can name the basic principles and concepts of machine technology and are able to describe the built and function of construction machinery and equipment. They can appropriately name the equipment and select the suitable machines depending on their building tasks. They understand the BGL system (list of construction equipment) and are able to rank and classify machines and equipment as needed. They will realize optimization potentials using suitable process technology and equipment alternatives. Finally, they will be able to plan and size various construction machines and transport devices with respect to static and dynamic effects and impacts.

Content
This module provides machine technology basics to better understand a broad variety of construction equipment and machinery. Further, static and dynamic effects and impacts of construction equipment application will be discussed, various construction machines introduced, their respective applications compared, and basics for their dimensioning provided. Different construction machines and their variations will be presented with the help of the BGL system. In addition, the functions, variations, effectiveness, and applications for diverse construction and productions procedures used in processing technology, earthworks, underground engineering, and hydraulic engineering will be presented and discussed. The curriculum also includes the necessary technical basics for drive systems, power transmission components (mechanic and hydraulic), undercarriages, as well as steering controls, and safety facilities. In addition to a building site visit for practical insight, a practical course on the institute's own test site will be offered to try out construction machinery. Finally, students need to develop two exercises within the scope of their seminar paper as part of this module.

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

Annotation
none

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

- Construction Equipment lecture: 30 h
- Process Engineering lecture: 30 h

independent study:

- preparation and follow-up lectures Construction Equipment: 20 h
- preparation and follow-up lectures Process Engineering: 20 h
- preparation of student research project: 30 h
- examination preparation: 50 h

total: 180 h

Recommendation
none

Literature
1) Baugeräteliste, aktuelle Fassung
2) Hüster, Felix, Leistungsberechnung der Baumaschinen, Shaker, 5. Aufl., Aachen, 2005.
3) Girmscheid, Gerhard: Leistungsermittlungshandbuch für Baumaschinen und Bauprozesse, Springer Berlin Heidelberg, 2010.
4) Drees, Gerhard; Krauß, Siri: Baumaschinen und Bauverfahren - Einsatzgebiete und Einsatzplanung, expert-Verlag, 3., völlig neu bearb. Aufl., Renningen, 2002.

M 5.102 Module: Production Planning and Control in Construction (bauiM4P7-) [M-BGU-105918]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Modules) (Usage from 4/1/2022)
Study Focus II / Technology and Management in Construction (Compulsory Modules) (Usage from 4/1/2022)
Subject-Specific Supplements (Usage from 4/1/2022)

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

Mandatory			
T-BGU-111901	Production Planning and Control in Construction	5 CR	Haghsheno
T-BGU-108010	Student Research Project 'Cost Estimation in Structural Engineering and Earthworks'	1 CR	Schneider

Competence Certificate
- 'Teilleistung' T-BGU-108010 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-111901 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
The module must not be taken together with the module Economics and Management in Construction [bauiM4P3-] not offered anymore.

Competence Goal
The students can describe the essential technical, business, and organizational tasks of construction management from the order to acceptance and can analyze and evaluate the individual work steps. They can describe the fundamental processes of construction site planning and handling and assign suitable methods and tasks. Besides, they can design production systems for selected products from the construction industry and apply various techniques and methods for resource and logistics planning. Furthermore, the students can name the essential accident prevention regulations and can describe the active and passive protection measures as well as the organization of the labor protection. In addition, the students can develop approaches to solutions in the area of occupational safety on the basis of problem situations.

The students can explain the different methods of calculation and the structure of a calculation. They have the knowledge to create tenders and unit prices independently. Furthermore, students can apply current software for the calculation. Furthermore, the course clarifies, how to create, justify and calculate claims based on the VOB/B by using practical examples.

Students can explain the construction contract laws as well as the difference between BGB and VOB. Furthermore, students can explain the different types of procuration. The students are familiar with legal thinking regarding contract and employment law and can apply the basics to construction projects. Thereby, they can assess and evaluate the contents of a construction contract.

Content
The course site management presents the work of foreman, site manager, and project manager and contains significant aspects of management processes of the construction site. In addition to performance reporting, work costing and site management, the technical, legal and economic tasks of the site manager as well as communication and correspondence on the construction site will be highlighted. In addition, accident prevention regulations, active and passive protection measures as well as the organization of the labor protection during operation and on site are discussed.

The area of construction site planning and handling deals in more detail with various production systems and factors from the construction industry. Based on this, resource planning for the management of a construction site is dealt with in more detail. In addition to the resources of financial resources, machines and employees, logistics planning is also dealt with in more detail. In the context of resource planning, in-depth insights into costing are given and the topic of claim management, which deals with the handling of supplements, is also dealt with in particular. In the area of construction law, topics relating to the construction contract are dealt with. In addition, the areas of obstructions, liability and limitation periods are also addressed.

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

Annotation
none

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

- Site Management lecture: 15 h
- Site Planning and Handling lecture/exercise: 45 h

independent study:

- preparation and follow-up lectures Site Management: 15 h
- preparation and follow-up lecture/exercises Site Planning and Handling: 30 h
- preparation of student research project: 30 h
- examination preparation: 45 h

total: 180 h

Recommendation
none

Literature
Elwert, Ulrich, Flassak, Alexander: Nachtragsmanagement in der Baupraxis - Grundlagen, Beispiele, Anwendung, Vieweg, 2., erw. und aktualisierte Aufl., Wiesbaden, 2008.

Berner, Fritz; Kochendörfer, Bernd; Schach, Rainer: Grundlagen der Baubetriebslehre 2 Baubetriebsplanung, Imprint: Springer Vieweg, Wiesbaden, 2013

Hofstadler, Christian: Bauablaufplanung und Logistik im Baubetrieb, Springer, Berlin, 2007

Schach, Rainer; Otto, Jens: Baustelleneinrichtung Grundlagen – Planung – Praxishinweise – Vorschriften und Regeln, Springer Fachmedien Wiesbaden GmbH, Wiesbaden, 2017

Drees, Gerhard; Paul, Wolfgang: Kalkulation von Baupreisen, Beuth Verlag GmbH, Berlin, 2015

Hauptverband d. Deutschen Bauindustrie/Zentralverband d. Deutschen Baugewerbes: Kosten-, Leistungs- und Ergebnisrechnung der Bauunternehmen, Rudolf Müller GmbH & Co. KG, Köln, 2016

M 5.103 Module: Environmentally-friendly Recycling and Disassembly of Buildings (bauiM4S06-) [M-BGU-100110]

Responsible: Prof. Dr.-Ing. Sascha Gentes

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

Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100146	Environmentally-Friendly Recycling and Disassembly of Buildings	6 CR	Gentes

Competence Certificate
- 'Teilleistung' T-BGU-100146 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can independently plan demolition, dismantling and disposal work for structural and technical systems, apply for them and implement them on site. They recognize the need and the sense of qualified demolition and the associated recycling related to the entire construction operation. They can explain various methods and procedures for implementation and realization. The students can assess demolition objects and demolition waste according to the current legal situation, implement safety requirements for demolition work and write risk assessments. They are able to evaluate recycling and disposal options and thus independently plan the necessary resources for demolition work (personnel, machines, processes) and create corresponding calculations.

Content
Information about the state of research and technology with respect to machined disassembly, transport, conditioning, dumping, and disposal of demolition waste, as well as the latest developments in machine technology is imparted. The entire approval process from the demolition license application to machine deployment plans will be discussed in addition to technical aspects. This also involves occupational safety, immission control, as well as handling pollutants in buildings to be demolished. Specific tasks, e.g. the partial demolition of existing buildings, will be explained and calculated using existing examples. VDI (The Association of German Engineers) guidelines pertaining to demolition projects will be introduced and an excursion to a recycling facility will provide the opportunity to discuss landfill directives.

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

Annotation
none

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

- Project Studies lecture, exercise: 30 h
- Disassembly Process Engineering lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Project Studies: 30 h
- preparation and follow-up lectures, exercises Disassembly Process Engineering: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

Literature

1) Seemann, Axel: Entwicklung integrierter Rückbau- und Recyclingkonzepte für Gebäude - ein Ansatz zur Kopplung von Demontage, Sortierung und Aufbereitung, Shaker, Aachen, 2003.
2) RAL, Deutsches Institut für Gütesicherung und Kennzeichnung e.V.: Ausbau und Entsorgung von Gefahrstoffen in Bauwerken - Gütesicherung, Beuth, Ausg. Juni 2004, Berlin, 2004.
3) Schröder, Marcel [Red.]: Abbrucharbeiten - Grundlagen, Vorbereitung, Durchführung, Müller, 3., aktualisierte und erw. Aufl., Köln, 2015.
4) VDI 6202 "Schadstoffsanierung"
5) VDI 6210 "Abbruch"

M 5.104 Module: Upgrading of Existing Buildings and Energetic Refurbishment (bauiM4S07-) [M-BGU-100108]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules)
Subject-Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-100621	Term Paper Upgrading of Existing Buildings and Energetic Refurbishment	1,5 CR	Lennerts
T-BGU-108001	Upgrading of Existing Buildings and Energetic Refurbishment	4,5 CR	Lennerts

Competence Certificate
- 'Teilleistung' T-BGU-100621 with examination of pther type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-108001 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
Students understand the economic, ecological and cultural significance of the building stock and to describe the specific tasks for a civil engineer in this field of activity. You can explain the advantages and disadvantages of different maintenance strategies and maintenance budgets can be calculated for real estate stocks. You know the basics of a technical due diligence and the basics of building information modeling. In addition, students may constitute the legal framework for energy rehabilitation measures and can use the methods of the energy performance of buildings apply.

Content

- durability and wear of components
- determination of component lifetimes
- budgeting of maintenance costs
- condition assessment & action planning
- monument and Historic Monuments
- building Information Modeling (BIM)
- policy development and historical development of the energy savings
- forms of energy and calculation of energy use
- energy efficiency of buildings by Energy Saving Ordinance
- renewables

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

Annotation
none

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

- Upgrading of Existing Buildings lecture, exercise: 45 h
- Energetic Refurbishment lecture: 15 h

independent study:

- preparation and follow-up lectures/exercises Upgrading of Existing Buildings: 30 h
- preparation and follow-up lectures Energetic Refurbishment: 15 h
- preparation of term paper (partial examination): 25 h
- examination preparation (partial examination): 50 h

total: 180 h

Recommendation
none

5.105 Module: Real Estate Management (bauiM4S08-) [M-BGU-100346]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100629	Real Estate Management	6 CR	Lennerts

Competence Certificate
- 'Teilleistung' T-BGU-100629 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students can distinguish between the prevailing real estate investment alternatives and apply the common controlling instruments in real estate management. They can evaluate real estate by means of different valuation methods and to prepare expert opinions. Furthermore, they can explain the basic features and specifics of real estate management in the public sector and the management of corporate real estate. Furthermore, they have knowledge of the decision-making bases and the implementation of public-private partnership projects and can clarify the benefits and limits of this procurement alternative. Furthermore, the students gain insight into the project development of real estate based on theoretical principles and case studies from practice and are put in a position to solve problems in project development.

Content

- controlling in real estate management
- valuation of real estate with the preparation of expert opinions
- special features in the management of corporate real estate
- special features in the real estate management of the public sector
- contract models and financing structures in PPP projects
- theoretical transfer and case studies from practice in the field of project development of real estate

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

Annotation
none

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

- Real Estate Management Controlling lecture: 15 h
- Property Valuation Basics lecture: 15 h
- Corporate and Public Real Estate Management lecture: 15 h
- Project Development with Case Study lecture: 15 h

independent study:

- preparation and follow-up lectures Real Estate Management Controlling: 15 h
- preparation and follow-up lectures Property Valuation Basics: 15 h
- preparation and follow-up lectures Corporate and Public Real Estate Management: 15 h
- preparation and follow-up lectures Project Development with Case Study: 15 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

5.106 Module: Lean Construction (bauiM4S09-) [M-BGU-100104]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno

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

Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules)
Subject-Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-101007	Project Paper Lean Construction	1,5 CR	Haghsheno
T-BGU-108000	Lean Construction	4,5 CR	Haghsheno

Competence Certificate
- 'Teilleistung' T-BGU-101007 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-108000 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
The students are able to explain the theoretical basics of Lean Construction. They are able to choose the right process management approach for a project and to adapt and improve it during the project. Furthermore, students will be able to identify and analyze problems in construction projects from a process perspective. The students are able to explain the different tools of Lean Construction and select, combine and apply them according to the problem.

Content
In this module, the theoretical basics of Lean Construction are presented at the beginning and deepened through learning simulations and exercises. Subsequently, the Last Planner System™, value stream mapping and cooperative contract forms, among others, are examined in depth. Aspects such as construction site logistics, cost and quality management and planning management from a lean perspective. In the exercise, students work in small groups on selected topics based on provided literature and analyze them in the context of the knowledge from the lecture. The results of the small group work are compiled in a written paper and presented at the end of the lecture. To consolidate and reflect on the learning objective, a joint follow-up of the small group work will take place, in which the individual works will be placed in an overall context.

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

Annotation
none

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- preparation of project with report (partial exam): 30 h
- examination preparation (partial exam): 60 h

total: 180 h

Recommendation
none

Literature

Gehbauer, F. (2013) *Lean Management Im Bauwesen*. Skript des Instituts für Technologie und Management im Baubetrieb, Karlsruher Institut für Technologie (KIT).

Liker, J. & Meier, D. (2007) *Praxisbuch, der Toyota Weg: für jedes Unternehmen*. Finanzbuch Verlag.

Rother, M., Shook, J., & Wiegand, B. (2006). *Sehen lernen: mit Wertstromdesign die Wertschöpfung erhöhen und Verschwendung beseitigen*. Lean Management Institut.

M 5.107 Module: Advanced Studies in Construction Engineering (bauiM4S10-) [M-BGU-100344]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-108003	Advanced Studies in Construction Engineering	6 CR	Haghsheno

Competence Certificate
- 'Teilleistung' T-BGU-108003 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students are able to identify terms and modes of operations of specific construction equipment, combination of devices and special procedural systems in the subject areas earthwork and special underground engineering. They are able to understand and evaluate complex combinations of methods and processes with civil engineering works. Adding to this, they can identify the influence of outside influences to the selected devices and output-tool efficiency. Moreover, the students can amplify fundamental construction methods and construction designs of tunnels and galleries including the corresponding machines and devices as much as basic knowledge in blasting engineering.

Content
Earthwork and Underground Construction:

special equipment features and options of devices, mode of operation of the single devices and systems; process engineering of earthworks while mining, transportation, placing and compacting; influences on efficiency; soil improvement; quality control; transport and controls of devices and equipment; methods of underground construction, including special temporary pit supporting systems and foundations; underground improvements; injections; underpinning; tunneling; caisson construction; freezing of soil; quay walls; harbor constructions; statics of floating systems; support devices.

Tunnels and Blasting Engineering:

geological, rock mechanical and geotechnical parameters for underground constructions (tunnels and galleries, caves, etc.); project-related, process-related, and environmental influences; Machines and devices; special methods and advancements; selection criteria for proper tunnel methods; blasting engineering; explosive substances and blasting techniques; basic legal knowledge for blasting; study trip relating to blasting engineering.

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

Annotation
none

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

- Tunnel Construction and Blasting Engineering lecture: 30 h
- Operation Methods for Foundation and Marine Construction lecture: 15 h
- Operation Methods for Earthmoving lecture: 15 h

independent study:

- preparation and follow-up lectures Tunnel Construction and Blasting Engineering: 30 h
- preparation and follow-up lectures Operation Methods for Foundation and Marine Construction: 15 h
- preparation and follow-up lectures Operation Methods for Earthmoving: 15 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

5.108 Module: Decommissioning of Nuclear Facilities (bauiM4S12-) [M-BGU-100345]

Responsible: Prof. Dr.-Ing. Sascha Gentes
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100627	Decommissioning of Nuclear Facilities	6 CR	Gentes

Competence Certificate
- 'Teilleistung' T-BGU-100627 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can name the processes, equipments and machinery for decommissioning nuclear facilities. They can explain analytical methods for the procedure, the required techniques and processes for decommissioningand can develop decommissioning concepts. They are able to analyse self-reliantly decommissioning projects of nuclear facilities and to work in teams. They can prepare proposal for approval considereing the respective laws.

Content
This course provides an overview about the state of research and technology in mechanical process engineering for the decommissioning of nuclear facilities. This involves decontamination procedures, remote-handled procedures, and procedures for the separation of reinforced concrete, etc.

The required approvals and licenses and the involved authorities will be introduced and discussed using examples and legal sources, e.g. the German Atomic Energy Act (Atomgesetz). The basics of radiation protection together with the pertaining measurement technology will be explained in step with actual practice. Furthermore, a suitable system to successfully manage decommissioning projects will be presented as well as the numerous stakeholders involved.

A visit to a nuclear facility currently under decommissioning is part of the course. The new findings will be further discussed in conjunction with existing decommissioning projects which will also be presented by the involved industry partners.

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

Annotation
none

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

- Removal and Decontamination of Nuclear Facilities lecture, exercise: 30 h
- New Development and Optimization of Decommissioning Machine Technology lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Removal and Decontamination of Nuclear Facilities: 30 h
- preparation and follow-up lectures, exercises New Development and Optimization of Decommissioning Machine Technology: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

Literature

1) Kohli, Rajiv [Hrsg.]: Developments in surface contamination and cleaning - fundamentals and applied aspects, Knovel library, USA, 2008.
2) Rahman, A.: Decommissioning and radioactive waste management, Whittles, Dunbeath, 2008.
3) Thierfeldt, S.; Schartmann,F.: Stillegung und Rückbau kerntechnischer Anlagen - Erfahrungen und Perspektiven, 4. Neu bearbeitete Auflage, Brenk Systemplanung Aachen, 2012.
4) Zeiher, Marco: Ein Entscheidungsunterstützungsmodell für den Rückbau massiver Betonstrukturen in kerntechnischen Anlagen, Karlsruhe, Univ., Diss., 2009.
5) Fortschrittsbericht über den Stand der BMBF – Stilllegungsprojekte und der vom BMBF geförderten FuE-Arbeiten zu 'Stilllegung / Rückbau kerntechnischer Anlagen'

M 5.109 Module: Building Information Modeling (BIM) (bauiM4S16-) [M-BGU-103916]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-108007	Building Information Modeling (BIM)	6 CR	Haghsheno

Competence Certificate
- 'Teilleistung' T-BGU-108007 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can describe the BIM method and the theoretical foundations of different perspectives of building digitalisation. Furthermore, they can apply CAD in practice in the construction industry and carry out modelling steps and link the modelled components with further information themselves. The students can present the different interests of the project participants within the framework of BIM and assess the perspectives of different project participants in a construction project. Thus, they are able to work in a team on planning and construction processes with different project participants.

Content
"Building Information Modelling (BIM) is a collaborative working methodology that uses digital models of a building to consistently capture and manage the information and data relevant to its life cycle and to exchange them in transparent communication between the parties involved or to transfer them for further processing" [2]. The module deals with the historical development of the method and provides the theoretical foundations necessary for understanding and applying BIM. Further application possibilities such as linking the building model with production planning and ERP systems or in the area of virtual building simulation are demonstrated. In addition, a project is modelled throughout several process phases in the context of group work, taking into account the goals of various participants. Since the creation of a three-dimensional building model is an essential prerequisite for the application of BIM, an introduction to CAD is provided as part of this module. In addition, CAD exercises are offered for practical application.

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

Annotation
For participation, it is necessary to have access to a notebook with a Windows operating system (64bit). The required software will be provided as student versions during the course.

registration procedure:

The number of participants is limited to 50 persons. Registration details will be published in advance on the institute's homepage. If necessary, a selection will be made taking into account the student's progress primarily students in Civil Engineering and Technology and Management in Construction. Confirmation of participation will be issued by the end of the first week of lectures.

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises, tutorials: 60 h
- project work, preparation of report and presentation (exam): 60 h

total: 180 h

Recommendation

course Computer Aided Design (CAD) (6200520)

topic 'Cost Estimation' in the course Economics in Construction Operation (6200412) from the module Technology and Management in Construction [bauiBFP6-TMB]

course Site Planning and Handling (6241803) from the module Production Planning and Control in Construction [bauiM4P7-]

Literature

[1] Borrmann, André; Köni, Markus; Koch, Christian; Beetz, Jakob; König, Markus (Hg.) (2015): Building information modeling // Building Information Modeling. Technologische Grundlagen und industrielle Praxis. Wiesbaden: Springer Vieweg (VDI-Buch).
[2] Bundesministerium für Verkehr und digitale Infrastruktur (Hg.) (2015): Stufenplan Digitales Planen und Bauen. Einführung moderner, IT-gestützter Prozesse und Technologien bei Planung, Bau und Betrieb von Bauwerken.
[3] Hausknecht, Kerstin; Liebich, Thomas (2016): BIM-Kompendium. Building Information Modeling als neue Planungsmethode. Stuttgart: Fraunhofer IRB Verlag.

5.110 Module: Research Seminar Construction Management (bauiM4S17-) [M-BGU-103917]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-108008	Research Seminar Construction Management	6 CR	Haghsheno

Competence Certificate
- 'Teilleistung' T-BGU-108008 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can name the principles of the theory of science and different research methods and can apply them self-reliantly to scientific problems in the context of construction management. They are able to prepare self-reliantly scientific papers.

Content

- theory of science
- research methods in context of research questions in construction management
- basics for scientific working
- structure, form and style of scientific papers
- application at example of specific and current research questions in the field of construction management
- intermediate and final presentations of current research with discussion
- semester accomanying seminar paper

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

Annotation
The module can be started with in the summer and in the winter semester as well. The courses of the module do not depend on each other and can be taken in arbitrary order.

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

- Research Seminar Construction Management I: 30 h
- Research Seminar Construction Management II: 30 h

independent study:

- preparation and follow-up Research Seminar Construction Management I: 30 h
- preparation and follow-up Research Seminar Construction Management II: 30 h
- project work, preparation of report and colloquium (exam): 60 h

total: 180 h

Recommendation
none

5.111 Module: Equipment and Special Construction Techniques in Building Practice (bauiM4S18-) [M-BGU-103918]

Responsible: Prof. Dr.-Ing. Sascha Gentes
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-108009	Equipment and Special Construction Techniques in Building Practice	6 CR	Gentes

Competence Certificate
- 'Teilleistung' T-BGU-108009 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can name the basic concepts of the presented construction equipment and special construction processes and are able to describe the structure and function of the devices and the procedures. Furthermore, they are able to assess the respective use of devices and processes and they know the current status of Technology of the treated areas.

Content
In this module, construction management basics of practical topics for work preparation and construction are taught. Various devices and special processes from different areas of construction, from formwork to construction and test methods, are presented and explained, especially with regard to innovative new features.

