Karlsruher Institut für Technologie

Module Handbook

Engineering Structures (Master of Science (M.Sc.), ER/SPO 2019)

Summer term 2025

Date: 06/03/2025

KIT DEPARTMENT OF CIVIL ENGINEERING, GEO- AND ENVIRONMENTAL SCIENCES

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This handbook version is for informational use only. For legally binding information, please refer to the German version of this handbook.

1 Preliminary remarks

The module handbook is the document in which important additional information about the studies is described. General examination regulation rules (s. https://www.sle.kit.edu/english/vorstudium/master-engineering-structures.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 institutes' web pages as well.

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2 Curriculum

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

https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2019_AB_036.pdf
(2019 KIT 036 Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Masterstudiengang Funktionaler und Konstruktiver Ingenieurbau – Engineering Structures; *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 46; *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 44; *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 42; *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 46; *in German*)

2.1 Objectives of the master degree program

The graduates of the master degree program ’Funktionaler und Konstruktiver Ingenieurbau - Engineering Structures’ at Karlsruhe Institute of Technology (KIT) augmented their scientific qualifications in the fields of construction engineering, building material technology and geotechnics obtained in the bachelor degree program by profound and in-depth knowledge oriented towards the national and international demand in science and practice.

The graduates can collect, analyze, interpret and evaluate relevant information from different sources based on problems and can take positions and make decisions. They are able to extend their knowledge and skills by themselves and can configure further learning processes. They learned to discuss knowledge from their own fields of expertise with colleagues, present it to an academic audience and to explain it in a non-technical way, to take exposed responsibility within a team, to lead a team and collaborators and to mobilize the skills of others and motivate others.

They can develop ideas and solutions for fundamental and unusual problems, conduct research and applied projects mainly independently, develop and work on scientific problems by themselves and conduct the critical analysis, development and synthesis of novel and complex ideas.

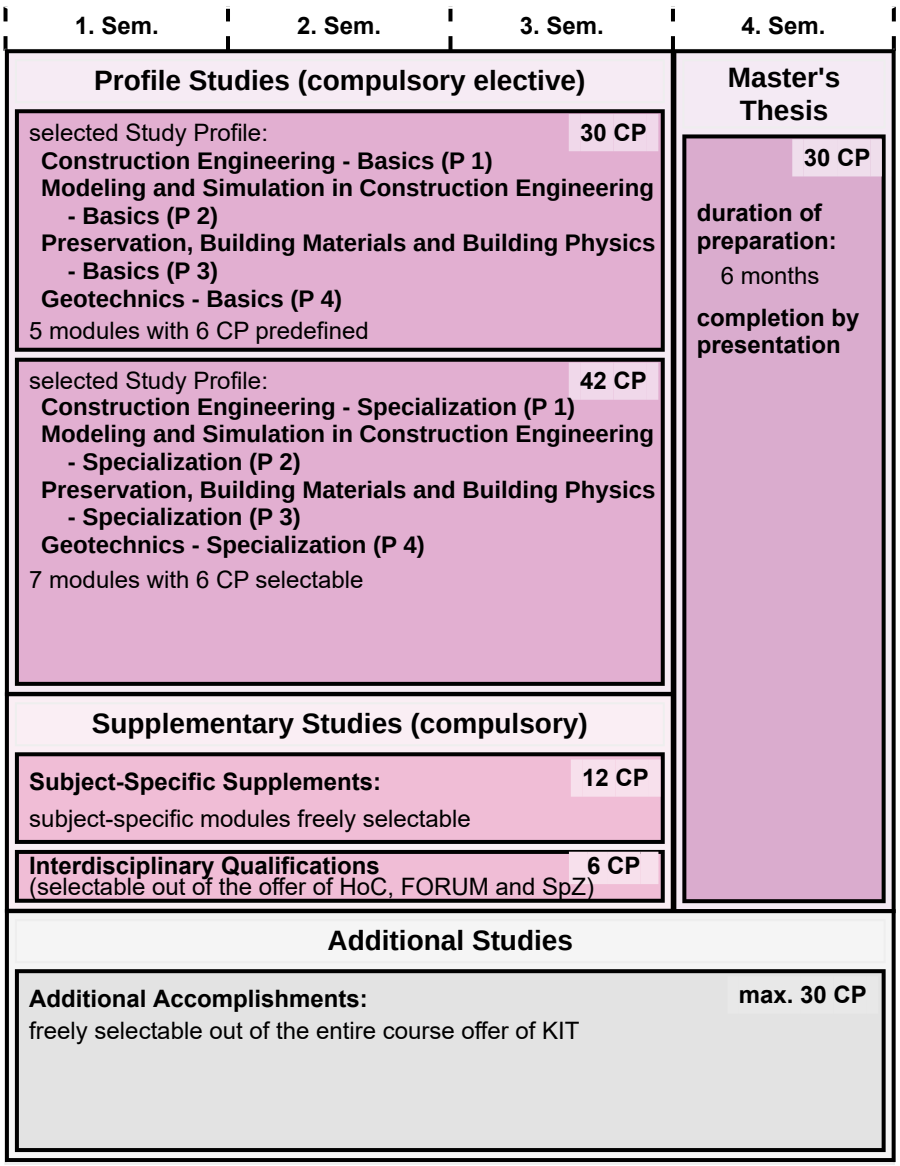
2.2 Structure of the master degree program