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

Annotation
none

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

- Equipment and specific Methods in Construction I lecture: 30 h
- Equipment and specific Methods in Construction II lecture: 30 h

independent study:

- preparation and follow-up lectures Equipment and specific Methods in Construction I: 30 h
- preparation and follow-up lectures Equipment and specific Methods in Construction II: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

5.112 Module: Digitalization in Facility and Real Estate Management (bauiM4S19-) [M-BGU-104348]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-108941	Digitalization in Facility and Real Estate Management	6 CR	Lennerts

Competence Certificate
- 'Teilleistung' T-BGU-108941 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students will acquire basic knowledge of sensor networks, building automation and the application of the 'Internet of Things' (IoT) in facility and real estate management. They will be able to take a critical look of the technologies of digitization (including network structures, cloud storage, sensor distribution, information privacy, augmented reality) and evaluate them according to the requirements of facility and real estate management. In addition, students will be able to implement simple sensor networks and the basics of 'augmented reality' by using a HoloLens.

Content

- Basic information of concepts of digitalization
- Execute Internet of Things in building automation
- Integration of sensor signals in FM processes
- Visualize of maintenance and inspection work through 'augmented reality' (HoloLens)
- Producing project work during the semester colloquium

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

Annotation
none

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

- Digitalization in Facility and Real Estate Management lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises Digitalization in Facility and Real Estate Management: 40 h
- preparation of project Digitalization in Facility and Real Estate Management, incl. report and presentation (examination): 80 h

total: 180 h

Recommendation
none

5.113 Module: Digital Technologies in Field Information Modeling (bauiM4S20-) [M-BGU-105638]

Responsible: Jun.-Prof. Dr. Reza Maalek

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

Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2021)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2021)
Subject-Specific Supplements (Usage from 4/1/2021)

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

Mandatory			
T-BGU-111276	Digital Technologies in Field Information Modeling	6 CR	Maalek

Competence Certificate
- 'Teilleistung' T-BGU-111276 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
This course discusses the practical methods to digitally document, model, store, and share required spatial and temporal information throughout the construction project's lifecycle. Students will get familiarized with the different state-of-the-art remote sensing technologies applicable to automating the collection of field construction information. The students will be able to use technologies, such as laser scanners, to automate construction engineering and management processes, including, progress monitoring, quality control, structural integrity assessment, and safety management. Students will be provided with the practical strategies and tools necessary to analyze the acquired field information to promote the seamless transfer of information between the real and digital worlds. These technologies and methodologies will allow the students to apply the domain of field information modeling (FIM) in practical settings.

Content
Construction project information modeling frameworks, such as building information modeling (BIM), heritage building information modeling (H-BIM), or bridge information modeling (BrIM), involve modeling and integrating intelligent and semantic information within multi-dimensional (n-D) computer-aided design (CAD) models. During the design stages, the 3-dimensional (3D) digital model of a construction project can be created, whereby each element is classified based on attributes such as functional type (e.g. structural wall), elemental relationships (e.g. structural wall and floor slab connectivity and interaction), and geometric properties (e.g. shape and size). Further modeling can be carried out so as to integrate project planning and control information, such as work sequences and duration (e.g. 4D BIM), as well as cost (e.g. 5D BIM), enabling the project management team to directly evaluate the impact of design changes on the project's schedule and cost. During construction, the designed n-D model serves as a detailed baseline to aid field construction work. Relevant field data must then be collected and compared to the designed model to ensure compliance. Particularly within the lean project delivery, recording fast, frequent, and reliable field data is desired to foster continual improvement. In the context of schedule and cost control for instance, daily measurement of percent planned complete, recommended as a part of the Last Planner® system, combined with frequent earned value analysis, require up-to-date knowledge of the progress of activities. Hence, Field Information Modeling (FIM) is essential to model and transform collected field data into intelligent, tangible and semantic digital models as a means of promoting the seamless flow of information between the field and the digital worlds. This course is designed to provide the learners with the tools necessary to understand the concept of FIM, the cutting-edge technologies that can be used to foster the FIM process, and methods to fully automate the FIM process along with the challenges, limitations and future progressions.

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises, tutorials: 60 h
- project work, preparation of report and presentation (examination): 60 h

total: 180 h

Recommendation
module Digital Engineering and Construction [bauiM4S21]

M 5.114 Module: Digital Engineering and Construction (bauiM4S21-) [M-BGU-105830]

Responsible: Jun.-Prof. Dr. Reza Maalek

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

Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 10/1/2021)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 10/1/2021)
Subject-Specific Supplements (Usage from 10/1/2021)

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

Mandatory			
T-BGU-111695	Digital Engineering and Construction	6 CR	Maalek

Competence Certificate
- 'Teilleistung' T-BGU-111604 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
Students will be able to describe the main digital technologies for the engineering design process throughout the lifecycle of construction projects. They can explain the role of the practical applications of these technologies within the engineering design process of a real project. They are also able to apply some selected basic principles of these technologies in practical settings in the context of lab assignments.

Content
Recent advancements in digital and remote sensing technologies in construction engineering and management is paving the path to the conception of industry 4.0 in construction (construction 4.0). A full digitization and automation of the construction industry is projected to produce annual cost savings of around € 1.3 trillion globally compared to current practices according to the most reliable sources (e.g., World Economic forum). The full digitization and automation must start from the early design stages of the project and continue throughout the construction, facility management and operations, and dismantling phases. The advancements in digital technologies now enables large scale 3D visualization, 4D and 5D simulation, design enhancements and optimizations, which were amiss in traditional design practices. The growth in information technologies has enabled the addition of intelligence through information modeling concepts onto a single model, which can then be utilized for further engineering analysis (e.g., solar, wind, structural), design optimization, and clash detection, particularly in larger projects. With the introduction of virtual reality tools, project stakeholders can now virtually walk through the project (e.g., a building) before it is built, which can reduce the possibility of change orders due to misunderstanding of design requirements. To further enhance communication between the construction labourers and the digital design, augmented and mix reality has been showing potential. This can further mitigate the risk of incorrect construction, saving time and cost of rework due to miscommunication of expectations. Another possibility is robotics and additive manufacturing, which can further help mitigate the risk of information loss between the digital and real worlds. Finally, to ensure the built complies with the design in terms of design standards and requirements, field information, such as 3D point clouds using laser scanners or smartphones, and non-destructive testing (NDT) methods can be performed so as to determine the discrepancies early on and prevent costly rework when the degree of influence on the project becomes less. This course is designed to provide the learners with the tools necessary to understand the digital engineering and construction framework, and the cutting-edge technologies used to foster construction automation, along with the challenges, limitations and future progressions.

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

Annotation
none

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

- lecture/lab assignment: 60 h

independent study:

- preparation and follow-up lecture/lab assignments: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
modules Building Information Modeling (BIM) [bauiM4S16-], Digital Planning and Building Information Modeling [bauiM1S42-DIGIPLAN]

course Computer Aided Design (CAD) (6200520)

5.115 Module: Leadership and Communication (bauiM4S22-) [M-BGU-105917]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno

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

Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Subject-Specific Supplements (Usage from 4/1/2022)

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

Mandatory			
T-BGU-111900	Leadership and Communication	6 CR	Haghsheno

Competence Certificate
- 'Teilleistung' T-BGU-111900 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
The module must not be taken together with the module Business and Human Resource Management [bauiM4S01-] not offered anymore.

Competence Goal
Students are taught how to explain the basics of leadership. They are able to classify leadership in the business management functions. They will also be able to list, describe and differentiate between various organizational and legal forms of companies. In the area of strategic planning, they can recognize types of strategy in construction companies and analyze their implementation. In the context of labor law, students will be able to define the concept of employee and distinguish it from self-employment. They are aware of the essential elements of a legally compliant admonition, warning and termination and are able to draft these writings.

The students are furthermore able to describe different communication models and to apply different communication techniques. They can explain the important basics from the topic area of public participation and know the associated concepts and methods. Furthermore, they are able to describe the components of conflict management systems and know about the role of communication in the context of conflict prevention as well as conflict resolution and are sensitized to the stages of conflict escalation. They also know methods of conflict resolution and can explain the concept of mediation in particular.

Content
In the area of management, generic strategies for construction companies and their implementation in the context of organizational structures and legal forms are taught. The procedures and processes for developing a corporate strategy and its implementation are explained. Furthermore, leadership principles as well as tasks and tools in the context of leadership are taught. The fundamentals and methods of personnel management, including determining personnel requirements, development, recruitment and motivation, are dealt with and illustrated by means of an example. In addition, the basics of labor law are taught with a focus on personnel management and personnel responsibility.

In the area of communication, communication models and communication techniques are presented and their application is tested with the help of a group exercise. As an example of communication in the context of construction projects, the topic of public participation is dealt with. In addition to the theoretical basics, a practical example will be presented. Furthermore, the topic of communication in conflict situations will be discussed with the aspects of conflict prevention, escalation and resolution. Furthermore, methods of conflict resolution are presented with a focus on the concept of mediation.

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
keine

5.116 Module: Real Estate and Facility Management - on Site Lectures (bauiM4S23-) [M-BGU-105924]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Subject-Specific Supplements (Usage from 4/1/2022)

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

Mandatory			
T-BGU-111909	Real Estate and Facility Management - on Site Lectures	6 CR	Lennerts

Competence Certificate
- 'Teilleistung' T-BGU-111909 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
The modules Real Estate Management [bauiM4S08-] and Facility Management [bauiM4S24-] must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-100346 - Real Estate Management must have been passed.
2. The module M-BGU-105922 - Facility Management must have been passed.

Competence Goal
The students can work independently on questions from real estate-related practice (research or application-oriented) using scientific methods and structure a given problem and present the results orally. They can select and apply methods and instruments appropriate to the problem in a well-founded manner. The students can work out the 'state-of-the-art' of a problem and a procedure for the solutions of the practical cases, to critically question and, if necessary, to adapt as well as to discard the previously worked out solution results accordingly and to derive new ones.

Content

- systematic evaluation, practice and application of scientific methods in the context of real estate-related practice
- specifying research objectives and conducting literature research
- drafting and elaboration of a research design
- derivation of scientifically based decisions for real estate-related practice
- written summary of the project work with colloquium

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 40 h
- work on student project incl. report and presentation/colloquium: 80 h

total: 180 h

Recommendation
none

M 5.117 Module: Facility Management (bauiM4S24-) [M-BGU-105922]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts

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

Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Subject-Specific Supplements (Usage from 4/1/2022)

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

Mandatory			
T-BGU-111908	Facility Management	6 CR	Lennerts

Competence Certificate
- 'Teilleistung' T-BGU-111908 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can name the term as well as the goals and tasks of FM and explain and differentiate the structures and work areas of commercial, infrastructural, and technical FM.

The students can classify and communicate risks for owners and operators of facilities and assign the operator responsibility to different actors. They can recognise, assess, and communicate potential legal consequences.

Furthermore, the students can name the basics of the concepts in maintenance management in general as well as in the areas of construction and maintenance.

The students can also apply the central standards, guidelines and laws of space management, measure and evaluate space utilisation costs and assess potentials for space optimisation in companies.

Content

- introduction to commercial, infrastructural, and technical FM
- maintenance management
- space management
- resources management
- operator responsibility
- interdisciplinary tasks in FM

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

5.118 Module: Technology and Production Methods in Turnkey Construction and Civil Engineering Works (bauiM4S25-) [M-BGU-105913]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno

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

Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Subject-Specific Supplements (Usage from 4/1/2022)

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

Mandatory			
T-BGU-111899	Technology and Production Methods in Turnkey Construction and Civil Engineering Works	6 CR	Haghsheno

Competence Certificate
- 'Teilleistung' T-BGU-111899 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
The module must not be taken together with the module Turnkey Construction [bauiM4S15-] not offered anymore.

Competence Goal
The students are able to describe and apply fundamental process and production methods, especially regarding to technical building services. Moreover, they are able to amplify fundamental processes in the subject area of turnkey construction and to analyze correspondent contexts and workflows.

Adding to this, the students are able to amplify essential elements of selected civil engineering structures and, regarding to this, comprehend typical production methods. Furthermore, the students are able to choose, amplify and analyze appropriate production methods for civil engineering structures.

Content
In the subject area of turnkey construction besides the detailed design of shell construction, technical support and technical building services, there is also an explanation of the related basic knowledge in engineering. Also, basics of the technical support belong to the curriculum, e.g., heating installations, ventilation systems, A/C, electric installations. Most of all, there is a focus on regenerative energies. Furthermore, the explanation of the processes in turnkey construction, from design and construction permit to final acceptance of work, is part of the lecture.

In the subject area of civil engineering structures and regenerative energies, besides basic knowledge in construction, there is also a focus on production methods for the construction and maintenance of the selected civil engineering structures. Adding to conventional construction methods there are topics like additive manufacturing in solid construction. This also includes the view on hydraulic constructions (e.g. water locks), waste disposal (e.g. waste disposal sites) and infrastructure constructions (e.g. steel composite bridge). Also, there is a focus on regenerative energies (e.g. wind power stations).

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

Annotation
none

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

- Turnkey Construction lecture/exercise: 30 h
- Civil Engineering Structures and Regenerative Energies lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Turnkey Construction: 30 h
- preparation and follow-up lecture/exercises Civil Engineering Structures and Regenerative Energies: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

Literature

Bundesamt für Justiz (Hg.) (2020): Verordnung über die Honorare für Architekten- und Ingenieurleistungen (Honorarordnung für Architekten und Ingenieure - HOAI), Anlage 12

Patt, H; Speerli, J.; Gonsowski, P. (2021): Wasserbau. Grundlagen, Gestaltung von wasserbaulichen Bauwerken und Anlagen. Wiesbaden: Springer Fachmedien.

Bilitewski, B.; Härdtle, G. (2013): Abfallwirtschaft. Handbuch für Praxis und Lehre. Berlin/Heidelberg: Springer-Verlag.

Petzek, E.; Bancila, R. (2015): Economical Bridge Solutions based on innovative composite dowels and integrated abutments. Wiesbaden: Springer Fachmedien.

Hau, W. (2014): Windkraftanlagen. Grundlagen – Technik – Einsatz – Wirtschaftlichkeit. Berlin/Heidelberg: Springer-Verlag.

M 5.119 Module: Lean Integrated Project Delivery (Lean IPD) (bauiM4S26-) [M-BGU-105925]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Subject-Specific Supplements (Usage from 4/1/2022)

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

Mandatory			
T-BGU-111911	Project Lean Integrated Project Delivery	3 CR	Haghsheno
T-BGU-111910	Lean Integrated Project Delivery	3 CR	Haghsheno

Competence Certificate
- 'Teilleistung' T-BGU-111911 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-111910 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
Students will be able to describe the basic approaches of Integrated Project Delivery (IPD) and its international models (IPD, Alliancing, Project Partnering) and to explain the associated functionalities and elements (values, culture, organization, economics, methods, and legal characteristics of a multi-party contract). In particular, they are able to analyze the interrelationships between IPD and lean management approaches and to present them from different perspectives. In addition, students will be able to apply appropriate Lean methods using practical examples for the development, planning and execution phases of construction projects, which are essential for the success of IPD projects (including Conditions of Satisfaction, Target Value Design, Set based Design, Choosing by Advantages).

Content
The following content will be covered in this module:

- challenges of traditional project delivery models in the construction industry
- basics of Integrated Project Delivery as an innovative approach, incl. the development in the international context
- development of IPD in Germany
- characteristics and model elements of IPD
- phase model of Integrated Project Delivery
- specifics of multi-party contracts and the selection process of project partners
- IPD from the perspective of lean management philosophy
- selected Lean methods with special relevance for IPD projects (Conditions of Satisfaction, Target Value Design, Set based Design, Choosing by Advantages)

In the context of a case study, the contents of an IPD project are worked on by teams. The results of the case study are documented in the form of a report and presented by the students at the end of the module.

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

Annotation
The module set-up follows the 'flipped classroom' approach. This means that after a short common introduction the case study is to be prepared by team work. At selected dates events (meetings, interim presentations etc.) in the plenum are arranged.

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

- lecture/exercise: 45 h

independent study:

- preparation and follow-up lecture/exercises: 45 h
- case study as team work, preparation of report and presentation (partial examination): 45 h
- examination preparation (partial examination): 45 h

total: 180 h

Recommendation
module Lean Construction [bauiM4S09-]

Literature
AIA California Council (2014): Integrated Project Delivery: an Updated. American Institute of Architects.

Allison, M.; Ashcarft, H.; Cheng, R.; Klawens, S.; Pease, J. (2018): Integrated Project Delivery - An Action Guide for Leaders.

Ashcraft, H. (2011): IPD Teams: Creation, Organization and Management.

Breyer, W. (2017): Partnering Modelle - ein internationaler Vergleich. In: Planen, Errichten und Betreiben. Digitalisierung im Bau. 4. Internationaler BBB-Kongress. Hrsg. von Fritz Berner. BBB Professoren. Stuttgart: Institut für Baubetriebslehre, Universität Stuttgart, S. 163–177.

Fiedler, M. (2018): Lean Construction – Das Managementhandbuch – Agile Methoden und Lean Management im Bauwesen. Springer, Berlin, Heidelberg.

Fischer, M.; Khanzode, A.; Reed, D.; Ashcraft, H. W. (2017): Integrated Project Delivery. John Wiley & Sons, Somerset.

Haghsheno, S.; Baier, C.; Schilling Miguel, A.; Talmon, P.; Budau, M. (2020): Integrated Project Delivery (IPD) – Ein neues Projektabwicklungsmodell für komplexe Bauvorhaben. In: Bauwirtschaft, 5 (2), 80–93

Heidemann, A. (2011): Kooperative Projektabwicklung im Bauwesen unter der Berücksichtigung von Lean-Prinzipien - Entwicklung eines Lean- Projektabwicklungssystems. Internationale Untersuchungen im Hinblick auf die Umsetzung und Anwendbarkeit in Deutschland”. Karlsruhe: Universität Karlsruhe. ISBN: 978-3-86644-583-3.

Lahdenperä, P. (2012): Making sense of the multi-party contractual arrangements of project partnering, project alliancing and integrated project delivery. In: Construction Management and Economics 30, S. 57–79.

Schlabach, C. (2013): Untersuchungen zum Transfer der australischen Projektabwicklungsform Project Alliancing auf den deutschen Hochbaumarkt. Dissertation, Kassel, Universität Kassel. ISBN: 9783862194902.

Thomsen, C.; Darrington, J.; Dunne, D.; Lichtig, W. (2009): Managing Integrated Project Delivery. Construction Management Association of America.

Walker, D. H. T.; Rowlinson, S. (Hrsg) (2020): Routledge handbook of integrated project delivery. 1. Aufl. Routledge handbooks. London, Routledge. ISBN: 9781138736689.

M 5.120 Module: Agile Project Management in Facility and Real Estate Management (bauiM4S27-) [M-BGU-105920]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts

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

Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Subject-Specific Supplements (Usage from 4/1/2022)

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

Mandatory			
T-BGU-111906	Agile Project Management in Facility and Real Estate Management	6 CR	Lennerts

Competence Certificate
- 'Teilleistung' T-BGU-111906 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students get familiar with the basics of agile PM and can name and explain the different roles and their tasks in relevant project teams. In addition, the tasks of the different roles in project teams are taught from an agile perspective as well as agile principles and the Scrum method. They can describe, compare and differentiate between different agile PM methods. Through the semester-long project work, the students can apply learned team management principles and innovative techniques such as prototyping, design thinking, etc., to a practical application in the field of real estate and facility management. Thereby, the students recognize the most important roles and processes in the context of a small and less complex project and subsequently acquire broad knowledge of agile project management and the practical application for planning and controlling projects.

Content

- agile project management: terminology and principles
- scrum method: roles, artifacts & in-class method simulation
- team dynamics: development phases & conflict management
- overview on prototyping & visualization tools & techniques
- design thinking & innovation

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 40 h
- preparation of project Agile Project Management in Facility and Real Estate Management, incl. report and presentation (examination): 80 h

total: 180 h

Recommendation
none

M 5.121 Module: Seminar Construction Machinery (bauiM4S28-) [M-BGU-105921]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 4/1/2022)
Subject-Specific Supplements (Usage from 4/1/2022)

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

Mandatory			
T-BGU-111907	Seminar Construction Machinery	6 CR	Haghsheno

Competence Certificate
- 'Teilleistung' T-BGU-111907 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can describe the functions and the use of different machine components. Furthermore, they can identify the different components of a construction machine on a real object of study. In addition, they are able to explain and plan the usage of specific components for concrete machine functions. The students can identify different malfunctions. They can evaluate maintenance repair work activities. In specific cases they manage some maintenance activities by themselves.

The students are capable of describing how selected construction machine sensors work. Furthermore, they can choose which sensors are appropriate for scientific test setups to examine machine and process optimization.

Also, the students learned to develop solutions for construction machine specific tasks by themselves. These solutions should be in accordance with the rules of good scientific practice.

Content
The teaching content is orientated on specific construction machines. The focus in each semester will be on one or several various machines. This is the reason why the specific content can variate from semester to semester.

The following content is part of the seminar:

- function, design and areas of application for specific construction machines
- function of specific machine components (for example hydraulic systems, motors, sensors and other machine components)

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

Annotation
The content of the seminar will be created together between the lecturers and the students. Beside theoretical parts there will be practical exercises on our testing field in Linkenheim-Hochstetten. Therefore, regular participation in person will be necessary.

IMPORTANT: The number of participants is limited to 10 students. Further information for the application procedure will be announced on the homepage of the institute. When necessary, the academic progress of the student is going to decide which student will be chosen to attend on the course. The latest point of the confirmation is the end of the first week in the semester.

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

- seminar/field exercise: 60 h

independent study:

- preparation and follow-up seminar/field exercises: 60 h
- portfolio, incl. report and presentation (examination): 60 h

total: 180 h

Recommendation
none

Literature
König, H.: Maschinen im Baubetrieb, Grundlagen und Anwendung. Springer Vieweg, Wiesbaden, 2014.

Grote, K.-H. und Feldhusen, J.: Dubbel Taschenbuch für den Maschinenbau. Springer, Berlin/Heidelberg/New York, 2007.

5.122 Module: Facility Management in Hospitals (bauiM4S29-) [M-BGU-106454]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 10/1/2023)
Study Focus II / Technology and Management in Construction (Compulsory Elective Modules) (Usage from 10/1/2023)
Subject-Specific Supplements (Usage from 10/1/2023)

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

Mandatory			
T-BGU-108004	Facility Management in Hospitals	6 CR	Lennerts

Competence Certificate
- 'Teilleistung' T-BGU-108004 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

Prerequisites
The module must not be taken together with the module Facility Management in Hospitals and Hospital Management [bauiM4S13-] not offered anymore.

Competence Goal
Students will be able to describe the basic features of the German health system with its Diagnosis Related Groups (DRG) system and understand the principle of hospital financing. They can explain the cost structures in a hospital and can understand these based on hospital accounting. Furthermore, the students can give an overview of broad areas of hospital management.

The students can distinguish between primary and secondary processes in a hospital. Students can carry out strategic planning for selected facility management processes (secondary processes). They understand the basic features of hospital planning with a focus on master planning, space and function programme and layout planning. Furthermore, the students independently carry out operating theatre simulations and understand the hygiene factor in this area.