The master degree program ’Funktionaler und Konstruktiver Ingenieurbau - Engineering Structures’ comprises 120 credit points (CP). It is subdivided into a compulsory elective block, the **Profile Studies** (72 CP), a compulsory block, the **Supplementary Studies** (18 CP), and the **Master's Thesis** (30 CP). In the Profile Studies one of the **Study Profiles** must be selected:

I. Construction Engineering
II. Modeling and Simulation in Construction Engineering
III. Building Preservation, Building Materials and Building Physics
IV. Geotechnics

The focus of these study profiles on a specific field is defined by the corresponding modules (s. Tab. 1 - 4) assigned according to the different characteristics of the professional profile. Each profile has two compulsory elective subjects. In the one compulsory elective subject (30 CP) five specific **basic modules** are predefined. The other compulsory elective subject (42 CP) is characterized by the corresponding module catalog with the **specialization modules**. All modules in the master degree program are integrated into these study profiles and cover 6 CP. Several modules are assigned to several profiles.

The Supplementary Studies cover the two compulsory subjects **Subject-Specific Supplements** (12 CP) and **Interdisciplinary Qualifications** (6 CP). Within the subject Subject-Specific Supplements all modules not yet selected or predefined (depending on selected profile) can be freely selected as **Supplementary Modules**. The interdisciplinary qualifications can basically be obtained with courses 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) and can be freely selected.



2.2.1 Profile 'Construction Engineering' (P1)

The graduates of the qualification profile 'Construction Engineering' can apply their scientifically based knowledge on material behavior, particularly of concrete, steel and timber, to the dimensioning and constructive design of all kinds of structures and structural component connections. They are able to use and develop the available models (analytical and numerical solution methods as well as their error analysis).

Table 1: Modules in Profile Construction Engineering

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(engi)					W	S		
Modules Construction Engineering - Basics (predefined)								
M101:	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
M201:	Steel and Composite Structures	6	Steel and Composite Structures (G)	L/E		2/2	ngA wE	2 4
M102:	Bracing and Stability in Reinforced Concrete	6	Bracing and Stability in Reinforced Concrete (G)	L/E		2/2	wE	6
M401:	Non-linear Analysis of Beam Structures	6	Non-linear Analysis of Beam Structures (G)	L/E	2/2		wE	6
M601:	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 basic modules		**30**			**12**	**8**		
Modules Construction Engineering - Specialization (selectable)								
M202:	Material Science, Welding and Fatigue **#)**	6	Material Science, Welding and Fatigue (G)	L/E		4	wE	6
M301:	Timber Structures **#)**	6	Timber Structures (G)	L/E		2/2	wE	6
M702:	Earthworks and Foundation Engineering [4] **#)**	6	Foundation Types (G)	L/E	2		ngA wE	2 4
			Basics in Earthworks and Embankment Dams (G)	L/E	2			
M715:	Geotechnical Constructions [2,5] **#)**	6	Foundation Types (G)	L/E	2		wE	6
			Foundations and Retaining Structures (G)	L/E		2	wE	6
M103:	Basics of Prestressed Concrete	6	Basics of Prestressed Concrete (G)	L/E		2/2	wE	6
M104:	Solid Construction Bridges	6	Solid Construction Bridges (G)	L/E	2/2		ngA [7] wE	1 5
M105:	Applied Dynamics of Structures [1]	6	Applied Dynamics of Structures (G)	L/E		1/1	wE	6
			Earthquake Engineering (G)	L/E	1/1			
M107:	Concrete Construction Technology	6	Concrete Technology (G)	L/E	3		oE	6
			Modelling in Concrete Technology (E)	L	1			
M108:	Durability and Service Life Design	6	Corrosion Processes and Life Time (G)	L/E	3		oE	6
			Analytic Methods (G)	L	1			
M109:	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		
M110:	Building Physics I	6	Applied Building Physics (G)	L	2		ngA oE	1 2
			Building Technology (G)	L	2		oE	3
M111:	Building Physics II	6	Practical Noise Control (G)	L		2	oE	3
			Practical Fire Protection (G)	L		2	oE	3