Content

- introduction to the special property of hospitals,
- facility organizational structures and their working conditions,
- hospital new construction and renovation and their financing,
- facility cost structure based on a DRG (Diagnosis Related Group) system,
- facility management processes in hospitals,
- strategic planning and cost structure of selected facility management services,
- sustainable hospitals,
- master planning, space and functional program, and layout planning of hospitals,
- operating room simulation and hygiene in hospitals,
- process mining in healthcare,
- written summary of the project work with colloquium

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 45 h
- written summary of the project work Facility management in hospitals with colloquium: 75 h

total: 180 h

Recommendation
course Facility and Real Estate Management (6200414)

M 5.123 Module: Theoretical Soil Mechanics (bauiM5P1-THEOBM) [M-BGU-100067]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz

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

Part of: Study Focus I / Geotechnical Engineering (Compulsory Modules)
Study Focus II / Geotechnical Engineering (Compulsory Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100067	Theoretical Soil Mechanics	6 CR	Mugele, Osinov

Competence Certificate
- 'Teilleistung' T-BGU-100067 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students obtained a scientific based understanding of the essential behavior of soil under monotonic and cyclic load of coarse grained as well as fine grained soils. They are able to describe relations in soil mechanics mathematically and physically correctly. They can understand the tensorial terminology of modern geotechnical literature. They recognize self-reliantly relevant mechanisms of boundary value problems and can specify the limitations of simple engineering models.

Content

- vectors and tensors in physical space
- strain tensor (linear theorie) and stress tensor
- balance equations
- constitutive relationships
- elasticity
- equation in cylindrical and spherical coordinates
- saturated soils
- capillarity and partial saturation
- soil behavior in element tests
- failure criteria
- plasticity models in soil mechanics
- practical aspects: seepage and stability

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

Annotation
none

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendation
fundamentals in soil mechanics and continuum mechanics

M 5.124 Module: Earthworks and Foundation Engineering (bauiM5P2-ERDGB) [M-BGU-100068]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Geotechnical Engineering (Compulsory Modules)
Study Focus II / Geotechnical Engineering (Compulsory Modules)
Subject-Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	3

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

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

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

Prerequisites
none

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

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

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

Annotation
none

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

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

independent study:

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

total: 180 h

Recommendation
basic knowledge of Soil Mechanics and Foundation Engineering;

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

Literature

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

M 5.125 Module: Basics of Numeric Modeling (bauiM5P4-NUMGRUND) [M-BGU-100070]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Geotechnical Engineering (Compulsory Modules)
Study Focus II / Geotechnical Engineering (Compulsory Modules)
Subject-Specific Supplements

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-106196	Continuum Mechanics	3 CR	Franke, Seelig
T-BGU-106197	Numerics in Geotechnics	3 CR	Osinov

Competence Certificate
- 'Teilleistung' T-BGU-106196 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-106197 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
This module must not be selected together with the module Continuum Mechanics of Heterogeneous Solids [bauiM1S32-KONTIMECH] not offered anymore and not with the module Continuum Mechanics and Wave Propagation [bauiM1S49-KMWAVE].

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-106115 - Continuum Mechanics and Wave Propagation must not have been started.

Competence Goal
The students are familiar with the general concepts of continuum mechanics and their application to engineering, specifically geotechnical, problems. They know operational methods for the discretization of the typical differential equations. They are able to comprehend the modelling of geomechanical boundary value problems using Finite Difference and Finite Element Methods and to work independently on standard problems. They can assess the failure potential of numerical calculations, select commercial FE-codes reasonably and test and evaluate FE results critically.

Content
see German version

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

Annotation
none

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

- Continuum Mechanics lecture: 30 h
- Numerics in Geotechnics lecture: 30 h

independent study:

- preparation and follow-up lectures Continuum Mechanics: 15 h
- examination preparation Continuum Mechanics (partial exam): 30 h
- preparation and follow-up lectures Numerics in Geotechnics: 15 h
- exercises with available software: 30 h
- examination preparation Numerics in Geotechnics (partial exam): 30 h

total: 180 h

Recommendation
course 'Introduction to Continuum Mechanics' (6200421) or similar basic knowledge;
module Theoretical Soil Mechanics [bauiM5P1-THEOBM]

Literature
[1] E. Becker, W. Bürger: Kontinuumsmechanik. Teubner, 1975
[2] J. Bonet, R.D., Wood: Nonlinear continuum mechanics for finite element analysis. Cambridge, 1997
[3] R. Greve: Kontinuumsmechanik. Springer, 2003
[4] L. Malvern: Introduction to the Mechanics of a Continuous Medium. Prentice Hall, 1969
[5] Th. Seelig: Kontinuumsmechanik. Skript zur Vorlesung
[6] Presss, W., e.a. (1992), Numerical Recipies, Cambridge Univ. Press
[7] Hughes, T.J.R. (2000): The FEM, Linear Static and Dynamic FE Analysis. Dover
[8] Bathe, K.-J. (200): Finite-Elemente-Methoden. Springer
[9] Smith, I.M.; Griffith, D.V. (2004): Programming the Finite Element Method. JWS
[10] Potts, D.M. Zdravkovic, L. (1999): Finite element analysis in geotechnical engineering. Thomas Telford Ltd
[11] Zienkewicz O.C. et.al. (2005): The Finite Element Method, Vol. 1, Wiley
[12] Hartmann, F. (1987): Methode der Randelemente, Springer
[13] Strang, G. (2007): Wissenschaftliches Rechnen, Springer

M 5.126 Module: Rock Mechanics and Rock Engineering (bauiM5P5-FMFB) [M-BGU-107001]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Geotechnical Engineering (Compulsory Modules) (Usage from 4/1/2025)
Study Focus II / Geotechnical Engineering (Compulsory Modules) (Usage from 4/1/2025)
Subject-Specific Supplements (Usage from 4/1/2025)

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

Mandatory			
T-BGU-113963	Coursework ‘Rock Mechanics and Rock Engineering’	1 CR	Stutz
T-BGU-113962	Rock Mechanics and Rock Engineering	5 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-113963 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-113962 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
Module must not selected together with the modules 'Rock Mechanics and Tunneling' [bauiM5P3-FMTUB] and 'Rock Engineering and Underground Construction' [bauiM5S05-FELSHOHL] not offered anymore.

Competence Goal
Students acquire a solid understanding of the essential strength and deformation properties of rock. They are able to apply basic analytical methods to solve simplified problems in surface and underground rock engineering. They can also apply rock mechanics methods and the necessary static proofs independently. Furthermore, students can plan, construct and measure securing systems for slopes and hillsides in rock. They can analyse interfaces, identify critical failure mechanisms and carry out corresponding stability analyses.

Content
The fundamentals of rock mechanics include rock and rock mass classification, estimation of in situ stresses, and experimental determination of the stress-strain behaviour and resistance of rock, jointed rock and discontinuities. The analytical relationships for the stress distribution and the deformations around the circular and elliptical tunnel cross-section and at the shaft are derived with and without plastification.

In rock engineering, basic knowledge of analysing and interpreting joint data in rock using the stereographic projection analysis is deepened. For sliding failure of rock slopes, graphical as well as analytical methods are derived and practised. Support systems for individual blocks and slopes and rock excavation techniques are explained.

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

Annotation
Module will be offered newly as from summer term 2025.

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

- Basics in Rock Mechanics lecture/exercise: 30 h
- Rock Engineering lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Basics in Rock Mechanics: 20 h
- preparation and follow-up lecture/exercises Rock Engineering: 20 h
- preparation of coursework: 20 h
- examination preparation: 60 h

total: 180 h

Recommendation

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

basic knowledge of Engineering Geology;

basic knowledge of Technical mechanics;

basic knowledge of Building Materials/Material Science;

Literature

[1] Brady, B.H.G. & Brown, E.T. (2004), Rock Mechanics for Underground Mining, 3rd Ed., Kluwer.
[2] Fecker, Edwin, 1997: Geotechnische Messgeräte und Feldversuche im Fels, Ferdinand Enke Verlag Stuttgart.
[3] Hoek, Evert, 2007: Practical Rock Engineering (kostenloser Download unter http://www.rocscience.com/education/hoeks_corner)
[4] Wittke, W.: Rock Mechanics Based on an Anisotropic Jointed Rock Model (AJRM), Ernst & Sohn, 2014

5.127 Module: Special Issues of Soil Mechanics (bauiM5S01-SPEZBM) [M-BGU-100005]

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

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

Mandatory			
T-BGU-100071	Special Issues of Soil Mechanics	6 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-100071 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students master a wide range of mechanical, hydraulic and numerical tools for the processing of specific soil mechanical problems. They can comprehend the cross-linking of hydraulic, mechanical and chemical processes under partial saturation. They can use the dynamic and cyclic laboratory techniques and apply material laws operationally for the calculation and calibration of experiments. They can describe and evaluate constructionally vibrations and waves in elastic continua and real soils in the range of strains from small shakes up to earthquakes.

Content
see German version

Module grade calculation
grade of the module is grade of the exams

Annotation
none

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

- Unsaturated, Viscous and Cyclic Soil Behaviour - Theory and Element Tests lecture/exercise: 30 h
- Soil Dynamics lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Unsaturated, Viscous and Cyclic Soil Behaviour - Theory and Element Tests: 15 h
- preparation and follow-up lecture/exercises Soil Dynamics: 15 h
- exercises with available software: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
module Theoretical Soil Mechanics [bauiM5P1-THEOBM]

M 5.128 Module: Ground Investigation (bauiM5S02-BERKUND) [M-BGU-100071]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Geotechnical Engineering (Compulsory Elective Modules)
Study Focus II / Geotechnical Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100072	Ground Investigation	6 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-100072 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can conduct the standard experiments common in soil mechanics by themself, define appropriate experimental conditions, analyse and control the experiments purposefully and derive constructionally conclusions. They are familiar with the common field experiments in unconsolidated rocks, they can plan, control, analyse and interpret these. They conducted experiments exemplarily by themselves.

Content
The module covers standard tests in soil mechanics, starting with indexing experiments, determination of shear parameters and water permeability through to different triaxial tests. The different types of explorations, measurement of density and stiffness as well as determination of interface structures in rocks are demonstrated in field experiments. It is discussed which requirements the types of experiments define for exploratory drilling and sample quality, which laboratory and field experiment or experimental conditions respectively are required for the evaluation of the ground and foundation and how drillings can be converted to monitoring wells.

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

Annotation
none

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

- Soil Mechanical Laboratory Exercises: 30 h
- Geomechanical Field Exercise: 30 h
- preparation and follow-up of experiments in the laboratory, own repeating experiments: 30 h

independent study:

- preparation and follow-up Soil Mechanical Laboratory Exercises: 15 h
- preparation and follow-up Geomechanical Field Exercise: 15 h
- examination preparation: 60 h

total: 180 h

Recommendation
none

M 5.129 Module: Applied Geotechnics (bauiM5S03-ANGEOTEC) [M-BGU-100072]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Study Focus I / Geotechnical Engineering (Compulsory Elective Modules)
Study Focus II / Geotechnical Engineering (Compulsory Elective Modules)
Subject-Specific Supplements

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

Mandatory			
T-BGU-100073	Applied Geotechnics	6 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-100073 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students make a self-dependent reasonable design decisions for pile foundations and excavations with regard to geological engineering, site managing and economical boundary conditions. They can assess the interaction of building, foundation and subsoil and can establish simple mechanical models by themself and use numerical tools customary in practice as well. They can describe and use relevant guidelines and can link constructional experience, dimensioning rules and standardization to theoretical knowledge about soil mechanical laws.

Content
see German version

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

Annotation
none

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

- Foundations and Retaining Structures lecture/exercise: 30 h
- Special Foundation Engineering and Design lecture/exercise: 30 h
- field trips: 10 h

independent study:

- preparation and follow-up lecture/exercises Foundations and Retaining Structures: 25 h
- preparation and follow-up lecture/exercises Special Foundation Engineering and Design: 25 h
- examination preparation: 60 h

total: 180 h

Recommendation
module Earthworks and Foundation Engineering [bauiM5P2-ERDGB]

Literature
[1] Seitz, J. & Schmidt, H.-G. (2000), Bohrpfähle Ernst & S.
[2] Triantafyllidis, Th. (1990), Planung und Bauausführung im Spezialtiefbau, Teil 1, Ernst & S.
[3] Weißenbach, A. (2001), Baugruben, Teil 1-3, Wiley
[4] EA Pfähle (2007), Dt. Ges. f. Geotechnik, Ernst & S.
[5] EAB (2006), Deutsche Ges. f. Geotechnik, 4. Aufl., Ernst & S.
[6] EAU (2004), HTG und Deutsche Ges. f. Geotechnik, 10. Aufl., Ernst & S.
[7] EBGEO (2010), Deutsche Ges. f. Geotechnik, Ernst & S.
[8] Witt, J. Grundbau-Taschenbuch Teil 1-3, 7. Aufl. (2009), Ernst & S.

M 5.130 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: Subject-Specific Supplements

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

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

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

details about the learning control see at the 'Teilleistung'

Prerequisites
none

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

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

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

Annotation
none

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

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

independent study:

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

total: 180 h

Recommendation
module Earthworks and Foundation Engineering [bauiM5P2-ERDGB]

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 5.131 Module: Numerical Modelling in Geotechnics (bauiM5S06-NUMMOD) [M-BGU-100075]

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

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

Mandatory			
T-BGU-100107	Numerical Modelling in Geotechnics	6 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-100107 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can develop numerical solutions for typical geotechnical boundary value problems by themself and implement them by programming with FORTRAN95. They got to know FE applications in several fields of geotechnics (foundation, rock and tunnel construction, dam construction), got practical experience with the FE code ABAQUS (TM) and applied this for the modeling of example problems. They are able to interpret and evaluate critically results of numerical simulations.

Content

- beam on elastic half-space
- slope stability with layer procedure according to Bishop
- 2D and 3D pile rafts with lateral bedding
- FE-modeling of spatially correlated fluctuations of soil parameters
- FE settlement prediction with nonlinearity for small strains
- introduction to the FE-program ABAQUS: definition of joints and elements, assignment of material laws, definition of initial and boundary conditions
- examples of FE-applications in tunnel engineering
- numerical FE-modeling of a deep pit excavation under consideration of the construction sequence
- numerical FE-modeling of seepage through a zoned dam with partial saturation (different load cases)
- linear dynamics using ABAQUS

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

Annotation
none

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

- Exercises in Numerical Modelling: 30 h
- FEM Applications in Geotechnical Modelling lecture: 30 h

independent study:

- preparation and follow-up Exercises in Numerical Modelling: 15 h
- preparation and follow-up lectures FEM Applications in Geotechnical Modelling: 15 h
- exercises with available software: 30 h
- examination preparation: 60 h

total: 180 h

Recommendation
module Basics of Numeric Modelling [bauiM5P4-NUMGRUND]

Literature

[1] Smith, I.M.; Griffith, D.V. (2004): Programming the Finite Element Method. JWS
[2] Hibbit, Karlsson, Sorensen: ABAQUS for geotechnical problems
[3] Helwany, S. (2007) Applied Soil Mechanics with ABAQUS Applications, Wiley
[4] Hibbit, Karlsson, Sorensen (1997): Contact in ABAQUS/Standard
[5] FORTRAN 95 HP Manual

M 5.132 Module: Geotechnical Testing and Measuring Technology (bauiM5S07-VERSMESS) [M-BGU-100076]

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

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

Mandatory			
T-BGU-100075	Geotechnical Testing and Measuring Technology	6 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-100075 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Prerequisites
none

Competence Goal
The students can classify the procedures and methods for subsoil exploration and testing techniques even those surpassing standard procedures. They are able to select reasonably appropriate combinations of techniques based on the specific application conditions and prerequisites. They can explain basic knowledge in geophysics, measurement technologies and the functioning principles of sensors and data acquisition. As a result of this they can select equipment reasonably with respect to resolution, accuracy, long term stability and interpretation. They have own experiences with the handling of sensor application, wiring, data acquisition, control elements, measuring and analysis procedures.

Content
The module deepens aspects of geotechnical experiments. Specific experiments from rock mechanics and dam and embarkment construction as well as the test of rheologic properties are presented. The students obtain also insight into geophysical exploratory methods. Further, basics with respect to the selection of appropriate sensors measuring physical, dynamic and electrical quantities, optical methods, correlation measurement techniques, influences of errors, data transfer, data acquisition as well as controlling concepts. The setup and test of a measurement chain for field measurements is practiced.

Module grade calculation
none

Annotation
none

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

- Rock Testing lecture: 15 h
- Testing in Dam and Wastefill Engineering lecture: 15 h
- Geotechnical Measuring Technology lecture/exercise: 30 h
- preparation and follow-up of experiments in the laboratory, own repeting experiments: 25 h

independent study:

- preparation and follow-up lecture Rock Testing: 10 h
- preparation and follow-up lecture Testing in Dam and Wastefill Engineering: 10 h
- preparation and follow-up lecture/exercise Geotechnical Measuring Technology: 15 h
- examination preparation: 60 h

total: 180 h

Recommendation
module Ground Investigation (bauiM5S02-BERKUND)

M 5.133 Module: Special Underground Engineering (bauiM5S08-SPEZTIEF) [M-BGU-100078]

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

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

Mandatory			
T-BGU-100080	Ground Improvement, Grouting and Soil Freezing	3 CR	Riegger
T-BGU-100079	Anchoring, Piling and Slurry Wall Technology	3 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-100080 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100079 with oral examination according to § 4 Par. 2 No. 2

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

Prerequisites
none

Competence Goal
The students can name performance, ranges of application, necessary preliminary investigations and accompanying controls (monitoring) for special underground engineering technologies. They can select self-reliantly appropriate technologies for certain construction problems, describe and dimensioning the steps of the procedure, motivate required preinvestigations, specify parameters for the realization and define the type of controls of execution. They can describe the principles of the observation method and the construction measurement technology and the controls for quality assurance.

Content
The module goes into specific construction techniques of special underground engineering and discusses questions of application limitation, of designing and proofs of safety, requirements for equipement, execution controls and advices for avoiding errors and minmizing risks:

- soil freezing techniques
- injection techniques
- soil improvement techniques
- implementation of slurry and seal walls
- drilling and anchor techniques for grouted anchors
- execution of piles

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

Annotation
none

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

- Ground Improvement, Grouting and Soil Freezing lecture/exercise: 30 h
- Anchoring, Piling and Slurry Wall Technology lecture/exercise: 30 h
- field trips: 10 h

independent study:

- preparation and follow-up lecture/exercises Ground Improvement, Grouting and Soil Freezing: 25 h
- examination preparation Ground Improvement, Grouting and Soil Freezing (partial exam): 30 h
- preparation and follow-up lecture/exercises Anchoring, Piling and Slurry Wall Technology: 25 h
- examination preparation Anchoring, Piling and Slurry Wall Technology (partial exam): 30 h

total: 180 h

Recommendation
none

Literature

[1] Triantafyllidis, Th. (1990), Planung und Bauausführung im Spezialtiefbau, Teil 1, Ernst & S.
[2] Seitz, J. & Schmidt, H.-G. (2000), Bohrpfähle Ernst & S.
[3] Witt, J. (Hrsg.), Grundbau-Taschenbuch Teil 1-3, 7. Aufl. (2009), Ernst & Sohn
[4] Kutzner, Ch. (1991), Injektionen im Baugrund, F.Enke

M 5.134 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: Subject-Specific Supplements

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

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

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

details about the learning control see at the 'Teilleistung'

Prerequisites
none

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

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

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

Annotation
none

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

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

independent study:

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

total: 180 h

Recommendation
none

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

M 5.135 Module: Coupled Geomechanic Processes (bauiM5S10-GEKOPPRO) [M-BGU-100077]

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

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	2 terms	German/English	4	3

Election notes
one of the courses in the field of Geothermics has be selected

Mandatory			
T-BGU-111058	Special Issues in Rock Mechanics	3 CR	Stutz
Electives (Election: 1 item)			
T-BGU-111924	Wildcard Transport of Heat and Fluids	3 CR	N.N.
T-BGU-108017	Applied Geothermics	4 CR	Kohl

Competence Certificate
- 'Teilleistung' T-BGU-111058 (compulsory) with examination of other type according to § 4 Par. 2 No. 3

according to the selected course:

- 'Teilleistung' T-BGU-111924 (compulsory elective 1) with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-108017 (compulsory elective 2) with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
none

Competence Goal
The students can explain supplementary knowledge about strength and deformation properties of rocks as well as of rock testing in-situ and in laboratory. They recognize and evaluate the basic physical and chemical alteration parameters of geomaterials. They are able to describe the involved hydromechanical and thermomechanical processes and to express mathematically their interdependence with mechanical properties.

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

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

Content
Special Issues in Rock Mechanics:

The module takes into account unconsolidated and hard rock as multiphase systems, in which mechanical processes takes place coupled with hydraulic, chemical, biological and thermal processes and their material behavior being therefore typically time-dependent. Phenoma of swelling, shrinking, creeping, fracture hydraulics and rock dynamics are conisered.

Transport of Heat and Fluids:

- 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 transport 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

Geothermische Nutzung:

- introduction into geothermal utilization
- hydrothermal and enhanced (or engineered) geothermal systems (EGS)
- stimulation methods
- geothermal exploration
- thermodynamics and power plant processes
- shallow geothermics
- examples

Module grade calculation
grade of the module is average grade of the compulsory partial exam and the selected compulsory elective partial exam.

Annotation
none

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

- Special Issues in Rock Mechanics lecture/exercise: 30 h
- Transport of Heat and Fluids lecture (compulsory elective 1): 30 h
- Application and Industrial Use / Geothermics 2 lecture/exercise (compulsory elective 2): 30 h

independent study:

- preparation and follow-up lecture/exercises Special Issues in Rock Mechanics: 30 h
- preparation of presentation and written report about Special Issues in Rock Mechanics (partial examination, compulsory): 30 h
- preparation and follow-up lectures Transport of Heat and Fluids: 30 h
- examination preparation Transport of Heat and Fluids (partial examination, compulsory elective 1): 30 h
- preparation and follow-up lecture/exercises Application and Industrial Use / Geothermics 2: 30 h
- examination preparation Application and Industrial Use / Geothermics 2 (partial examination, compulsory elective 2): 30 h

total: 180 h

Recommendation
module Rock Engineering and Tunneling [bauiM5P3-FMTUB]

Literature
[1] Brady, B.H.G. & Brown, E.T. (2004), Rock Mechanics for Underground Mining, 3rd Ed., Kluwer.
[2] Fecker, Edwin, 1997: Geotechnische Messgeräte und Feldversuche im Fels, Ferdinand Enke Verlag Stuttgart.
[3] Hoek, Evert, 2007: Practical Rock Engineering (free download from http://www.rocscience.com/education/hoeks_corner)

M 5.136 Module: Tunneling and Underground Construction (bauiM5S11-TBUHB) [M-BGU-107002]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Subject-Specific Supplements (Usage from 4/1/2025)

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

Mandatory			
T-BGU-113964	Tunneling and Underground Construction	6 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-113964 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Prerequisites
Module must not selected together with the modules 'Rock Mechanics and Tunneling' [bauiM5P3-FMTUB] and 'Rock Engineering and Underground Construction' [bauiM5S05-FELSHOHL] not offered anymore.

Competence Goal
Students learn to select fundamental construction methods and designs for tunnelling. They develop comprehensive geotechnical problem-solving skills, considering factors such as design variants, costs, construction operations, and safety aspects when working in solid rock. They are able to explain the structure and function of tunnel boring machines and excavation methods, drawing from practical experience, and can make informed choices regarding tunnelling techniques.

Students acquire in-depth knowledge of strength and deformation properties, as well as methods for advance and accompanying exploration, which they can apply to the repair of existing tunnels. They can explain the structure and function of tunnel boring machines and support systems based on their own experience and demonstrate the ability to select appropriate tunnelling techniques. Furthermore, they can effectively apply their expertise in strength and deformation properties and exploration methods to maintain and repair existing tunnels.

Content
The course introduces students to tunnel structures, covering various types of tunnels and their purposes, as well as providing an overview of tunnel construction methods, tunnelling techniques, and support measures. Students practice deriving tunnel driving classes and support requirements based on rock exploration and classification, as well as instrumenting tunnels.

The course also presents the functioning and limitations of different mechanical tunnelling methods and pipe jacking techniques, including shield driving, compressed air support, and fluid and earth pressure methods. Students explore calculation approaches for tunnel statics and deformation forecasts, particularly for tunnels in loose rock near the surface.

The principles of tunnelling are further developed with a focus on sealing, shell design, and tunnel safety. Additionally, the inspection and repair of existing tunnels are covered, equipping students with the skills to address real-world challenges in tunnel maintenance.

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

Annotation
Module will be offered newly as from summer term 2025.

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

- lecture/exercise: 60 h
- field trips: 10 h

independent study:

- preparation and follow-up lecture/exercises: 50 h
- examination preparation: 60 h

total: 180 h

Recommendation

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

basic knowledge of Engineering Geology;

basic knowledge of Technical mechanics;

basic knowledge of Building Materials/Material Science;

basic knowledge of Rock Mechanics and Rock Engineering;

Literature

[1] Maidl, B. 1997: Tunnelbau im Sprengvortrieb
[2] Müller, L. 1978: Der Felsbau, Bd. 3 Tunnelbau
[3] Maidl, B; Herrenknecht, M.;, Maidl, U.; Wehrmeyer, G. 2011: Maschineller Tunnelbau im Schildvortrieb

5.137 Module: Module Master's Thesis (bauiMSC-THESIS) [M-BGU-104996]

Responsible: Studiendekan:in der KIT-Fakultät für Bauingenieur-, Geo- und Umweltwissenschaften
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Master's Thesis (Usage from 7/1/2019)

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

Mandatory			
T-BGU-110135	Master's Thesis	30 CR	Studiendekan:in der KIT-Fakultät für Bauingenieur-, Geo- und Umweltwissenschaften

Competence Certificate
thesis and final presentation according to § 14 ER/SPO

Prerequisites
Modules in extent of minimum 42 CP has to be passed in order to be admitted to the Master Thesis according to ER/SPO § 14 Par. 1. Results obtained in the module Interdisciplinary Qualifications [bauiMW0-UEQUAL] cannot be counted for this purpose.

Competence Goal
The student is able to investigate independently a complex problem within a particular research field of his choice in limited time, following scientific methods. He can search autonomously for literature, can find own approaches, can evaluate his results and can classify them according to the state of the art. He is further able to present clearly the essential matter and results in his master thesis and in a comprehensive presentation.

Content
The Master Thesis is an independent written report and comprises the theoretical or experimental work on a complex problem within a particular field of civil engineering with scientific methods. The topic of the master thesis derives from the students choice of a particular field. The student and can make proposals for the topic.

Module grade calculation
The grade of the module results from the evaluation of the Master Thesis and the final presentation.

Annotation
Information about the procedure regarding admission and registration of the Master Thesis see chap. 2.9.

Workload

- working on thesis project: 720 h
- thesis writing: 150 h.
- preparation of presentation: 30 h

total: 900 h

Recommendation
All technical skills and soft skills required for working on the selected topic and the preparation of the thesis should be attained.

M 5.138 Module: Interdisciplinary Qualifications (bauiMW0-UEQUAL) [M-BGU-103927]

Responsible: Studiendekan:in der KIT-Fakultät für Bauingenieur-, Geo- und Umweltwissenschaften
Organisation: University
Part of: Interdisciplinary Qualifications

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

Election notes
Courses accepted gererally by the Examination Committee are available directly as selection option in the module.

For self assignment of taken interdisciplinary qualifications of HoC, FORUM (formerly ZAK) or 'Sprachenzentrums' (SpZ) the 'Teilleistungen' with the title "Self Assignment HoC-FORUM-SpZ ..." have to be selected according to the grading scale, not graded or graded (see module handbook Sect. 2.4). Title and CP of the taken exam are taken over by the assignment.

Interdisciplinary Qualifications (Election: at least 6 credits)			
T-BGU-106765	Introduction to Matlab	3 CR	Ehret
T-BGU-112598	Introduction to Python	3 CR	Cermak, Fuchs
T-BGU-111596	Self Assignment HoC-FORUM-SpZ 1 not graded	2 CR	
T-BGU-111597	Self Assignment HoC-FORUM-SpZ 2 not graded	2 CR	
T-BGU-111598	Self Assignment HoC-FORUM-SpZ 3 not graded	2 CR	
T-BGU-112837	Self Assignment HoC-FORUM-SpZ 7 not graded	2 CR	
T-BGU-111599	Self Assignment HoC-FORUM-SpZ 4 graded	2 CR	
T-BGU-111600	Self Assignment HoC-FORUM-SpZ 5 graded	2 CR	
T-BGU-111601	Self Assignment HoC-FORUM-SpZ 6 graded	2 CR	

Competence Certificate
according to taken courses

Prerequisites
none

Competence Goal
Learning outcomes can be divided into three main complementary categories:1. Contextual Knowledge

- Students are aware of the cultural context of their position and are in a position to consider the views and interests of others (beyond the boundaries of subject, culture, and language).
- They have enhanced their ability to participate properly and appropriately in academic or public discussions.

2. Practical Focus

- Students have gained an insight into the routines of professional life.
- They have further developed their capability to learn.
- They have improved their scope of action by extending their knowledge of foreign languages.
- They are able to relate their field of experience to basic aspects of business administration and law.

3. Basic Competences

- The students autonomously acquire new knowledge in a planned, specific, and methodologically founded manner and use it for solving tasks and problems.
- They can evaluate own work.
- They possess efficient work techniques, can set priorities, take decisions, and assume responsibility.

Content
With the key competences, the House of Competence (HoC) and the Centre for Cultural and General Studies (ZAK) offer a wide range of courses, which are bundled thematically for better orientation. The contents are explained in detail in the descriptions of the courses on the internet pages of HoC (https://studium.hoc.kit.edu/index.php/lehrangebot-gesamtuebersicht/; in German) and FORUM (https://www.forum.kit.edu/english/general_studies.php). Further, courses of the General Studies of FORUM (formerly ZAK) or language courses of the 'Sprachenzentrums' (https://www.spz.kit.edu/index.php; in German) can be taken as Interdisciplinary Qualifications.

Module grade calculation
not graded

Annotation
In exceptional cases the Examination Committee can accept or recognize further suitable courses as Interdisciplinary Qualifications which are not listed in the mentioned offers of HoC, FORUM (formerly ZAK) and 'Sprachenzentrum' or already included in the module. Further information about the Interdisciplinary Qualifications (selection, registration, etc.) see Sect. 2.4 (module handbook).

In agreement with the examiner the passing of the respective course can be marked. This mark is not considered for the grade of the module as the module is not graded.

Workload
according to taken courses; see course description of HoC, lecture descriptions of FORUM (formerly ZAK), descriptions of language courses

Recommendation
none

M 5.139 Module: Further Examinations (bauiMZL) [M-BGU-103951]

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

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

Additional Examinations (Election: at most 30 credits)			
T-BGU-111044	Practical Exercises Dynamics of Structures	2 CR	Betsch

5.140 Module: Supplementary Studies on Science, Technology and Society [M-FORUM-106753]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: Additional Examinations (Usage from 10/1/2024)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
16	Grade to a tenth	Each term	3 terms	German	4	1

Election notes

Students have to self-record the achievements obtained in the Supplementary Studies on Science, Technology and Society in their study plan. FORUM (formerly ZAK) records the achievements as "non-assigned" under "ÜQ/SQ-Leistungen". Further instructions on self-recording of achievements can be found in the FAQ at https://campus.studium.kit.edu/ and on the FORUM homepage at https://www.forum.kit.edu/english/. The title of the examination and the amount of credits override the modules placeholders.

If you want to use FORUM achievements for both your Interdisciplinary Qualifications and for the Supplementary Studies, please record them in the Interdisciplinary Qualifications first. You can then get in contact with the FORUM study services (stg@forum.kit.edu) to also record them in your Supplementary Studies.

In the Advanced Unit you can choose examinations from three subject areas: "About Knowledge and Science", "Science in Society" and "Science in Social Debates". It is advised to complete courses from each of the three subject areas in the Advanced Unit.

To self-record achievements in the Advanced Unit, you have to select a free placeholder partial examination first. The placeholders' title do *not* affect which achievements the placeholder can be used for!

Mandatory			
T-FORUM-113578	Lecture Series Supplementary Studies on Science, Technology and Society - Self Registration	2 CR	Mielke, Myglas
T-FORUM-113579	Basic Seminar Supplementary Studies on Science, Technology and Society - Self Registration	2 CR	Mielke, Myglas
Advanced Unit Supplementary Studies on Science, Technology and Society (Election: at least 12 credits)			
T-FORUM-113580	Elective Specialization Supplementary Studies on Science, Technology and Society / About Knowledge and Science - Self-Registration	3 CR	Mielke, Myglas
T-FORUM-113581	Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Society - Self-Registration	3 CR	Mielke, Myglas
T-FORUM-113582	Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Public Debates - Self Registration	3 CR	Mielke, Myglas
Mandatory			
T-FORUM-113587	Registration for Certificate Issuance - Supplementary Studies on Science, Technology and Society	0 CR	Mielke, Myglas

Competence Certificate

The monitoring is explained in the respective partial achievement.

They are composed of:
- Protocols
- Reflection reports
- Presentations
- Preparation of a project work
- An individual term paper
- An oral examination
- A written exam

Upon successful completion of the supplementary studies, graduates receive a graded report and a certificate issued by the FORUM.

Prerequisites
The course is offered during the course of study and does not have to be completed within a defined period. Enrollment is required for all assessments of the modules in the supplementary studies.
Participation in the supplementary studies is regulated by § 3 of the statutes. KIT students register for the supplementary studies by selecting this module in the student portal and booking a performance themselves. Registration for courses, assessments, and exams is regulated by § 8 of the statutes and is usually possible shortly before the start of the semester.
The course catalog, module description (module manual), statutes (study regulations), and guidelines for creating the various written performance requirements can be downloaded from the FORUM homepage at https://www.forum.kit.edu/begleitstudium-wtg.php.

Registration and exam modalities

PLEASE NOTE:
Registration on the FORUM, i.e. additionally via the module selection in the student portal, enables students to receive up-to-date information about courses or study modalities. In addition, registering on the FORUM ensures that you have proof of the credits you have earned. As it is currently (as of winter semester 24-25) not yet possible to continue additional credits acquired in the Bachelor's programme electronically in the Master's programme, we strongly advise you to digitally secure the credits you have earned by archiving the Bachelor's transcript of records yourself and by registering on FORUM.
In the event that a transcript of records of the Bachelor's certificate is no longer available - we can only assign the achievements of registered students and thus take them into account when issuing the certificate.

Competence Goal
Graduates of the Supplementary Studies on Science, Technology, and Society gain a solid foundation in understanding the interplay between science, the public, business, and politics. They develop practical skills essential for careers in media, political consulting, or research management. The program prepares them to foster innovation, influence social processes, and engage in dialogue with political and societal entities. Participants are introduced to interdisciplinary perspectives, encompassing social sciences and humanities, to enhance their understanding of science, technology, and society. The teaching objectives of this supplementary degree program include equipping participants with both subject-specific knowledge and insights from epistemological, economic, social, cultural, and psychological perspectives on scientific knowledge and its application in various sectors. Students are trained to critically assess and balance the implications of their actions at the intersection of science and society. This training prepares them for roles as students, researchers, future decision-makers, and active members of society.

Through the program, participants learn to contextualize in-depth content within broader frameworks, independently analyze and evaluate selected course materials, and communicate their findings effectively in both written and oral formats. Graduates are adept at analyzing social issues and problem areas, reflecting on them critically from a socially responsible and sustainable standpoint.

Content

The Supplementary Studies on Science, Technology and Society can be started in the 1st semester of the enrolled degree programme and is not limited in time. The wide range of courses offered by FORUM makes it possible to complete the program usually within three semesters. The supplementary studies comprises 16 or more credit points (LP). It consists of **two modules: the Basic Module (4 LP) and the Advanced Module (12 LP)**.

The **basic Module** comprises the compulsory courses 'Lecture Series Supplementary Studies on Science, Technology and Society' and a basic seminar with a total of 4 LP.

The **Advanced Module** comprises courses totalling 12 LP in the humanities and social sciences subject areas 'On Knowledge and Science', 'Science in Society' and 'Science in Public Debates'. The allocation of courses to the accompanying study programme can be found on the homepage https://www.forum.kit.edu/wtg-aktuelland in the printed FORUM course catalogue.

The 3 thematic subject areas:

Subject area 1: About Knowledge and Science

This is about the internal perspective of science: students explore the creation of knowledge, distinguishing between scientific and non-scientific statements (e.g., beliefs, pseudo-scientific claims, ideological statements), and examining the prerequisites, goals, and methods of knowledge generation. They investigate how researchers address their own biases, analyze the structure of scientific explanatory and forecasting models in various disciplines, and learn about the mechanisms of scientific quality assurance.

After completing courses in the "Knowledge and Science" area, students can critically reflect on the ideals and realities of contemporary science. They will be able to address questions such as: How robust is scientific knowledge? What are the capabilities and limitations of predictive models? How effective is quality assurance in science, and how can it be improved? What types of questions can science answer, and what questions remain beyond its scope?

Subject area 2: Science in Society

This focuses on the interactions between science and different areas of society, such as how scientific knowledge influences social decision-making and how social demands impact scientific research. Students learn about the specific functional logics of various societal sectors and, based on this understanding, estimate where conflicts of goals and actions might arise in transfer processes—for example, between science and business, science and politics, or science and journalism. Typical questions in this subject area include: How and under what conditions does an innovation emerge from a scientific discovery? How does scientific policy advice work? How do business and politics influence science, and when is this problematic? According to which criteria do journalists incorporate scientific findings into media reporting? Where does hostility towards science originate, and how can social trust in science be strengthened?

After completing courses in the "Sciene in Society" area, students can understand and assess the goals and constraints of actors in different societal sectors. This equips them to adopt various perspectives of communication and action partners in transfer processes and to act competently at various social interfaces with research in their professional lives.

Subject area 3: Science in Public Debates

The courses in this subject area provide insights into current debates on major social issues such as sustainability, digitalization, artificial intelligence, gender equality, social justice, and educational opportunities. Public debates on complex challenges are often polarized, leading to oversimplifications, defamation, or ideological thinking. This can hinder effective social solution-finding processes and alienate people from the political process and from science. Debates about sustainable development are particularly affected, as they involve a wide range of scientific and technological knowledge in both problem diagnosis (e.g., loss of biodiversity, climate change, resource consumption) and solution development (e.g., nature conservation, CCS, circular economy).

By attending courses in "Science in Public Debates," students are trained in an application-oriented way to engage in factual debates—exchanging arguments, addressing their own prejudices, and handling contradictory information. They learn that factual debates can often be conducted more deeply and with more nuance than is often seen in public discourse. This training enables them to handle specific factual issues in their professional lives independently of their own biases and to be open to differentiated, fact-rich arguments.

Supplementary credits:

Additional LP (supplementary work) totalling a maximum of 12 LP can also be acquired from the complementary study programme (see statutes for the WTG complementary study programme § 7). § 4 and § 5 of the statutes remain unaffected by this. These supplementary credits are not included in the overall grade of the accompanying study programme. At the request of the participant, the supplementary work will be included in the certificate of the accompanying study programme and marked as such. Supplementary coursework is listed with the grades provided for in § 9.

Module grade calculation

The overall grade of the supplementary course is calculated as a credit-weighted average of the grades that were achieved in the advanced module.

Annotation
Climate change, biodiversity crisis, antibiotic resistance, artificial intelligence, carbon capture and storage, and gene editing are just a few areas where science and technology can diagnose and address numerous social and global challenges. The extent to which scientific findings are considered in politics and society depends on various factors, such as public understanding and trust, perceived opportunities and risks, and ethical, social, or legal considerations.
To enable students to use their expertise as future decision-makers in solving social and global challenges, we aim to equip them with the skills to navigate the interfaces between science, business, and politics competently and reflectively. In the Supplementary Studies, they acquire foundational knowledge about the interactions between science, technology, and society.

They learn:
- How reliable scientific knowledge is produced,
- how social expectations and demands influence scientific research, and
- how scientific knowledge is adopted, discussed, and utilized by society.

The program integrates essential insights from psychology, philosophy, economics, social sciences, and cultural studies into these topics. After completing the supplementary studies programme, students can place the content of their specialized studies within a broader social context. This prepares them, as future decision-makers, to navigate competently and reflectively at the intersections between science and various sectors of society, such as politics, business, or journalism, and to contribute effectively to innovation processes, public debates, or political decision-making.

Workload
The workload is made up of the number of hours of the individual modules:

- Basic Module approx. 120 hours
- Advanced Module approx. 390 hours

> Total: approx. 510 hours

In the form of supplementary services, up to approximately 390 hours of work can be added.

Recommendation
It is recommended to complete the supplementary study program in three or more semesters, beginning with the lecture series on science, technology, and society in the summer semester. Alternatively, you can start with the basic seminar in the winter semester and then attend the lecture series in the summer semester.

Courses in the Advanced Module can be taken simultaneously. It is also advised to complete courses from each of the three subject areas in the advanced unit.

Learning type
- Lectures
- Seminars/Project Seminars
- Workshops

6 Courses

T 6.1 Course: Advanced Fluid Mechanics [T-BGU-106612]

Responsible: Prof. Dr. Olivier Eiff
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103359 - Advanced Fluid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6221701	Advanced Fluid Mechanics	4 SWS	Lecture / Practice (/	Eiff

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.2 Course: Advanced Studies in Construction Engineering [T-BGU-108003]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100344 - Advanced Studies in Construction Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6241903	Tunnel Construction and Blasting Engineering	2 SWS	Lecture / 🗣	Haghsheno, Scheuble
WT 24/25	6241904	Underground Construction	1 SWS	Lecture / 🗣	Haghsheno, Schneider
WT 24/25	6241905	Earthwork	1 SWS	Lecture / 🗣	Haghsheno, Waleczko

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.3 Course: Agile Project Management in Facility and Real Estate Management [T-BGU-111906]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105920 - Agile Project Management in Facility and Real Estate Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6242805	Agile Project Management in Facility and Real Estate Management	4 SWS	Lecture / Practice (/ 🗣	Lennerts

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

Competence Certificate
project:

report, appr. 10 pages, and
presentation, appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.4 Course: Analysis and Evolution of Mobility [T-BGU-101004]

Responsible: PD Dr.-Ing. Martin Kagerbauer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100583 - Analysis and Evolution of Mobility

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6232901	Empirical Data in Transportation	2 SWS	Lecture / Practice (/ 🗣	Kagerbauer
ST 2025	6232811	Mobility Services and New Forms of Mobility	2 SWS	Lecture / 🗣	Kagerbauer

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
The Exercise Transportation Data Analysis (T-BGU-113671) has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-113671 - Exercise Transportation Data Analysis must have been passed.

Recommendation
none

Annotation
none

Workload
170 hours

T 6.5 Course: Anchoring, Piling and Slurry Wall Technology [T-BGU-100079]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100078 - Special Underground Engineering

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

Events					
ST 2025	6251822	Anchoring, Piling and Slurry Wall Technology	2 SWS	Lecture / Practice (/ 🗣	Stutz

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

6.6 Course: Applied Building Physics [T-BGU-100039]

Responsible: Frank Altmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103950 - Building Physics I

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

Events					
WT 24/25	6211909	Angewandte Bauphysik	2 SWS	Lecture / 🗣	Vogel, Dehn, Altmann

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.7 Course: Applied Dynamics of Structures [T-BGU-100021]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100038 - Applied Dynamics of Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	2 terms	2

Events					
WT 24/25	6211903	Erdbebeningenieurwesen	1 SWS	Lecture	Stark, Sedlmair
WT 24/25	6211904	Übungen zu Erdbebeningenieurwesen	1 SWS	Practice	Sedlmair
ST 2025	6211805	Practical Building Dynamics	1 SWS	Lecture / 🗣	N.N., Stark
ST 2025	6211806	Excersises Practical Building Dynamics	1 SWS	Practice / 🗣	Mitarbeiter/innen

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.8 Course: Applied Ecology and Water Quality [T-BGU-109956]

Responsible: PD Dr.-Ing. Stephan Fuchs
Dr.-Ing. Stephan Hilgert
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-104922 - Freshwater Ecology

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

Events					
ST 2025	6223813	Applied Ecology and Water Quality	2 SWS	Seminar / 🗣	Hilgert, Fuchs

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

Competence Certificate
term paper, appr. 8-15 pages, and
presentation, appr. 15 min.

Prerequisites
none

Recommendation
none

Annotation
The number of participants in the course is limited to 12 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The attendance at the first meeting is mandatory. In case of absence the place will be assigned to a person on the waiting list.

Workload
90 hours

T 6.9 Course: Applied Geotechnics [T-BGU-100073]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100072 - Applied Geotechnics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6251810	Foundations and Retaining Structures	2 SWS	Lecture / Practice (/ 🗣	Stutz
ST 2025	6251812	Special Foundation Engineering and Design	2 SWS	Lecture / Practice (/ 🗣	Stutz

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.10 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-100077 - Coupled Geomechanic Processes

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

Events					
ST 2025	6310425	Geothermics II: Application and Industrial Use	2 SWS	Lecture / Practice (/	Kohl

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

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

Prerequisites
none

6.11 Course: Basic Seminar Supplementary Studies on Science, Technology and Society - Self Registration [T-FORUM-113579]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each summer term	1 terms	1

Competence Certificate
Study achievement in the form of a presentation or a term paper or project work in the selected course.

Prerequisites
None

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendation
It is recommended that the basic seminar be completed during the same semester as the lecture series "Science in Society". If it is not possible to attend the lecture series and the basic seminar in the same semester, the basic seminar can also be attended in the semesters before the lecture series.
However, attending courses in the advanced unit before attending the basic seminar should be avoided.

Annotation

T 6.12 Course: Basics of Finite Elements [T-BGU-100047]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100052 - Basics of Finite Elements

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

Events					
WT 24/25	6215901	Grundlagen Finite Elemente	2 SWS	Lecture / 🗣	Franke
WT 24/25	6215902	Übungen zu Grundlagen Finite Elemente	2 SWS	Practice / 🗣	Reiff

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
150 hours

T 6.13 Course: Basics of Prestressed Concrete [T-BGU-100019]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100036 - Basics of Prestressed Concrete

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6211803	Basics of Prestressed Concrete	2 SWS	Lecture / 🗣	Stark
ST 2025	6211804	Exercises of Basics Prestressed Concrete	2 SWS	Practice / 🗣	Mitarbeiter/innen

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.14 Course: Bracing and Stability in Reinforced Concrete [T-BGU-100018]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100003 - Bracing and Stability in Reinforced Concrete

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6211801	Reinforcement and Stability in Reinforced Concrete Construction	2 SWS	Lecture / 🗣	Stark
ST 2025	6211802	Exercises Reinforcement and Stability in Reinforced Concrete Construction	2 SWS	Practice / 🗣	Mitarbeiter/innen

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.15 Course: Brownfield Sites - Investigation, Evaluation, Rehabilitation [T-BGU-100089]

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

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

Events					
WT 24/25	6251915	Brownfield Sites - Investigation, Evaluation, Rehabilitation	2 SWS	Lecture / 🗣	Bieberstein, Eiche, Würdemann, Mohrlok

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

6.16 Course: Building and Environmental Aerodynamics [T-BGU-111060]

Responsible: Dr.-Ing. Christof-Bernhard Gromke
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105503 - Interaction Flow - Building Structure

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

Events					
WT 24/25	6221905	Building and Environmental Aerodynamics	2 SWS	Lecture / Practice (/	Gromke

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.17 Course: Building Information Modeling (BIM) [T-BGU-108007]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103916 - Building Information Modeling (BIM)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6241812	Building Information Modeling	4 SWS	Lecture / Practice (/ 🗣	Haghsheno

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

Competence Certificate
project report appr. 10 pages and presentation appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.18 Course: Building Preservation in Steel Structures [T-BGU-110856]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100043 - Building Preservation of Steel and Timber Structures
M-BGU-105373 - Building Preservation and Innovations in Metal and Lightweight Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6212909	Bauwerkserhaltung im Stahlbau	2 SWS	Lecture / 🗣	Ummenhofer

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

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.19 Course: Building Preservation in Timber Structures [T-BGU-110857]

Responsible: Dr.-Ing. Matthias Frese
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100043 - Building Preservation of Steel and Timber Structures
M-BGU-105374 - Building Preservation and Innovations in Timber Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6213903	Building Preservation of Timber Structures	2 SWS	Lecture / Practice (/ 🗣	Frese, Mitarbeiter/ innen

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

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.20 Course: Building Preservation of Concrete and Masonry Constructions [T-BGU-100038]

Responsible: Dr.-Ing. Michael Vogel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100058 - Building Preservation of Concrete and Masonry Constructions

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

Events					
ST 2025	6211811	Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions	2 SWS	Lecture / 🗣	Vogel
ST 2025	6211812	Exercises to Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions	1 SWS	Practice / 🗣	Vogel
ST 2025	6211813	Building Analysis	1 SWS	Lecture / 🗣	Vogel

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
140 hours

T 6.21 Course: Building Technology [T-BGU-100040]

Responsible: PD Dr.-Ing. Stephan Wirth
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103950 - Building Physics I

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	3	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6211910	Gebäudetechnik	2 SWS	Lecture / 🗣	Wirth

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, x Cancelled

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.22 Course: City Transport Facilities [T-BGU-100083]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100026 - City Transport Facilities

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6233909	Inner-city traffic facilities	4 SWS	Lecture / Practice (/	Zimmermann, Mitarbeiter/innen

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

Competence Certificate
oral exam, appr. 45 min.

Prerequisites
Exercises and student research project City Transport Facilities has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-109912 - Exercises and Student Research Project City Transport Facilities must have been passed.

Recommendation
none

Annotation
none

Workload
115 hours

T 6.23 Course: Computational Analysis of Structures [T-BGU-100031]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100047 - Computational Analysis of Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	Each term	1 terms	3

Events					
ST 2025	6214801	Computational Analysis of Structures	2 SWS	Lecture / 🗣	Wagner
ST 2025	6214802	Exercises to Computational Analysis of Structures	2 SWS	Practice / 🗣	Geiger

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
Student research project "Computational Analysis of Structures" has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-100174 - Student Research Project 'Computational Analysis of Structures' must have been passed.

Recommendation
none

Annotation
none

Workload
130 hours

T 6.24 Course: Computational Structural Dynamics [T-BGU-100999]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100579 - Numerical Structural Dynamics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6215810	Numerical Structural Dynamics	4 SWS	Lecture / Practice (/ 🗣	Franke, Mitarbeiter/ innen

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.25 Course: Concrete Construction Technology [T-BGU-100036]

Responsible: Prof. Dr.-Ing. Frank Dehn
Dr. Ravi Ajitbhai Patel

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

Part of: M-BGU-100056 - Concrete Construction Technology

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6211914	Betontechnologie	3 SWS	Lecture / Practice (/ 🗣	Dehn, Kvitsel
WT 24/25	6211915	Modelling in Concrete Technology	1 SWS	Lecture / 🗣	Patel, Dehn

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.26 Course: Construction Chemistry II [T-BGU-113961]

Responsible: Dr. rer. nat. Andreas Bogner
Dr. Peter Thissen

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

Part of: M-BGU-107000 - Construction Chemistry II

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6211816	Construction Chemistry II	2 SWS	Lecture / 🗣	Thissen
ST 2025	6211817	Exercises for Construction Chemistry II	2 SWS	Practice / 🗣	Thissen

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
will be offered newly as from summer term 2025

Workload
180 hours

T 6.27 Course: Construction of Steel and Composite Bridges [T-BGU-100024]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100040 - Construction of Steel and Composite Bridges

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6212805	Construction of Steel and Composite Bridges	2 SWS	Lecture / 🗣	Ummenhofer
ST 2025	6212806	Exercises Construction of Steel and Composite Bridges	2 SWS	Practice / 🗣	Ummenhofer, Mitarbeiter/innen

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

Competence Certificate
oral exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.28 Course: Contact Mechanics [T-BGU-109947]

Responsible: Dr.-Ing. Marlon Franke
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-104916 - Contact Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6215909	Contact Mechanics	2 SWS	Lecture	Konyukhov
WT 24/25	6215910	Exercises Contact Mechanic	2 SWS	Practice	Konyukhov
ST 2025	6215909	Contact Mechanics	4 SWS	Lecture / Practice (/ 🗣	Franke, Mitarbeiter/ innen

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, x Cancelled

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.29 Course: Continuum Mechanics [T-BGU-106196]

Responsible: Dr.-Ing. Marlon Franke
Prof. Dr.-Ing. Thomas Seelig

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

Part of: M-BGU-100070 - Basics of Numeric Modeling
M-BGU-106115 - Continuum Mechanics and Wave Propagation

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

Events					
WT 24/25	6215702	Kontinuumsmechanik	2 SWS	Lecture / 🗣	Betsch, Hille

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.30 Course: Coursework 'Rock Mechanics and Rock Engineering' [T-BGU-113963]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107001 - Rock Mechanics and Rock Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	1

Events					
ST 2025	6251804	Rock Mechanics and Rock Construction Underground	4 SWS	Lecture / Practice (/ 🗣	Schneider, Walter

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

Competence Certificate
preparation of 4 homeworks, former exams

Prerequisites
none

Recommendation
none

Annotation
will be offered newly as from summer term 2025

Workload
20 hours

6.31 Course: Decommissioning of Nuclear Facilities [T-BGU-100627]

Responsible: Prof. Dr.-Ing. Sascha Gentes
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100345 - Decommissioning of Nuclear Facilities

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6243901	Removal and Decontamination of Nuclear Facilities	2 SWS	Lecture / Practice (/ 🗣	Gentes, Mitarbeiter/innen
WT 24/25	6243903	New Development and Optimization of Decommissioning Machine Technology	2 SWS	Lecture / Practice (/ 🗣	Gentes, Mitarbeiter/innen

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
keine

Recommendation
none

Annotation
none

Workload
180 hours

T 6.32 Course: Deep Learning in Hydrological Modeling [T-BGU-112171]

Responsible: Dr. rer. nat. Ralf Loritz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105994 - Deep Learning in Hydrological Modeling

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6224912	Deep Learning in Hydrological Modeling	4 SWS	Lecture / Practice (/ 🗣	Loritz

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

Competence Certificate
scientific presentation appr. 15 min., report appr. 10 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.33 Course: Design and Construction in Metal and Lightweight Structures [T-BGU-110852]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105370 - Design and Construction in Metal and Lightweight Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6212913	Entwerfen und Konstruieren im Metall- und Leichtbau	4 SWS	Lecture / Practice (/ 🗣	Ummenhofer

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, x Cancelled

Competence Certificate
structure and construction proposal, report appr. 20 pages, colloquium appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

6.34 Course: Design and Construction of Components in Reinforced Concrete [T-BGU-100015]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100033 - Design and Construction of Components in Reinforced Concrete

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	4	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6211701	Bemessung und Konstruktion von Bauteilen im Stahlbeton	2 SWS	Lecture / 🗣	Stark
WT 24/25	6211702	Übungen zu Bemessung und Konstruktion von Bauteilen im Stahlbeton	2 SWS	Practice	Mitarbeiter/innen

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
120 hours

T 6.35 Course: Design Exercise Hydraulic Structures [T-BGU-111929]

Responsible: Prof. Dr. Mario Jorge Rodrigues Pereira da Franca
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103376 - Hydraulic Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	1

Events					
ST 2025	6222703	Design of Hydraulic Structures	2 SWS	Lecture / Practice (/ 🗣	Seidel

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

Competence Certificate
1 design exercise, report about 10 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
25 hours

T 6.36 Course: Design Exercise River Engineering [T-BGU-111928]

Responsible: Prof. Dr. Mario Jorge Rodrigues Pereira da Franca
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103376 - Hydraulic Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	1

Events					
ST 2025	6222701	River Engineering	2 SWS	Lecture / Practice (/ 🗣	Rodrigues Pereira da Franca

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

Competence Certificate
1 design exercise, report about 10 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
25 hours

T 6.37 Course: Digital Engineering and Construction [T-BGU-111695]

Responsible: Jun.-Prof. Dr. Reza Maalek
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105830 - Digital Engineering and Construction

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each winter term	1 terms	1

Events					
WT 24/25	6244901	Digital Engineering and Construction	4 SWS	Lecture / Practice (/ 🗣	Maalek

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

Competence Certificate
4 weekly assignments, term paper approx. 10 pages, presentation approx. 15-20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.38 Course: Digital Planning and Building Information Modeling [T-BGU-110382]

Responsible: Dr.-Ing. Tim Zinke
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105135 - Digital Planning and Building Information Modeling

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each winter term	1 terms	1

Events					
WT 24/25	6212912	Digital Planning and Building Information Modeling	4 SWS	Lecture / Practice (/	Zinke

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

Competence Certificate
preparation of BIM flat pattern plan and report, approx. 20 pages, with presentation, approx. 10 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.39 Course: Digital Technologies in Field Information Modeling [T-BGU-111276]

Responsible: Jun.-Prof. Dr. Reza Maalek
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105638 - Digital Technologies in Field Information Modeling

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each term	1 terms	2

Events					
ST 2025	6244801	Digital Technologies in Field Information Modeling	4 SWS	Lecture / Practice (/ 🗣	Maalek

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

Competence Certificate
4 weekly assignments, term paper approx. 10 pages, presentation approx. 15 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.40 Course: Digitalization in Facility and Real Estate Management [T-BGU-108941]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-104348 - Digitalization in Facility and Real Estate Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6242907	Digitalization in Facility- and Real Estate Management	4 SWS	Lecture / Practice (/ 🗣	Lennerts, Mitarbeiter/innen

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

Competence Certificate
project work incl. report, appr. 15 pages, and presentation/colloquium, appr. 15 min

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.41 Course: Durability and Service Life Design [T-BGU-100037]

Responsible: Dr.-Ing. Michael Vogel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100057 - Durability and Service Life Design

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6211907	Korrosive Prozesse und Lebensdauer	3 SWS	Lecture / Practice (/ 🗣	Vogel, Dehn
WT 24/25	6211908	Analytische Verfahren	1 SWS	Lecture / 🗣	Vogel

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.42 Course: Dynamics of Structures [T-BGU-100077]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100035 - Surface Structures and Dynamics of Structures

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

Events					
WT 24/25	6215701	Baudynamik	2 SWS	Lecture / 🗣	Betsch

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

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
70 hours

T 6.43 Course: Earthworks and Foundation Engineering [T-BGU-100068]

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

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	4	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6251701	Foundation Types	2 SWS	Lecture / Practice (/ 🗣	Stutz
WT 24/25	6251703	Basics in Earthworks and Embankment Dams	2 SWS	Lecture / Practice (/ 🗣	Bieberstein

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
preparation of the student research project for examination preparation

Annotation
none

Workload
120 hours

T 6.44 Course: Elective Specialization Supplementary Studies on Science, Technology and Society / About Knowledge and Science - Self-Registration [T-FORUM-113580]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

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

Competence Certificate
Another type of examination assessment under § 5, section 3 involves a presentation, term paper, or project work within the chosen course.

Prerequisites
None

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendation
The contents of the basic module are helpful. The basic module should be completed or attended in parallel, but not after the advanced module.
The reading recommendations for primary and specialist literature are determined individually by the respective lecturers according to the subject area and course.

Annotation
This placeholder can be used for any achievement in the Advanced Unit of the Supplementary Studies.

In the Advanced Module, students can choose their own individual focus, e.g. sustainable development, data literacy, etc. The focus should be discussed with the module coordinator at the FORUM.

T 6.45 Course: Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Public Debates - Self Registration [T-FORUM-113582]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

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

Competence Certificate
Another type of examination assessment under § 5, section 3 involves a presentation, term paper, or project work within the chosen course.

Prerequisites
None

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendation
The contents of the basic module are helpful. The basic module should be completed or attended in parallel, but not after the advanced module.
The reading recommendations for primary and specialist literature are determined individually by the respective lecturers according to the subject area and course.

Annotation
This placeholder can be used for any achievement in the Advanced Unit of the Supplementary Studies.

T 6.46 Course: Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Society - Self-Registration [T-FORUM-113581]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

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

Competence Certificate
Another type of examination assessment under § 5, section 3 involves a presentation, term paper, or project work within the chosen course.

Prerequisites
None

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendation
The contents of the basic module are helpful. The basic module should be completed or attended in parallel, but not after the advanced module.
The reading recommendations for primary and specialist literature are determined individually by the respective lecturers according to the subject area and course.

Annotation
This placeholder can be used for any achievement in the Advanced Unit of the Supplementary Studies.

T 6.47 Course: Environmental Communication [T-BGU-101676]

Responsible: Dr. rer. nat. Charlotte Kämpf
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-101108 - Environmental Communication

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6224905	Environmental Communication	2 SWS	Seminar / 🗣	Kämpf
ST 2025	6224905	Environmental Communication	2 SWS	Seminar / 🗣	Kämpf

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

Competence Certificate
presentation, appr. 15 min.,
manuscript, appr. 6000 words, and
Poster DIN-A3

Prerequisites
The accomplishment 'Examination Prerequisite Environmental Communication' (T-BGU-106620) has to be passend.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-106620 - Examination Prerequisite Environmental Communication must have been passed.

Recommendation
none

Annotation
none

Workload
135 hours

T 6.48 Course: Environmental Fluid Mechanics [T-BGU-106767]

Responsible: Prof. Dr. Olivier Eiff
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103383 - Environmental Fluid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6221909	Environmental Fluid Mechanics	4 SWS	Lecture / Practice (/ 🗣	Eiff

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.49 Course: Environmentally-Friendly Recycling and Disassembly of Buildings [T-BGU-100146]

Responsible: Prof. Dr.-Ing. Sascha Gentes
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100110 - Environmentally-friendly Recycling and Disassembly of Buildings

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6243801	Project Studies	2 SWS	Lecture / Practice (/ 🗣	Gentes
ST 2025	6243803	Dismantling Techniques	2 SWS	Lecture / Practice (/ 🗣	Gentes

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.50 Course: Equipment and Special Construction Techniques in Building Practice [T-BGU-108009]

Responsible: Prof. Dr.-Ing. Sascha Gentes
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103918 - Equipment and Special Construction Techniques in Building Practice

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	2 terms	1

Events					
WT 24/25	6243905	Equipment and special Construction Techniques in Building Practice II	2 SWS	Lecture / 🗣	Gentes, Schneider
ST 2025	6241815	Equipment and Special Construction Techniques in Building Practice I	2 SWS	Lecture / 🗣	Gentes, Schneider

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

Competence Certificate
oral exam, appr. 45 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.51 Course: Examination Prerequisite Conceptual Design of Concrete Bridges [T-BGU-113070]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100037 - Solid Construction Bridges

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6211901	Massivbrücken	2 SWS	Lecture / 🗣	Stark
WT 24/25	6211902	Übungen zu Massivbrücken	2 SWS	Practice	Mitarbeiter/innen

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

Competence Certificate
preparation of a structural analysis, appr. 25 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
30 hours

T 6.52 Course: Examination Prerequisite Environmental Communication [T-BGU-106620]

Responsible: Dr. rer. nat. Charlotte Kämpf
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-101108 - Environmental Communication

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	0	pass/fail	Each term	1 terms	1

Events					
WT 24/25	6224905	Environmental Communication	2 SWS	Seminar / 🗣	Kämpf
ST 2025	6224905	Environmental Communication	2 SWS	Seminar / 🗣	Kämpf

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

Competence Certificate
2 literature annotations, appr. 150 words each, and
short presentation, appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
45 hours

T 6.53 Course: Examination Prerequisite Urban Management [T-BGU-113672]

Responsible: Prof. Dr. Anke Karmann-Woessner
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100013 - Urban Renewal

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	1

Events					
WT 24/25	6231801	City Management	2 SWS	Lecture / Practice (/ 🗣	Karmann-Woessner

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

Competence Certificate
presentation, 5-10 min., or seminar paper, 5-10 pages, defined by the selected topic;

Topics and dates are presented at the beginning of the semester.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
30 hours

T 6.54 Course: Exercise Logistics, Supply and Disposal [T-BGU-113017]

Responsible: PD Dr.-Ing. Martin Kagerbauer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100014 - Space and Infrastructure

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	1

Events					
ST 2025	6231805	Development, Supply and Disposal Planning	2 SWS	Lecture / Practice (/ 🗣	Kagerbauer

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

Competence Certificate
1 plan submission with 1-2 pages written explanation

Prerequisites
none

Recommendation
none

Annotation
none

Workload
20 hours

T 6.55 Course: Exercise Transportation Data Analysis [T-BGU-113671]

Responsible: PD Dr.-Ing. Martin Kagerbauer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100583 - Analysis and Evolution of Mobility

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	0	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6232901	Empirical Data in Transportation	2 SWS	Lecture / Practice (/ 🗣	Kagerbauer

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

Competence Certificate
Exercise to qualitative and quantitative analyses of travel surveys, appr. 2 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
10 hours

T 6.56 Course: Exercise Transportation Data Analysis [T-BGU-113971]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100015 - Traffic Management and Simulation Methods

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	0	pass/fail	Each summer term	1 terms	1

Events					
ST 2025	6232802	Traffic Management and Telematics	2 SWS	Lecture / Practice (/	Vortisch

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

Competence Certificate
programming exercise with Python

Prerequisites
none

Recommendation
none

Annotation
will be offered newly as examination prerequisite as from summer term 2025

Workload
10 hours

T 6.57 Course: Exercises and Student Research Project City Transport Facilities [T-BGU-109912]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100026 - City Transport Facilities

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6233909	Inner-city traffic facilities	4 SWS	Lecture / Practice (/ 🗣	Zimmermann, Mitarbeiter/innen

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

Competence Certificate
report approx. 5 pages and 3 planning documents

Prerequisites
none

Recommendation
none

Annotation
none

Workload
70 hours

T 6.58 Course: Experimental Hydraulics [T-BGU-112374]

Responsible: Dr.-Ing. Frank Seidel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106114 - Experimental Hydraulics and Measurement Techniques

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

Events					
WT 24/25	6222907	Experimental Hydraulics	2 SWS	Lecture / Practice (/	Seidel

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

Competence Certificate
term paper, appr. 10 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.59 Course: Experimental Report Advanced Experimental Solid Mechanics [T-BGU-113138]

Responsible: Dr.-Ing. Martin Helbig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106116 - Practical Course in Experimental Solid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	1

Competence Certificate
experimental report of one selected experiment, appr. 15 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
25 hours

T 6.60 Course: Experimental Report Fundamentals in Experimental Solid Mechanics [T-BGU-113137]

Responsible: Dr.-Ing. Martin Helbig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106116 - Practical Course in Experimental Solid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6215911	Advanced Experimental Solid Mechanics	2 SWS	Practical course / 🗣	Helbig
ST 2025	6215911	Advanced Experimental Solid Mechanics	1 SWS	Practical course / 🗣	Helbig

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

Competence Certificate
experimental report of one selected experiment, appr. 15 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
25 hours

T 6.61 Course: Experiments in Fluid Mechanics [T-BGU-106760]

Responsible: Prof. Dr. Olivier Eiff
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103377 - Experiments in Fluid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	2

Events					
ST 2025	6221802	Experiments in Fluid Mechanics	4 SWS	Lecture / Practice (/ 🗣	Eiff, Mitarbeiter/innen

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

Competence Certificate
laboratory reports with analyses of the experiments in small teams, each appr. 10 pages including figures and tables, and oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.62 Course: Facility Management [T-BGU-111908]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105922 - Facility Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6242908	Facility and Service Management	3 SWS	Lecture / Practice (/ 🗣	Lennerts
WT 24/25	6242909	Facility and Real Estate Management II	1 SWS	Lecture / 🗣	Lennerts

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.63 Course: Facility Management in Hospitals [T-BGU-108004]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106454 - Facility Management in Hospitals

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each winter term	1 terms	2

Events					
WT 24/25	6242905	Facility Management in Hospitals	4 SWS	Lecture / Practice (/ 🗣	Lennerts, Mitarbeiter/ innen

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

Competence Certificate
term paper appr. 10 pages, with final presentation appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.64 Course: FE-Applications in Practical Engineering [T-BGU-100032]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100048 - FE-Applications in Practical Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	2

Events					
ST 2025	6214803	FE-Applications in Practical Engineering	4 SWS	Lecture / Practice (/ 🗣	Volovikova

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

Competence Certificate
FE modeling and analysis of a specified and a selectable engineering structure as home work and project group work, submission of the home work, the program data and the slides of the presentation, final project presentation ca. 30 min. and subsequent discussion

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.65 Course: Field Training Water Quality [T-BGU-109957]

Responsible: PD Dr.-Ing. Stephan Fuchs
Dr.-Ing. Stephan Hilgert
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-104922 - Freshwater Ecology

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

Events					
ST 2025	6223814	Field Training Water Quality	2 SWS	Practice / 🗣	Hilgert, Fuchs

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

Competence Certificate
report on field training, appr. 8-15 pages

Prerequisites
The 'Teilleistung' Applied Ecology and Water Quality (T-BGU-109956, seminar paper with presentation) has to be begun, i.e. at least the registration has to be made.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-109956 - Applied Ecology and Water Quality must have been started.

Recommendation
none

Annotation
The number of participants in the course is limited to 12 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The attendance at the first meeting is mandatory. In case of absence the place will be assigned to a person on the waiting list.

Workload
90 hours

T 6.66 Course: Finite Elements in Solid Mechanics [T-BGU-100998]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100578 - Finite Elements in Solid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6215808	Finite Elements in Solid Mechanics	2 SWS	Lecture / 🗣	Betsch
ST 2025	6215809	Exercises Finite Elements in Solid Mechanics	2 SWS	Practice / 🗣	Mitarbeiter/innen

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.67 Course: Fire Behavior of Building Materials, Components and Constructions [T-BGU-111947]

Responsible: Prof. Dr.-Ing. Frank Dehn
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105936 - Fire Behavior of Building Materials, Components and Constructions

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6211916	Fire Behaviour of Building Materials, Components and Constructions	4 SWS	Lecture / Practice (/ 🗣	Dehn, Mitarbeiter/ innen

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.68 Course: Flow Measurement Techniques [T-BGU-110411]

Responsible: Dr.-Ing. Christof-Bernhard Gromke
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106114 - Experimental Hydraulics and Measurement Techniques

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

Events					
WT 24/25	6221907	Flow Measurement Techniques	2 SWS	Lecture / Practice (/ 🗣	Gromke

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.69 Course: Fluid Mechanics of Turbulent Flows [T-BGU-110841]

Responsible: Prof. Dr.-Ing. Markus Uhlmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105361 - Fluid Mechanics of Turbulent Flows

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6221806	Fluid Mechanics of Turbulent Flows	4 SWS	Lecture / Practice (/	Uhlmann

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

Competence Certificate
oral exam, appr. 45 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.70 Course: Fracture and Damage Mechanics [T-BGU-100087]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100053 - Fracture and Damage Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6215903	Fracture and Damage Mechanics	2 SWS	Lecture / 🗣	Seelig
WT 24/25	6215904	Exercises Fracture and Damage Mechanics	2 SWS	Practice / 🗣	Mitarbeiter/innen, Seelig

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

Competence Certificate
oral exam, appr. 45 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.71 Course: Freight Transport [T-BGU-106611]

Responsible: Dr. Eckhard Szimba
Prof. Dr.-Ing. Peter Vortisch

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

Part of: M-BGU-100020 - Intermodality in Freight, Long-Distance and Air Transport

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	2

Events					
ST 2025	6232809	Freight Transport	2 SWS	Lecture / Practice (/	Szimba

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

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.72 Course: Geostatistics [T-BGU-106605]

Responsible: Dr. Mirko Mälicke
Prof. Dr.-Ing. Erwin Zehe

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

Part of: M-BGU-103762 - Analysis of Spatial Data

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	2

Events					
ST 2025	6224805	Geostatistics	4 SWS	Lecture / Practice (/ 🗣	Mälicke, Zehe

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

Competence Certificate
presentation of an exercise, appr. 15 min. (max. 30 points), and submission of a project report, appr. 12 pages (max. 70 points); passed with min. 60 points

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

6.73 Course: Geotechnical Testing and Measuring Technology [T-BGU-100075]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100076 - Geotechnical Testing and Measuring Technology

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6251909	Rock Testing	1 SWS	Lecture / 🗣	Schneider
WT 24/25	6251910	Testing in Dam and Wastefill Engineering	1 SWS	Lecture / 🗣	Bieberstein
WT 24/25	6251911	Geotechnical Measuring Technology	2 SWS	Lecture / Practice (/ 🗣	Gehring

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

Competence Certificate
oral exam, appr. 40 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.74 Course: Glass, Plastic and Cable Structures [T-BGU-100025]

Responsible: Dr.-Ing. Daniel Ruff
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100041 - Glass, Plastic and Cable Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6212905	Glas-, Kunststoff- und Seiltragwerke	3 SWS	Lecture / 🗣	Ruff
WT 24/25	6212906	Übungen zu Glas-, Kunststoff- und Seiltragwerke	1 SWS	Practice / 🗣	Ruff

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.75 Course: Ground Improvement, Grouting and Soil Freezing [T-BGU-100080]

Responsible: Tobias Riegger
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100078 - Special Underground Engineering

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

Events					
ST 2025	6251820	Ground Improvement, Grouting and Soil Freezing	2 SWS	Lecture / Practice (/ 🗣	Riegger

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.76 Course: Ground Investigation [T-BGU-100072]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100071 - Ground Investigation

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6251808	Soil Mechanical Laboratory Exercises	2 SWS	Practice / 🗣	Reith, Zürn
ST 2025	6251809	Geomechanical Field Exercise	2 SWS	Practice / 🗣	Reith, Zürn

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

Competence Certificate
oral exam, appr. 40 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.77 Course: Ground Water and Earth Dams [T-BGU-100091]

Responsible: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100073 - Ground Water and Earth Dams

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6251814	Geotechnical Ground Water Problems	2 SWS	Lecture / Practice (/	Bieberstein
ST 2025	6251816	Embankment Dams (Advanced)	2 SWS	Lecture / Practice (/	Bieberstein

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

Competence Certificate
oral exam, appr. 40 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.78 Course: Groundwater Hydraulics [T-BGU-100624]

Responsible: Dr. Ulf Mohrlok
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100340 - Groundwater Management

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

Events					
ST 2025	6221801	Groundwater Hydraulics	2 SWS	Lecture / Practice (/	Mohrlok

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

6.79 Course: Group Exercise Project Integrated Planning [T-BGU-109916]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Dr.-Ing. Matthias Zimmermann

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

Part of: M-BGU-100018 - Project Integrated Planning

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

Events					
WT 24/25	6230901	Integrated Planning Project	4 SWS	Project (P / 🗣	Zimmermann, Vallee

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

Competence Certificate
integrated term paper of the whole group and 2 presentations of the result, each appr. 15 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
135 hours

T 6.80 Course: Highway Design [T-BGU-100057]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100017 - Highway Design

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6233901	IT-based Road Design	2 SWS	Lecture / Practice (/ 🗣	Zimmermann
WT 24/25	6233903	Highway Design Project Study	2 SWS	Lecture / Practice (/ 🗣	Zimmermann

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
Study project Design of a Rural Road hat to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-109917 - Study Project Design of a Rural Road must have been passed.

Recommendation
none

Annotation
none

Workload
130 hours

T 6.81 Course: History of Urban Planning [T-BGU-108441]

Responsible: Steven Christopher Ross
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100013 - Urban Renewal

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	2

Events					
ST 2025	6328016	Urban Planning I: Urban Planning History	2 SWS	Lecture / 🗣	Ross

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.82 Course: Hollow Section Structures [T-BGU-100086]

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100004 - Hollow Section Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
please note:

Courses are not offered in the winter term 2024/25.

Workload
180 hours

T 6.83 Course: Homework 'Basics of Finite Elements' [T-BGU-109908]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100052 - Basics of Finite Elements

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6215901	Grundlagen Finite Elemente	2 SWS	Lecture / 🗣	Franke
WT 24/25	6215902	Übungen zu Grundlagen Finite Elemente	2 SWS	Practice / 🗣	Reiff

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

Competence Certificate
processing of three exercise sheets

Prerequisites
none

Recommendation
none

Annotation
none

Workload
30 hours

T 6.84 Course: Homework 'Introduction to Environmental Data Analysis and Statistical Learning' [T-BGU-109950]

Responsible: PD Dr.-Ing. Uwe Ehret
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-104880 - Introduction to Environmental Data Analysis and Statistical Learning

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6224908	Introduction to Environmental Data Analysis and Statistical Learning	4 SWS	Lecture / Practice (/ 🗣	Ehret

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

Competence Certificate
course associated assignments, short reports appr. 1 page each

Prerequisites
none

Recommendation
none

Annotation
none

Workload
60 hours

T 6.85 Course: Hydraulic Engineering [T-BGU-106759]

Responsible: Prof. Dr. Mario Jorge Rodrigues Pereira da Franca
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103376 - Hydraulic Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	4	Grade to a third	Each term	1 terms	2

Events					
ST 2025	6222701	River Engineering	2 SWS	Lecture / Practice (/ 🗣	Rodrigues Pereira da Franca
ST 2025	6222703	Design of Hydraulic Structures	2 SWS	Lecture / Practice (/ 🗣	Seidel

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

Competence Certificate
written exam, 75 min.

Prerequisites
The not graded accomplishments 'Design Exercise River Engineering', T-BGU-111928, and 'Design Exercise Hydraulic Structures', T-BGU-111929, have to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-111928 - Design Exercise River Engineering must have been passed.
2. The course T-BGU-111929 - Design Exercise Hydraulic Structures must have been passed.

Recommendation
none

Annotation
none

Workload
130 hours

6.86 Course: Hydro Power Engineering [T-BGU-100139]

Responsible: Dr.-Ing. Peter Oberle
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100103 - Hydro Power Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6222801	Hydro Power Engineering	4 SWS	Lecture / Practice (/ 🗣	Oberle

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.87 Course: Hydrological Measurements in Environmental Systems [T-BGU-106599]

Responsible: Dr. Jan Wienhöfer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103763 - Hydrological Measurements in Environmental Systems

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6224807	Hydrological Measurements in Environmental Systems	4 SWS	/ 🗣	Wienhöfer, Mitarbeiter/innen

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

Competence Certificate
The examination consists of four parts:

1. active participation in the seminar (presentation ~ 20 mins)
2. active participation in field and lab work
3. documentation of the field experiments (report ~ 10 pages)
4. analysis of field data (presentation ~ 20 mins and report ~10 pages)

Each part is graded with points, and the overall grade is determined by the number of points obtained.

Passing the exam requires at least 1 point in each of the four parts, and in total the minimum number of points.

Prerequisites
none

Recommendation
none

Annotation
The course requires a minimum number of 6 and a maximum number of 30 participants. Please register online for the course (not exam!), 6224807, via the Campus portal (in exceptional cases via e-mail to the responsible lecturer). Participants are selected according to their progress of study considering the following order: students of *Water Science and Engineering*, students of *Civil Engineering*, students of *Geoecology*.

Workload
180 hours

T 6.88 Course: Information Management for Public Mobility Services [T-BGU-106608]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103357 - Special Issues of Public Transport

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

Events					
WT 24/25	6232905	Information Management for Public Mobility Services	2 SWS	Block / 🗣	Vortisch

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

Competence Certificate
lecture accompanying exercises, appr. 5 pieces

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.89 Course: Infrastructure Management [T-BGU-106300]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100009 - Infrastructure Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6233801	Design and Construction of Roads	2 SWS	Lecture / 🗣	Zimmermann, Stelzenmüller
ST 2025	6233802	Operation and Maintenance of Roads	2 SWS	Lecture / 🗣	Zimmermann, Hess, Stelzenmüller

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

Competence Certificate
written exam, 120 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.90 Course: Innovations and Developments in Metal and Lightweight Structures [T-BGU-110854]

Responsible: Dr.-Ing. Matthias Albiez
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105372 - Innovations and Developments in Steel and Timber Structures
M-BGU-105373 - Building Preservation and Innovations in Metal and Lightweight Structures

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

Events					
ST 2025	6212808	Innovations and Developments in Metal and Lightweight Structures	2 SWS	Lecture / Practice (/ 🗣	Albiez

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.91 Course: Innovations and Developments in Timber Structures [T-BGU-110855]

Responsible: Dr. Carmen Sandhaas
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105372 - Innovations and Developments in Steel and Timber Structures
M-BGU-105374 - Building Preservation and Innovations in Timber Structures

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

Events					
WT 24/25	6213906	Innovations and Developments in Timber Structures	2 SWS	Lecture / Practice (/	Sandhaas, Strübel

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.92 Course: Integrated Design Project in Water Resources Management [T-BGU-111275]

Responsible: PD Dr.-Ing. Uwe Ehret
Dr.-Ing. Frank Seidel

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

Part of: M-BGU-105637 - Integrated Design Project in Water Resources Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6224801	Integrated Design Project in Water Resources Management	4 SWS	Lecture / Practice (/ 🗣	Ehret, Seidel

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

Competence Certificate
project work, report approx. 15 pages with presentation approx. 15 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

6.93 Course: Interaction Flow - Hydraulic Structures [T-BGU-110404]

Responsible: Dr.-Ing. Michael Gebhardt
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105503 - Interaction Flow - Building Structure
M-BGU-107026 - Hydraulic Interactions

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6221903	Interaction Flow - Hydraulic Structures	2 SWS	Lecture / Practice (	Gebhardt

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.94 Course: Interaction Flow – Sediment Bed and Subsurface [T-BGU-114086]

Responsible: Dr. Victor Dupuis
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107026 - Hydraulic Interactions

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6221817	Interaction Flow - Sediment Bed and Subsurface	2 SWS	Lecture / Practice (/ 🗣	Dupuis

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
newly offered as from summer term 2025

Workload
90 hours

T 6.95 Course: Interdisciplinary Design – Urban and Transportation Planning [T-BGU-112555]

Responsible:	Prof. Dr.-Ing. Barbara Engel Prof. Dr.-Ing. Peter Vortisch
Organisation:	KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of:	M-BGU-106183 - Interdisciplinary Design – Urban and Transportation Planning

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	see Annotations	1 terms	1

Competence Certificate
urban planning and traffic planning design services with semester-long supervision:

report with plan illustrations and evaluations from a traffic demand model, approx. 10 pages, and interim and final presentations, each approx. 10 min.

Prerequisites
none

Recommendation
none

Annotation
The course can only be offered if there is a task suitable for interdisciplinary collaboration in the respective semester. Therefore, the course can only be offered irregularly. Please inform yourself about this also on the website of the Institute of Transportation.

The number of participants in the course is limited to 10 persons. A registration is mandatory. Registration modalities will be published on the institute homepage in due time. If necessary, the places are allocated considering the progress in the students' studies, with priority to students from *Mobility and Infrasctructure*. The participation will be confirmed by the end of the first lecture week.

Workload
180 hours

T 6.96 Course: Interdisciplinary Design of Timber Structures [T-BGU-112392]

Responsible: Prof. Dr.-Ing. Philipp Dietsch
Prof. Dr.-Ing. Riccardo La Magna
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106119 - Interdisciplinary Design of Timber Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6213803	Interdisciplinary Structural Development in Timber Construction	4 SWS	Lecture / Practice (/ 🗣	Dietsch, La Magna

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, ⨯ Cancelled

Competence Certificate
structural design:

- drawing and describing the structure,
- plans with documentation,
- documentation of the structural analysis,
- two interim and final presentations, each appr. 15 min.

Prerequisites
none

Recommendation
none

Annotation
The number of participants is limited. 12 participants will be selected according to thier progress of study of the master programs *Engineering Structures* and *Civil Engineering*.

Workload
180 hours

T 6.97 Course: Introduction to Environmental Data Analysis and Statistical Learning [T-BGU-109949]

Responsible: PD Dr.-Ing. Uwe Ehret
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-104880 - Introduction to Environmental Data Analysis and Statistical Learning

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

Events					
WT 24/25	6224908	Introduction to Environmental Data Analysis and Statistical Learning	4 SWS	Lecture / Practice (/ 🗣	Ehret

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

Competence Certificate
written exam, 60 min.

Prerequisites
The accomplishment Homework 'Introduction to Environmental Data Analysis and Statistical Learning' (T-BGU-109265) has to be passend.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-109950 - Homework 'Introduction to Environmental Data Analysis and Statistical Learning' must have been passed.

Recommendation
none

Annotation
none

Workload
120 hours

T 6.98 Course: Introduction to GIS for Students of Natural, Engineering and Geo Sciences, Prerequisite [T-BGU-103541]

Responsible: Dr.-Ing. Sven Wursthorn
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100014 - Space and Infrastructure

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	3	pass/fail	Each winter term	1 terms	4

Events					
WT 24/25	6071101	Introduction to GIS for Students of Natural Sciences, Engineering and Geosciences, L+E	4 SWS	Lecture / Practice (/ 🗣	Wursthorn

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

Competence Certificate
The achievement control takes place via accepted exercises.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.99 Course: Introduction to Matlab [T-BGU-106765]

Responsible: PD Dr.-Ing. Uwe Ehret
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103927 - Interdisciplinary Qualifications

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	3	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6224907	Introduction to Matlab	2 SWS	Lecture / Practice (/ 🖥	Ehret, Wienhöfer

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

Competence Certificate
Implementation of a Matlab code within a class exercise

Prerequisites
none

Recommendation
none

Annotation
The course is limited to 60 participants. Please register via the student portal (Studierendenportal). Only in case that this should not be possible: Please register via e-mail to the responsible lecturer. Participants are selected according to their progress of study considering the following order: students of Water Science and Engineering, then students of Civil Engineering with focus 'Water and Environment', then other students.

Workload
90 hours

T 6.100 Course: Introduction to Python [T-BGU-112598]

Responsible: Prof. Dr. Jan Cermak
Dr. Julia Fuchs
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103927 - Interdisciplinary Qualifications

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework (practical)	3	pass/fail	Each winter term	1 terms	2

Events					
WT 24/25	6020130	Introduction to Python	2 SWS	Lecture / Practice (/	Fuchs, Bork-Unkelbach

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

Competence Certificate
Successfully completed exercises focussing on implementation and documentation of a Python code.

Prerequisites
None

Recommendation
None

Annotation
The associated lecture is especially intended for students of the MSc Geodäsie und Geoinformatik and MSc Remote Sensing and Geoinformatics.
External students may attend the course if there is sufficient capacity. External students communicate their individual interest to participate in this lecture at the latest one week before the start of the lectures via e-mail to anja.carle@kit.edu receive positive/negative feedback regarding the possibility of participation.

The total workload is 90 hours and has to be invested in

- Contact hours: 20 hours
- Self-study: 70 hours
  - consolidation of subject by recapitulation of lectures, by use of references and by own inquiry (40 hours)
  - working on exercises (30 hours)

Workload
90 hours

T 6.101 Course: Landfills [T-BGU-100084]

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

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

Events					
WT 24/25	6251913	Landfills	2 SWS	Lecture / Practice (/	Bieberstein

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.102 Course: Laws and Proceedings Concerning Traffic and Roads [T-BGU-106297]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Dr.-Ing. Matthias Zimmermann

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

Part of: M-BGU-100011 - Laws and Proceedings Concerning Traffic and Roads

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6232801	Assessment and Decision-making Process	1 SWS	Lecture / 🗣	Chlond
ST 2025	6233803	Laws Concerning Traffic and Roads	2 SWS	Lecture / 🗣	Hönig
ST 2025	6233804	Environmental Sustainability of Roads	1 SWS	Lecture / 🗣	Zimmermann

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

Competence Certificate
written exam, 120 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.103 Course: Leadership and Communication [T-BGU-111900]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105917 - Leadership and Communication

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6241805	Leadership and Communication	4 SWS	Lecture / Practice (/ 🗣	Haghsheno, Eschen

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

6.104 Course: Lean Construction [T-BGU-108000]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100104 - Lean Construction

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	4,5	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6241901	Lean Construction	4 SWS	Lecture / Practice (/	Haghsheno, Mitarbeiter/innen

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

Competence Certificate
written exam, 70 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
140 hours

T 6.105 Course: Lean Integrated Project Delivery [T-BGU-111910]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105925 - Lean Integrated Project Delivery (Lean IPD)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6241817	Lean Integrated Project Delivery	3 SWS	Lecture / 🗣	Haghsheno

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

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.106 Course: Lecture Series Supplementary Studies on Science, Technology and Society - Self Registration [T-FORUM-113578]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each summer term	1 terms	1

Competence Certificate
Active participation, learning protocols, if applicable.

Prerequisites
None

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendation
It is recommended that you complete the lecture series "Science in Society" before attending events in the advanced module and in parallel with attending the basic seminar.
If it is not possible to attend the lecture series and the basic seminar in the same semester, the lecture series can also be attended after attending the basic seminar.
However, attending events in the advanced module before attending the lecture series should be avoided.

Annotation
The basic module consists of the lecture series "Science in Society" and the basic seminar. The lecture series is only offered during the summer semester.
The basic seminar can be attended in the summer or winter semester.

T 6.107 Course: Long-Distance and Air Traffic [T-BGU-106301]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100020 - Intermodality in Freight, Long-Distance and Air Transport

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6232904	Long-distance and Air Transportation	2 SWS	Lecture /	Vortisch, Dozenten

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

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.108 Course: Machinery and Process Engineering [T-BGU-100623]

Responsible: Prof. Dr.-Ing. Sascha Gentes
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100339 - Machinery and Process Engineering

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

Events					
WT 24/25	6241703	Process Engineering	2 SWS	Lecture / 🗣	Schneider, Waleczko
WT 24/25	6243701	Construction Equipment	2 SWS	Lecture / 🗣	Gentes, Dörfler, Schneider

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
150 hours

T 6.109 Course: Mass Fluxes in River Basins [T-BGU-111061]

Responsible: PD Dr.-Ing. Stephan Fuchs
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103373 - River Basin Modeling

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	3	pass/fail	Each summer term	1 terms	1

Events					
ST 2025	6223812	Mass Fluxes in River Basins	2 SWS	Lecture / Blended	Fuchs, Morling

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

Competence Certificate
working on exercises: report, appr. 5 pages, and presentation , appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.110 Course: Master's Thesis [T-BGU-110135]

Responsible: Studiendekan:in der KIT-Fakultät für Bauingenieur-, Geo- und Umweltwissenschaften
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-104996 - Module Master's Thesis

Type	Credits	Grading scale	Recurrence	Expansion	Version
Final Thesis	30	Grade to a third	Each term	1 terms	1

Competence Certificate
duration appr. 6 months
presentation within one month after submission of the thesis

Prerequisites
defined for the module Master Thesis

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

This thesis requires confirmation by the examination office.

Recommendation
see module

Annotation
Information about the procedure regarding admission and registration of the Master Thesis see chap. 2.9.

Workload
900 hours

T 6.111 Course: Material Models in Solid Mechanics [T-BGU-100044]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100054 - Material Models in Solid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6215801	Material Models in Solid Mechanics	2 SWS	Lecture / 🗣	Seelig, Schmidt
ST 2025	6215802	Übungen zu Anwendungsorientierte Materialtheorien	2 SWS	Practice / 🗣	Seelig, Schmidt

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

Competence Certificate
oral exam, appr. 45 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.112 Course: Material Science, Welding and Fatigue [T-BGU-100023]

Responsible: Dr.-Ing. Philipp Weidner
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100039 - Material Science, Welding and Fatigue

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6212803	Material Science, Welding and Fatigue	4 SWS	Lecture / Practice (/ 🗣	Seyfried, Weidner

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.113 Course: Materials Testing and Measuring Techniques [T-BGU-100043]

Responsible: Dr.-Ing. Nico Herrmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100061 - Materials Testing and Measuring Techniques

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6211911	Messverfahren im konstruktiven Ingenieurbau	1 SWS	Lecture / 🗣	Herrmann, Dehn
WT 24/25	6211912	Übungen zu Messverfahren im konstruktiven Ingenieurbau	1 SWS	Practice / 🗣	Herrmann
WT 24/25	6211913	Materialprüfung im Stahlbetonbau	2 SWS	Lecture / 🗣	Herrmann, Dehn

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.114 Course: Mechanics of Planar Laminates [T-BGU-113679]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106817 - Mechanics of Composite Materials

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

Events					
WT 24/25	6215912	Mechanics of planar laminates	2 SWS	Lecture / 🗣	Seelig

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.115 Course: Micromechanics of Heterogeneous Solids [T-BGU-113680]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106817 - Mechanics of Composite Materials

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

Events					
ST 2025	6215813	Micromechanics of Heterogeneous Solids	2 SWS	Lecture / 🗣	Schmidt

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.116 Course: Modeling of Turbulent Flows - RANS and LES [T-BGU-110842]

Responsible: Prof. Dr.-Ing. Markus Uhlmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105362 - Modeling of Turbulent Flows - RANS and LES

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6221911	Modelling of Turbulent Flows - RANS and LES	4 SWS	Lecture / Practice (/ 🗣	Uhlmann

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

Competence Certificate
oral exam, appr. 45 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.117 Course: Modeling Techniques in Solid Mechanics [T-BGU-103223]

Responsible: apl. Prof. Dr. Alexander Konyukhov
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-101673 - Modeling in Solid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	2

Events					
ST 2025	6215807	Modeling in Strength of Materials	4 SWS	Lecture / Practice (/ 🗣	Betsch, Konyukhov

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.118 Course: Modeling Wastewater Treatment Processes [T-BGU-112371]

Responsible: Dr.-Ing. Mohammad Ebrahim Azari Najaf Abad
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106113 - Modeling Wastewater Treatment Processes

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6223816	Modelling Wastewater Treatment Processes	4 SWS	Lecture / Practice (/ 🗣	Azari Najaf Abad

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

Competence Certificate
written report, appr. 10 pages, and presentation, appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
The number of participants in the course is limited to 20 persons. The registration is made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering*, *Chemical and Process Engineering, Geoecology* and further study programs.

Workload
180 hours

T 6.119 Course: Models and Methods in Traffic Engineering and Transportation Planning [T-BGU-100012]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100008 - Models and Methods in Traffic Engineering and Transportation Planning

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6232701	Calculation Methods and Models in Traffic Planning	2 SWS	Lecture / Practice (/ 🗣	Vortisch, Mitarbeiter/ innen
WT 24/25	6232703	Road Traffic Engineering	2 SWS	Lecture / Practice (/ 🗣	Vortisch, Mitarbeiter/ innen

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.120 Course: Non-linear Analysis of Beam Structures [T-BGU-100030]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100046 - Non-linear Analysis of Beam Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6214702	Non-linear Analysis of Beam Structures	2 SWS	Lecture / 🗣	Fina
WT 24/25	6214703	Exercises to Non-linear Analysis of Beam Structures	2 SWS	Practice / 🗣	Schweizer

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.121 Course: Non-linear Analysis of Surface Structures [T-BGU-100035]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100051 - Non-linear Analysis of Surface Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6214903	Non-linear Analysis of Surface Structures	2 SWS	Lecture / 🗣	Wagner
WT 24/25	6214904	Übungen zu Nichtlineare Modellierung von Flächentragwerken	2 SWS	Practice / 🗣	Panther

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

Competence Certificate
oral exam, appr. 3 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.122 Course: Numerical Flow Modeling in Hydraulic Engineering [T-BGU-106776]

Responsible: Dr.-Ing. Peter Oberle
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103390 - Numerical Flow Modeling in Hydraulic Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6222903	Numerical Flow Modeling in Hydraulic Engineering	4 SWS	Lecture / Practice (/ 🗣	Oberle

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.123 Course: Numerical Fluid Mechanics [T-BGU-106758]

Responsible: Prof. Dr.-Ing. Markus Uhlmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103375 - Numerical Fluid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6221702	Numerical Fluid Mechanics I	4 SWS	Lecture / Practice (/ 🗣	Uhlmann

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

6.124 Course: Numerical Fluid Mechanics II [T-BGU-106768]

Responsible: Prof. Dr.-Ing. Markus Uhlmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103384 - Advanced Computational Fluid Dynamics

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

Events					
ST 2025	6221809	Numerical Fluid Mechanics II	2 SWS	Lecture / Practice (/ 🗣	Uhlmann

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
module Numerical Fluid Mechanics [bauiM2P5-NUMFLMECH] must be completed

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-103375 - Numerical Fluid Mechanics must have been passed.

Recommendation
none

Annotation
none

Workload
90 hours

T 6.125 Course: Numerical Groundwater Modeling [T-BGU-100625]

Responsible: Dr. Ulf Mohrlok
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100340 - Groundwater Management

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

Events					
WT 24/25	6221901	Numerical Groundwater Modeling	2 SWS	Project (P / 🗣	Mohrlok

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

Competence Certificate
project report, appr. 15 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
95 hours

T 6.126 Course: Numerical Methods in Structural Analysis [T-BGU-100034]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100050 - Numerical Methods in Structural Analysis

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6214901	Numerische Methoden in der Baustatik	4 SWS	Lecture / Practice (/	Fina

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.127 Course: Numerical Modelling in Geotechnics [T-BGU-100107]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100075 - Numerical Modelling in Geotechnics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6251818	Exercises in Numerical Modelling	2 SWS	Practice / 🗣	Mugele
ST 2025	6251819	FEM Applications in Geotechnical Modelling	2 SWS	Lecture / 🗣	Mugele

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

Competence Certificate
oral exam, appr. 30 min.;

on base of a programming project worked at during the semseter

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.128 Course: Numerics in Geotechnics [T-BGU-106197]

Responsible: Dr.-Ing. Vladimir Osinov
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100070 - Basics of Numeric Modeling

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

Events					
WT 24/25	6251707	Numerics in Geotechnics	2 SWS	Lecture / 🗣	Osinov

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.129 Course: Parallel Programming Techniques for Engineering [T-BGU-106769]

Responsible: Prof. Dr.-Ing. Markus Uhlmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103384 - Advanced Computational Fluid Dynamics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	3	Grade to a third	Each term	1 terms	2

Events					
ST 2025	6221807	Parallel Programming Techniques for Engineering Problems	2 SWS	Lecture / Practice (/	Uhlmann

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
module Numerical Fluid Mechanics [bauiM2P5-NUMFLMECH] must be completed

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-103375 - Numerical Fluid Mechanics must have been passed.

Recommendation
none

Annotation
none

Workload
90 hours

6.130 Course: Planning of Transportation Systems [T-BGU-100013]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100016 - Planning of Transportation Systems

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	2

Events					
ST 2025	6232806	Properties of Means of Transport	2 SWS	Lecture / 🗣	Vortisch
ST 2025	6232808	Strategic Traffic Planning	2 SWS	Lecture / 🗣	Waßmuth

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

Competence Certificate
written exam, 120 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.131 Course: Practical Course in Experimental Solid Mechanics [T-BGU-113139]

Responsible: Dr.-Ing. Martin Helbig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106116 - Practical Course in Experimental Solid Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	Each term	2 terms	1

Events					
WT 24/25	6215911	Advanced Experimental Solid Mechanics	2 SWS	Practical course / 🗣	Helbig
ST 2025	6215911	Advanced Experimental Solid Mechanics	1 SWS	Practical course / 🗣	Helbig

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
in each semester an experimental report has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-113137 - Experimental Report Fundamentals in Experimental Solid Mechanics must have been passed.
2. The course T-BGU-113138 - Experimental Report Advanced Experimental Solid Mechanics must have been passed.

Recommendation
none

Annotation
The oral examination should normally be taken at the end of the summer term.

Workload
130 hours

T 6.132 Course: Practical Exercises Dynamics of Structures [T-BGU-111044]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103951 - Further Examinations

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6215701	Baudynamik	2 SWS	Lecture / 🗣	Betsch
WT 24/25	6215905	Baudynamikpraktikum	2 SWS	Practical course / 🗣	Zähringer

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

Competence Certificate
reports 2-4 pages per experiment

Prerequisites
none

Recommendation
none

Annotation
in addition to course Dynamics of Structures;

only selectable as additional accomplishment in the module Further Examinations (M-BGU-103951)

Workload
50 hours

T 6.133 Course: Practical FE Analyses in Strength Analysis [T-BGU-113682]

Responsible: Dr.-Ing. Martin Helbig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106818 - Practical FE Analyses in Strength Analysis

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

Events					
WT 24/25	6215913	Practical FE Analyses in Strength of Materials	2 SWS	Lecture / 🗣	Helbig
WT 24/25	6215914	Exercises for “Practical FE analyses in strength analysis”	2 SWS	Practice / 🗣	Helbig

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
The Student Research Project 'Practical FE Analyses in Strength Analysis' (T-BGU-113681) has to be passed as examination prerequisite.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-113681 - Student Research Project 'Practical FE Analyses in Strength Analysis' must have been passed.

Recommendation
none

Annotation
none

Workload
155 hours

T 6.134 Course: Practical Fire Protection [T-BGU-100042]

Responsible: Thomas Egelhaaf
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100060 - Building Physics II

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

Events					
ST 2025	6211815	Practical Fire Protection	2 SWS	Lecture / 🗣	Egelhaaf

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.135 Course: Practical Noise Control [T-BGU-108024]

Responsible: Christian Zander
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100060 - Building Physics II

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

Events					
ST 2025	6211814	Practical Noise Control	2 SWS	Lecture / 🗣	Zander

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.136 Course: Presentation 'Urban Water Infrastructure and Management' [T-BGU-112369]

Responsible: Dr.-Ing. Mohammad Ebrahim Azari Najaf Abad
PD Dr.-Ing. Stephan Fuchs
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103358 - Urban Water Infrastructure and Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6223701	Urban Water Infrastructure and Management	4 SWS	Lecture / Practice (/ 🗣	Fuchs

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

Competence Certificate
presentation, appr. 15 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
60 hours

6.137 Course: Production Planning and Control in Construction [T-BGU-111901]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105918 - Production Planning and Control in Construction

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

Events					
ST 2025	6241801	Site Management	1 SWS	Lecture / Practice (/ 🗣	N.N.
ST 2025	6241803	Site Planning and Handling	3 SWS	Lecture / Practice (/ 🗣	Miernik, Kohlhammer, Haghsheno, Mitarbeiter/innen

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
150 hours

T 6.138 Course: Project Integrated Planning [T-BGU-100061]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Dr.-Ing. Matthias Zimmermann

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

Part of: M-BGU-100018 - Project Integrated Planning

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

Events					
WT 24/25	6230901	Integrated Planning Project	4 SWS	Project (P / 🗣	Zimmermann, Vallee

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
Group exercise Project Integrated Planning has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-109916 - Group Exercise Project Integrated Planning must have been passed.

Recommendation
none

Annotation
none

Workload
45 hours

T 6.139 Course: Project Lean Integrated Project Delivery [T-BGU-111911]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105925 - Lean Integrated Project Delivery (Lean IPD)

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

Events					
ST 2025	6241817	Lean Integrated Project Delivery	3 SWS	Lecture / 🗣	Haghsheno

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

Competence Certificate
case study report, appr. 15 pages;
final presentation and colloquium, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.140 Course: Project Management in Construction and Real Estate Industry [T-BGU-100622]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100338 - Project Management in Construction and Real Estate Industry

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	5	Grade to a third	Each term	1 terms	4

Events					
WT 24/25	6241701	Construction Project Management	4 SWS	Lecture / Practice (/ 🗣	Haghsheno, Mitarbeiter/innen

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

Competence Certificate
case study during the semester:

report: appr. 20 pages
final presentations with discussion: appr. 10 min. each
colloquium at the end of the semester: appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
150 hours

T 6.141 Course: Project Paper Lean Construction [T-BGU-101007]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100104 - Lean Construction

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

Events					
WT 24/25	6241901	Lean Construction	4 SWS	Lecture / Practice (/ 🗣	Haghsheno, Mitarbeiter/innen

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

Competence Certificate
project:

report, appr. 10 pages, and
presentation, appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
40 hours

T 6.142 Course: Project Report Water Distribution Systems [T-BGU-108485]

Responsible: Dr.-Ing. Peter Oberle
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-104100 - Water Distribution Systems

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	2

Events					
WT 24/25	6222905	Water Distribution Systems	4 SWS	Lecture / Practice (/	Oberle

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

Competence Certificate
project report, appr. 15 pages, and
presentation, appr. 15 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
60 hours

T 6.143 Course: Project Studies in Water Resources Management [T-BGU-106783]

Responsible: Dr.-Ing. Frank Seidel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103394 - Project Studies in Water Resources Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each winter term	1 terms	1

Events					
WT 24/25	6222901	Project Studies: Planning in Water Management	4 SWS	Lecture / Practice (/ 🗣	Seidel

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

Competence Certificate
project work: term paper, appr. 15 pages, with presentation, appr. 15 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.144 Course: Real Estate and Facility Management - on Site Lectures [T-BGU-111909]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105924 - Real Estate and Facility Management - on Site Lectures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6242804	Real Estate und Facility Management – on site lectures	4 SWS	Lecture / Practice (/ 🗣	Lennerts, Schmidt-Bäumler

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

Competence Certificate
report appr. 15 pages and presentatin/colloquium appr. 15 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

6.145 Course: Real Estate Management [T-BGU-100629]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100346 - Real Estate Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6242901	Real Estate Management Controlling	1 SWS	Lecture / 🗣	Lennerts
WT 24/25	6242902	Property Valuation Basics	1 SWS	Lecture / 🗣	Lennerts
WT 24/25	6242903	Corporate and Public Real Estate Management	1 SWS	Lecture / 🗣	Lennerts
WT 24/25	6242904	Projectdevelopment with Case Study	1 SWS	Lecture / 🗣	Lennerts, Mitarbeiter/innen

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.146 Course: Registration for Certificate Issuance - Supplementary Studies on Science, Technology and Society [T-FORUM-113587]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each term	1

Prerequisites

In order to register, it is mandatory that the basic module and the advanced module have been completed and that the grades for the partial performances in the advanced module are available.

Registration as a partial achievement means the issue of a certificate.

T 6.147 Course: Research Seminar Construction Management [T-BGU-108008]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103917 - Research Seminar Construction Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each term	2 terms	1

Events					
WT 24/25	6241906	Research Seminar Construction Management II	2 SWS	Seminar / 🗣	Haghsheno, Mitarbeiter/innen
ST 2025	6241814	Baubetriebliches Forschungsseminar I	2 SWS	Seminar / 🗣	Haghsheno, Mitarbeiter/innen

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

Competence Certificate
project report, appr. 25 pages, and colloquium, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.148 Course: River Basin Modeling [T-BGU-106603]

Responsible: PD Dr.-Ing. Stephan Fuchs
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103373 - River Basin Modeling

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	3	Grade to a third	Each winter term	1 terms	2

Events					
WT 24/25	6223904	Modelling Mass Fluxes in River Basins	2 SWS	Lecture / Practice (/	Fuchs

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

Competence Certificate
project report, appr. 10 pages, and
presentation, appr. 15 min.

Prerequisites
The not graded accomplishment 'Mass Fluxes in River Basins' (T-BGU-111061) has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-111061 - Mass Fluxes in River Basins must have been passed.

Recommendation
none

Annotation
none

Workload
90 hours

T 6.149 Course: River Processes [T-BGU-111930]

Responsible: Prof. Dr. Mario Jorge Rodrigues Pereira da Franca
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105927 - River Processes

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6222805	Landscape and River Morphology	2 SWS	Lecture / Practice (/ 🗣	Rodrigues Pereira da Franca, Vanzo
ST 2025	6222807	Transport Processes in Rivers	2 SWS	Lecture / Practice (/ 🗣	Rodrigues Pereira da Franca, Vanzo

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

Competence Certificate
assignment on Landscape and River Morphology, max. 10 pages;
experimental work and analysis (research-based teaching) on Transport Processes in Rivers, appr. 10 pages;
final colloquium, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.150 Course: Road Construction [T-BGU-100058]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100006 - Road Construction

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6233904	Laborpraktikum im Straßenwesen	2 SWS	Lecture / Practice (/ 🗣	Plachkova-Dzhurova
WT 24/25	6233905	Bemessung von Fahrbahnkonstruktionen und Schadensanalytik	2 SWS	Lecture / 🗣	Plachkova-Dzhurova

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.151 Course: Road Safety [T-BGU-100062]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100021 - Road Safety

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	3

Events					
ST 2025	6233906	Safety Management in Highway Engineering	2 SWS	Lecture / Practice (/ 🗣	Zimmermann
ST 2025	6233908	Seminar im Straßenwesen	2 SWS	Seminar / 🗣	Zimmermann

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

Competence Certificate
written exam, 60 min.

Prerequisites
Seminar paper Road Safety has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-109915 - Seminar Paper Road Safety must have been passed.

Recommendation
none

Annotation
none

Workload
90 hours

T 6.152 Course: Rock Mechanics and Rock Engineering [T-BGU-113962]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107001 - Rock Mechanics and Rock Engineering

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

Events					
ST 2025	6251804	Rock Mechanics and Rock Construction Underground	4 SWS	Lecture / Practice (/	Schneider, Walter

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
preparation of the coursework for examination preparation

Annotation
will be offered newly as from summer term 2025

Workload
160 hours

T 6.153 Course: Self Assignment HoC-FORUM-SpZ 1 not graded [T-BGU-111596]

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

Part of: M-BGU-103927 - Interdisciplinary Qualifications

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each term	1 terms	1

Competence Certificate
according to the assignment to be credited

Prerequisites
none

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

Recommendation
none

Annotation
'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

Workload
60 hours

T 6.154 Course: Self Assignment HoC-FORUM-SpZ 2 not graded [T-BGU-111597]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103927 - Interdisciplinary Qualifications

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each term	1 terms	1

Competence Certificate
according to the assignment to be credited

Prerequisites
none

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

Recommendation
none

Annotation
'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

Workload
60 hours

T 6.155 Course: Self Assignment HoC-FORUM-SpZ 3 not graded [T-BGU-111598]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103927 - Interdisciplinary Qualifications

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each term	1 terms	1

Competence Certificate
according to the assignment to be credited

Prerequisites
none

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

Recommendation
none

Annotation
'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

Workload
60 hours

T 6.156 Course: Self Assignment HoC-FORUM-SpZ 4 graded [T-BGU-111599]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103927 - Interdisciplinary Qualifications

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	2	Grade to a third	Each term	1 terms	1

Competence Certificate
according to the assignment to be credited

Prerequisites
none

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

Recommendation
none

Annotation
'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

Workload
60 hours

T 6.157 Course: Self Assignment HoC-FORUM-SpZ 5 graded [T-BGU-111600]

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

Part of: M-BGU-103927 - Interdisciplinary Qualifications

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	2	Grade to a third	Each term	1 terms	1

Competence Certificate
according to the assignment to be credited

Prerequisites
none

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

Recommendation
none

Annotation
'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

Workload
60 hours

T 6.158 Course: Self Assignment HoC-FORUM-SpZ 6 graded [T-BGU-111601]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103927 - Interdisciplinary Qualifications

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	2	Grade to a third	Each term	1 terms	1

Competence Certificate
according to the assignment to be credited

Prerequisites
none

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

Recommendation
none

Annotation
'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

Workload
60 hours

T 6.159 Course: Self Assignment HoC-FORUM-SpZ 7 not graded [T-BGU-112837]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103927 - Interdisciplinary Qualifications

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each term	1 terms	1

Competence Certificate
according to the assignment to be credited

Prerequisites
none

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)

Recommendation
none

Annotation
'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

Workload
60 hours

T 6.160 Course: Seminar Construction Machinery [T-BGU-111907]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105921 - Seminar Construction Machinery

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6241816	Seminar Construction Machinery	4 SWS	Seminar / 🗣	Schneider

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

Competence Certificate
portfolio:

report appr. 15 pages
presentation appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.161 Course: Seminar in Transportation [T-BGU-100014]

Responsible: PD Dr.-Ing. Martin Kagerbauer
Prof. Dr.-Ing. Peter Vortisch

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

Part of: M-BGU-103357 - Special Issues of Public Transport
M-BGU-106182 - Seminars on Empirical Research, Modeling and Simulation in Transportation

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

Events					
WT 24/25	6232903	Seminar Transport Studies	2 SWS	Seminar / On-Site	Vortisch, Kagerbauer
ST 2025	6232903	Seminar Verkehrswesen	2 SWS	Seminar / Blended	Vortisch, Kagerbauer

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

Competence Certificate
seminar paper, appr. 10 pages, and presentation, appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.162 Course: Seminar on Modeling and Simulation in Transportation [T-BGU-112552]

Responsible: PD Dr.-Ing. Martin Kagerbauer
Prof. Dr.-Ing. Peter Vortisch

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

Part of: M-BGU-103357 - Special Issues of Public Transport
M-BGU-106182 - Seminars on Empirical Research, Modeling and Simulation in Transportation

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

Events					
WT 24/25	6232907	Seminar Modeling and Simulation in Transportation	2 SWS	Seminar / 🗣	Vortisch, Kagerbauer, Mitarbeiter/innen

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

Competence Certificate
work on a practical problem in the area of traffic engineering, traffic simulation or in the area of microscopic travel demand modeling:

final report, appr. 5 pages, and presentation, appr. 10 min.

Prerequisites
none

Recommendation
modules Models and Methods in Traffic Engineering and Transportation Planning [mobiM201-VERMODELL] or Traffic Management and Simulation Methods [mobiM202-VERMANAGE]

Annotation
none

Workload
90 hours

T 6.163 Course: Seminar Paper Road Safety [T-BGU-109915]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100021 - Road Safety

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	3	pass/fail	Each summer term	1 terms	1

Events					
ST 2025	6233908	Seminar im Straßenwesen	2 SWS	Seminar / 🗣	Zimmermann

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

Competence Certificate
integrated seminar paper of the team, appr. 10 pages/person and plan documents, presentation appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.164 Course: Seminar Paper 'Waterway Engineering' [T-BGU-106779]

Responsible: Dr.-Ing. Andreas Kron
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103392 - Waterway Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	2

Events					
ST 2025	6222803	Waterway Engineering	4 SWS	Lecture / Practice (/ 🗣	Kron

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

Competence Certificate
seminar paper, appr. 15 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
30 hours

6.165 Course: Shell Structures and Stability of Structures [T-BGU-100033]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100049 - Shell Structures and Stability of Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	Each term	1 terms	3

Events					
ST 2025	6214805	Shell Structures	1 SWS	Lecture / 🗣	Fina
ST 2025	6214806	Exercises Shell Structures	1 SWS	Practice / 🗣	Fina
ST 2025	6214807	Stability of Structures	1 SWS	Lecture / 🗣	Fina
ST 2025	6214808	Exercises Stability of Structures	1 SWS	Practice / 🗣	Panther

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

Competence Certificate
oral exam, appr. 40 min.

Prerequisites
Student research project "Shell Structures and Stability of Structures" has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-100254 - Student Research Project 'Shell Structures and Stability of Structures' must have been passed.

Recommendation
none

Annotation
none

Workload
130 hours

6.166 Course: Solid Construction Bridges [T-BGU-100020]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100037 - Solid Construction Bridges

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

Events					
WT 24/25	6211901	Massivbrücken	2 SWS	Lecture / 🗣	Stark
WT 24/25	6211902	Übungen zu Massivbrücken	2 SWS	Practice	Mitarbeiter/innen

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

Competence Certificate
written exam, 90 min.

Prerequisites
The Examination Prerequisite Conceptual Design of Concrete Bridges (T-BGU-113070) has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-113070 - Examination Prerequisite Conceptual Design of Concrete Bridges must have been passed.

Recommendation
none

Annotation
none

Workload
150 hours

T 6.167 Course: Space and Infrastructure [T-BGU-100056]

Responsible: PD Dr.-Ing. Martin Kagerbauer
Dr.-Ing. Sven Wursthorn

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

Part of: M-BGU-100014 - Space and Infrastructure

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	2	Grade to a third	Each term	1 terms	4

Events					
ST 2025	6231805	Development, Supply and Disposal Planning	2 SWS	Lecture / Practice (/ 🗣	Kagerbauer

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

Competence Certificate
written exam, 90 min.

Prerequisites
Introduction to GIS for Students of Natural, Engineering and Geo Sciences, Prerequisite, as well as Exercise Logistics, Supply and Disposal must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-113017 - Exercise Logistics, Supply and Disposal must have been passed.
2. The course T-BGU-103541 - Introduction to GIS for Students of Natural, Engineering and Geo Sciences, Prerequisite must have been passed.

Recommendation
none

Annotation
none

Workload
70 hours

T 6.168 Course: Special Issues in Rock Mechanics [T-BGU-111058]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100077 - Coupled Geomechanic Processes

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	3	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6251916	Special Issues in Rock Mechanics	2 SWS	Lecture / Practice (/	Schneider

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

Competence Certificate
presentation, appr. 10 min., with written report, 5 - 10 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.169 Course: Special Issues of Soil Mechanics [T-BGU-100071]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100005 - Special Issues of Soil Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6251901	Unsaturated, Viscous and Cyclic Soil Behaviour - Theory and Element Tests	2 SWS	Lecture / Practice (/ 🗣	Mugele
WT 24/25	6251903	Soil Dynamics	2 SWS	Lecture / Practice (/ 🗣	Osinov

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

Competence Certificate
oral exam, appr. 40 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.170 Course: Special Topics in Highway Engineering [T-BGU-106734]

Responsible: Rainer Hess
Dr.-Ing. Matthias Zimmermann

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

Part of: M-BGU-100022 - Special Topics in Highway Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

6.171 Course: Steel and Composite Structures [T-BGU-100016]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100034 - Steel and Composite Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	4	Grade to a third	Each term	1 terms	2

Events					
ST 2025	6212801	Steel and Steel Composite Construction	2 SWS	Lecture / 🗣	Ummenhofer
ST 2025	6212802	Exercises Steel and Steel Composite Construction	2 SWS	Practice / 🗣	Ummenhofer, Mitarbeiter/innen

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
120 hours

6.172 Course: Stormwater Management [T-BGU-112370]

Responsible: Dr.-Ing. Mohammad Ebrahim Azari Najaf Abad
PD Dr.-Ing. Stephan Fuchs

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

Part of: M-BGU-106112 - Stormwater Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2025	6223815	Stormwater Management	4 SWS	Lecture / Practice (/ 🗣	Azari Najaf Abad, Fuchs

Legend: 🖥 Online, ⚙ Blended (On-Site/Online), 🗣 On-Site, x Cancelled

Competence Certificate
written report, appr. 10 pages, and presentation, appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
The attendance of the site visits and the lab work is mandatory.

The number of participants in the course is limited to 20 persons. The registration is made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering*, *Geoecology* and further study programs.

Workload
180 hours

T 6.173 Course: Student Research Project 'Building Preservation of Concrete and Masonry Constructions' [T-BGU-100175]

Responsible: Dr.-Ing. Michael Vogel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100058 - Building Preservation of Concrete and Masonry Constructions

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	2

Events					
ST 2025	6211811	Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions	2 SWS	Lecture / 🗣	Vogel
ST 2025	6211812	Exercises to Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions	1 SWS	Practice / 🗣	Vogel
ST 2025	6211813	Building Analysis	1 SWS	Lecture / 🗣	Vogel

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

Competence Certificate
student research paper, 15-20 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
40 hours

T 6.174 Course: Student Research Project 'Computational Analysis of Structures' [T-BGU-100174]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100047 - Computational Analysis of Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each summer term	1 terms	2

Events					
ST 2025	6214801	Computational Analysis of Structures	2 SWS	Lecture / 🗣	Wagner
ST 2025	6214802	Exercises to Computational Analysis of Structures	2 SWS	Practice / 🗣	Geiger

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

Competence Certificate
student research project, appr. 15 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
50 hours

T 6.175 Course: Student Research Project 'Cost Estimation in Structural Engineering and Earthworks' [T-BGU-108010]

Responsible: Dr.-Ing. Harald Schneider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105918 - Production Planning and Control in Construction

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	2

Events					
ST 2025	6241801	Site Management	1 SWS	Lecture / Practice (/ 🗣	N.N.

Legend: 🖥 Online, ⚄ Blended (On-Site/Online), 🗣 On-Site, x Cancelled

Competence Certificate
term paper, appr. 15 pages, with test

Prerequisites
none

Recommendation
none

Annotation
none

Workload
30 hours

T 6.176 Course: Student Research Project 'Dynamics of Structures' [T-BGU-107819]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100035 - Surface Structures and Dynamics of Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each winter term	1 terms	2

Events					
WT 24/25	6215701	Baudynamik	2 SWS	Lecture / 🗣	Betsch

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

Competence Certificate
processing of three to four exercise sheets

Prerequisites
none

Recommendation
none

Annotation
none

Workload
20 hours

T 6.177 Course: Student Research Project 'Earthworks and Foundation Engineering' [T-BGU-100178]

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

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	2

Events					
WT 24/25	6251701	Foundation Types	2 SWS	Lecture / Practice (/ 🗣	Stutz
WT 24/25	6251703	Basics in Earthworks and Embankment Dams	2 SWS	Lecture / Practice (/ 🗣	Bieberstein

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

Competence Certificate
report appr. 45 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
60 hours

T 6.178 Course: Student Research Project 'Excavation Pit Development and Shuttering Planning' [T-BGU-108012]

Responsible: Dr.-Ing. Harald Schneider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100339 - Machinery and Process Engineering

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each winter term	1 terms	2

Events					
WT 24/25	6241703	Process Engineering	2 SWS	Lecture / 🗣	Schneider, Waleczko
WT 24/25	6243701	Construction Equipment	2 SWS	Lecture / 🗣	Gentes, Dörfler, Schneider

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

Competence Certificate
term paper, appr. 15 pages, with test

Prerequisites
none

Recommendation
none

Annotation
none

Workload
30 hours

T 6.179 Course: Student Research Project 'Practical FE Analyses in Strength Analysis' [T-BGU-113681]

Responsible: Dr.-Ing. Martin Helbig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106818 - Practical FE Analyses in Strength Analysis

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6215913	Practical FE Analyses in Strength of Materials	2 SWS	Lecture / 🗣	Helbig
WT 24/25	6215914	Exercises for “Practical FE analyses in strength analysis”	2 SWS	Practice / 🗣	Helbig

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

Competence Certificate
working on an FE analysis problem; documentation, appr. 10 pages, and presentation, appr. 10 min., of the simulation results

Prerequisites
none

Recommendation
none

Annotation
none

Workload
25 hours

T 6.180 Course: Student Research Project 'Reinforced Concrete' [T-BGU-100170]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100033 - Design and Construction of Components in Reinforced Concrete

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	2

Events					
WT 24/25	6211701	Bemessung und Konstruktion von Bauteilen im Stahlbeton	2 SWS	Lecture / 🗣	Stark
WT 24/25	6211702	Übungen zu Bemessung und Konstruktion von Bauteilen im Stahlbeton	2 SWS	Practice	Mitarbeiter/innen

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

Competence Certificate
preparation of a structural analysis including planning documents, appr. 50 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
60 hours

T 6.181 Course: Student Research Project 'Scheduling and Building Site Facilities' [T-BGU-108011]

Responsible: Dr.-Ing. Harald Schneider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100338 - Project Management in Construction and Real Estate Industry

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each winter term	1 terms	2

Events					
WT 24/25	6241701	Construction Project Management	4 SWS	Lecture / Practice (/ 🗣	Haghsheno, Mitarbeiter/innen

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

Competence Certificate
term paper, appr. 15 pages, with test

Prerequisites
none

Recommendation
none

Annotation
none

Workload
30 hours

T 6.182 Course: Student Research Project 'Shell Structures and Stability of Structures' [T-BGU-100254]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100049 - Shell Structures and Stability of Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each summer term	1 terms	2

Events					
ST 2025	6214805	Shell Structures	1 SWS	Lecture / 🗣	Fina
ST 2025	6214806	Exercises Shell Structures	1 SWS	Practice / 🗣	Fina
ST 2025	6214807	Stability of Structures	1 SWS	Lecture / 🗣	Fina
ST 2025	6214808	Exercises Stability of Structures	1 SWS	Practice / 🗣	Panther

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

Competence Certificate
student research project, appr. 15 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
50 hours

T 6.183 Course: Student Research Project 'Steel Structures' [T-BGU-100171]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100034 - Steel and Composite Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each summer term	1 terms	2

Events					
ST 2025	6212801	Steel and Steel Composite Construction	2 SWS	Lecture / 🗣	Ummenhofer
ST 2025	6212802	Exercises Steel and Steel Composite Construction	2 SWS	Practice / 🗣	Ummenhofer, Mitarbeiter/innen

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

Competence Certificate
term paper, appr. 40 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
60 hours

T 6.184 Course: Student Research Project 'Surface Structures' [T-BGU-107818]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100035 - Surface Structures and Dynamics of Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each winter term	1 terms	2

Events					
WT 24/25	6214701	Surface Structures	2 SWS	Lecture / 🗣	Freitag

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

Competence Certificate
processing of three to four exercise sheets

Prerequisites
none

Recommendation
none

Annotation
none

Workload
20 hours

T 6.185 Course: Study Project Design of a Rural Road [T-BGU-109917]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100017 - Highway Design

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	1

Events					
WT 24/25	6233903	Highway Design Project Study	2 SWS	Lecture / Practice (/ 🗣	Zimmermann

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

Competence Certificate
preparation of 4 planning documents

Prerequisites
none

Recommendation
none

Annotation
none

Workload
50 hours

T 6.186 Course: Surface and Subsurface Contaminant Transport [T-BGU-113965]

Responsible: Prof. Dr.-Ing. Erwin Zehe
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107003 - Surface and Subsurface Contaminant Transport

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6224803	Surface and Subsurface Contaminant Transport: From Processes to Numerical Models	4 SWS	Lecture / Practice (/ 🗣	Zehe, Wienhöfer

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
The 'Teilleistung' Transport and Transformation of Contaminants in Hydrological Systems (T-BGU-106598) must not be selected.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-106598 - Transport and Transformation of Contaminants in Hydrological Systems must not have been started.

Recommendation
none

Annotation
will be offered newly as from summer term 2025

Workload
180 hours

T 6.187 Course: Surface Structures [T-BGU-100017]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100035 - Surface Structures and Dynamics of Structures

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

Events					
WT 24/25	6214701	Surface Structures	2 SWS	Lecture / 🗣	Freitag

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

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
70 hours

T 6.188 Course: Sustainability in Mobility Systems [T-BGU-111057]

Responsible: PD Dr.-Ing. Martin Kagerbauer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103357 - Special Issues of Public Transport

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6232906	Sustainability in Mobility Systems	2 SWS	Lecture / 🗣	Kagerbauer, Plötz, Gnann

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

Competence Certificate
written exam, 60 min., computer-based

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.189 Course: Sustainability in Real Estate Management [T-BGU-100149]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100112 - Sustainability in Real Estate Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6242801	Sustainability in Real Estate Management	3 SWS	Lecture / Practice (/ 🗣	Lennerts
ST 2025	6242803	Life Cycle Management of Real Estate	1 SWS	Lecture / 🗣	Lennerts

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.190 Course: Tank Construction [T-BGU-101000]

Responsible: Dr.-Ing. Peter Knödel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100580 - Tank Construction

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	3	Grade to a third	Each term	1 terms	2

Events					
WT 24/25	6212910	Tank Construction	3 SWS	Lecture / 🗣	Knödel
WT 24/25	6212911	Übungen zu Behälterbau	1 SWS	Practice / 🗣	Knödel

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
100 hours

T 6.191 Course: Technology and Production Methods in Turnkey Construction and Civil Engineering Works [T-BGU-111899]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105913 - Technology and Production Methods in Turnkey Construction and Civil Engineering Works

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6241808	Turnkey Construction	2 SWS	Lecture / Practice (/ 🗣	Teizer
ST 2025	6241810	Civil Engineering Structures and Regenerative Energies	2 SWS	Lecture / Practice (/ 🗣	Haghsheno, Mitarbeiter/innen

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.192 Course: Tendering, Planning and Financing in Public Transport [T-BGU-101005]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103357 - Special Issues of Public Transport

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

Events					
ST 2025	6232807	Competition, Planning and Financing in Public Transport	2 SWS	Lecture / 🗣	Pischon

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

6.193 Course: Term Paper Tank Construction [T-BGU-101001]

Responsible: Dr.-Ing. Peter Knödel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100580 - Tank Construction

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	3	Grade to a third	Each winter term	1 terms	2

Events					
WT 24/25	6212910	Tank Construction	3 SWS	Lecture / 🗣	Knödel
WT 24/25	6212911	Übungen zu Behälterbau	1 SWS	Practice / 🗣	Knödel

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

Competence Certificate
term paper, appr. 20 pages, with presentation, appr. 15 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
80 hours

T 6.194 Course: Term Paper Upgrading of Existing Buildings and Energetic Refurbishment [T-BGU-100621]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100108 - Upgrading of Existing Buildings and Energetic Refurbishment

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

Events					
WT 24/25	6240901	Bauen im Bestand	3 SWS	Lecture / Practice (/ 🗣	Lennerts, Schneider
WT 24/25	6240903	Energetic Refurbishment	1 SWS	Lecture / 🗣	Kropp, Münzl, Schneider

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

Competence Certificate
term paper, appr. 10 pages, and
presentation, appr. 10 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
40 hours

T 6.195 Course: Theoretical Soil Mechanics [T-BGU-100067]

Responsible: Luis Mugele
Dr.-Ing. Vladimir Osinov
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100067 - Theoretical Soil Mechanics

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	2

Events					
ST 2025	6251801	Theoretical Soil Mechanics	4 SWS	Lecture / Practice (/ 🗣	Mugele, Osinov

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

Competence Certificate
oral exam, appr. 40 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.196 Course: Timber Structures [T-BGU-100028]

Responsible: Prof. Dr.-Ing. Philipp Dietsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100044 - Timber Structures

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6213801	Timber Structures	2 SWS	Lecture / 🗣	Dietsch
ST 2025	6213802	Exercises to Timber Structures	2 SWS	Practice / 🗣	Mitarbeiter/innen

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

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.197 Course: Timber Structures: Materials and Appropriate Design [T-BGU-110853]

Responsible: Dr.-Ing. Matthias Frese
Dr. Carmen Sandhaas

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

Part of: M-BGU-105371 - Timber Structures: Materials and Appropriate Design

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6213904	Timber Structures: Materials and Appropriate Design	4 SWS	Lecture / Practice (/ 🗣	Sandhaas, Frese, La Magna, Kuck, Müller

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

Competence Certificate
oral exam, appr. 40 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.198 Course: Traffic Management und Simulation Methods [T-BGU-100008]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100015 - Traffic Management and Simulation Methods

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	2

Events					
ST 2025	6232802	Traffic Management and Telematics	2 SWS	Lecture / Practice (/ 🗣	Vortisch
ST 2025	6232804	Traffic Simulation	2 SWS	Lecture / Practice (/ 🗣	Vortisch, Mitarbeiter/ innen

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
Exercise Transportation Data Analysis must be passed

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-113971 - Exercise Transportation Data Analysis must have been passed.

Recommendation
none

Annotation
as from summer term 2025 the Exercise Transportation Data Analysis will be implemented as examination prerequisite

Workload
180 hours

T 6.199 Course: Tunneling and Underground Construction [T-BGU-113964]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107002 - Tunneling and Underground Construction

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
will be offered newly as from summer term 2025

Workload
180 hours

T 6.200 Course: Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis [T-BGU-111932]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105929 - Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6214809	Structural Analysis with Uncertain Data	2 SWS	Lecture / 🗣	Freitag
ST 2025	6214810	Artificial Neural Networks in Structural Analysis	1 SWS	Lecture / 🗣	Freitag
ST 2025	6214811	Structural Optimization	1 SWS	Lecture / 🗣	Freitag

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

Competence Certificate
oral exam, appr. 40 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.201 Course: Upgrading of Existing Buildings and Energetic Refurbishment [T-BGU-108001]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100108 - Upgrading of Existing Buildings and Energetic Refurbishment

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	4,5	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6240901	Bauen im Bestand	3 SWS	Lecture / Practice (/ 🗣	Lennerts, Schneider
WT 24/25	6240903	Energetic Refurbishment	1 SWS	Lecture / 🗣	Kropp, Münzl, Schneider

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

Competence Certificate
written exam, 70 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
140 hours

T 6.202 Course: Urban and Regional Planning [T-BGU-100050]

Responsible: Dr.-Ing. Tamer Soylu
Sebastian Wilske

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

Part of: M-BGU-100007 - Urban and Regional Planning

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6231701	Urban Planning	2 SWS	Lecture / Practice (/ 🗣	Soylu
WT 24/25	6231703	Regional Planning	2 SWS	Lecture / 🗣	Wilske

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.203 Course: Urban Management [T-BGU-108442]

Responsible: Prof. Dr. Anke Karmann-Woessner
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100013 - Urban Renewal

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

Events					
WT 24/25	6231801	City Management	2 SWS	Lecture / Practice (/ 🗣	Karmann-Woessner
ST 2025	6231801	City Management	2 SWS	Lecture / Practice (/ 🗣	Karmann-Woessner

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

Competence Certificate
oral exam, appr. 15 min.

Prerequisites
The Examination Prerequisite Urban Management (T-BGU-113672) has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-113672 - Examination Prerequisite Urban Management must have been passed.

Recommendation
none

Annotation
Please note:

The course Urban Management (6231801), 2 HpW/SWS, was exceptionally not offered in the summer semester 2024 but is offered in the winter semester 2024/25.

Workload
60 hours

T 6.204 Course: Urban Water Infrastructure and Management [T-BGU-106600]

Responsible: Dr.-Ing. Mohammad Ebrahim Azari Najaf Abad
PD Dr.-Ing. Stephan Fuchs

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

Part of: M-BGU-103358 - Urban Water Infrastructure and Management

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	4	Grade to a third	Each term	1 terms	3

Events					
WT 24/25	6223701	Urban Water Infrastructure and Management	4 SWS	Lecture / Practice (/ 🗣	Fuchs

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

Competence Certificate
written exam, 60 min.

Prerequisites
The not graded accomplishment Presentation 'Urban Water Infrastructure and Management' (T-BGU-112369) has to be passend.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-112369 - Presentation 'Urban Water Infrastructure and Management' must have been passed.

Recommendation
none

Annotation
none

Workload
120 hours

T 6.205 Course: Wastewater Treatment Technologies [T-BGU-109948]

Responsible: Dr.-Ing. Mohammad Ebrahim Azari Najaf Abad
PD Dr.-Ing. Stephan Fuchs

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

Part of: M-BGU-104917 - Wastewater Treatment Technologies

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	4

Events					
WT 24/25	6223801	Wastewater Treatment Technologies	4 SWS	Lecture / Practice (/ 🗣	Fuchs, Azari Najaf Abad

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

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
The number of participants in the course is limited to 30 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering, Chemical and Process Engineering, Geoecology* and further study programs.

Workload
180 hours

6.206 Course: Water and Energy Cycles [T-BGU-106596]

Responsible: Prof. Dr.-Ing. Erwin Zehe
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103360 - Water and Energy Cycles

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each term	1 terms	3

Events					
WT 24/25	6224702	Water and Energy Cycles in Hydrological Systems: Processes, Predictions and Management	4 SWS	Lecture / Practice (/	Zehe

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

Competence Certificate
submission of at least 50% of the weekly exercises plus a written term paper on a given topic, approx. 10 to 15 pages

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.207 Course: Water Distribution Systems [T-BGU-108486]

Responsible: Dr.-Ing. Peter Oberle
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-104100 - Water Distribution Systems

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	4	Grade to a third	Each winter term	1 terms	2

Events					
WT 24/25	6222905	Water Distribution Systems	4 SWS	Lecture / Practice (/	Oberle

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
The accomplishment 'Project Report Water Distribution Systems' (T-BGU-108485) has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-108485 - Project Report Water Distribution Systems must have been passed.

Recommendation
none

Annotation
none

Workload
120 hours

T 6.208 Course: Waterway Engineering [T-BGU-106780]

Responsible: Dr.-Ing. Andreas Kron
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103392 - Waterway Engineering

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

Events					
ST 2025	6222803	Waterway Engineering	4 SWS	Lecture / Practice (/ 🗣	Kron

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

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
The accomplishment 'Seminar Paper Waterway Engineering' (T-BGU-106779) has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-106779 - Seminar Paper 'Waterway Engineering' must have been passed.

Recommendation
none

Annotation
none

Workload
150 hours

T 6.209 Course: Wave Propagation in Solids [T-BGU-112375]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106115 - Continuum Mechanics and Wave Propagation

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

Events					
ST 2025	6215811	Wave Propagation in Solids	2 SWS	Lecture / 🗣	Seelig

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

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.210 Course: Wildcard Transport of Heat and Fluids [T-BGU-111924]

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100077 - Coupled Geomechanic Processes

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	see Annotations	1 terms	1

Events					
WT 24/25	6339091	Geothermics I: Transport of Heat and Fluids	2 SWS	Lecture / Practice (/	Kohl, Nitschke

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

Prerequisites
none

Workload
90 hours