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

Table 1: Modules in Profile Construction Engineering (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(engi)					W	S		
M112:	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			
M113:	Fire Behavior of Building Materials, Components and Constructions	6	Fire Behavior of Building Materials, Components and Constructions (G)	L/E	2/2		oE	6
M114	Construction Chemistry II [3)]	6	Construction Chemistry II (G)	L/E		2/2	oE	6
M203:	Construction of Steel and Composite Bridges	6	Construction of Steel and Composite Bridges (G)	L/E		2/2	wE	6
M204:	Hollow Section Structures	6	Hollow Section Structures **) (G)	L/E	2/2		oE	6
M205:	Glass, Plastic and Cable Structures	6	Glass, Plastic and Cable Structures (G)	L/E	3/1		oE	6
M206:	Tank Construction	6	Tank Construction (G)	L/E	3/1		EoT oE	3 3
M207:	Digital Planning and Building Information Modeling	6	Digital Planning and Building Information Modeling (G)	L/E	4		EoT	6
M208:	Design and Construction in Metal and Lightweight Structures [6a)]	6	Design and Construction in Metal and Lightweight Structures (G)	L/E	4		EoT	6
M209:	Building Preservation and Innovations in Metal and Lightweight Structures [6b)]	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
M603:	Building Preservation of Steel and Timber Structures [6c)]	6	Building Preservation in Steel Structures (G)	L	2		wE	3
			Building Preservation in Timber Structures (G)	L/E	2		wE	3
M604:	Innovations and Developments in Steel and Timber Structures [6c)]	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
M303:	Timber Structures: Materials and Appropriate Design [6d)]	6	Timber Structures: Materials and Appropriate Design (G)	L/E	4		oE	6
M304:	Building Preservation and Innovations in Timber Structures [6b)]	6	Building Preservation in Timber Structures (G)	L/E	2		wE	3
			Innovations and Developments Timber Structures (G)	L/E	2		oE	3
M305:	Interdisciplinary Design of Timber Structures	6	Interdisciplinary Design of Timber Structures ***) (G)	L/E		4	EoT	6
M402:	Computational Analysis of Structures	6	Computational Analysis of Structures (G)	L/E		2/2	ngA [7)] wE	2 4
M403:	FE-Applications in Practical Engineering	6	FE-Applications in Practical Engineering (G)	L/E		4	EoT	6
M404:	Shell Structures and Stability of Structures	6	Shell Structures (G)	L/E		1/1	ngA [7)] oE	2 4
			Stability of Structures (G)	L/E		1/1		
M405:	Numerical Methods in Structural Analysis	6	Numerical Methods in Structural Analysis (G)	L/E	4		oE	6
M406:	Non-linear Analysis of Surface Structures	6	Non-linear Analysis of Surface Structures (G)	L/E	2/2		oE	6

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

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

Table 1: Modules in Profile Construction Engineering (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(engi)					W	S		
M407:	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		
M502:	Fracture and Damage Mechanics	6	Fracture and Damage Mechanics (G)	L/E		2/2	oE	6
M517:	Practical Course in Experimental Solid Mechanics [2)]	6	Basics of Experimental Solid Mechanics (G)	P	2	2	ngA [7)]	3
			Advanced Experimental Solid Mechanics (G)	P		2	ngA [7)] oE	3
M518:	Mechanics of Composite Materials	6	Mechanics of Planar Laminates (G)	L	2		oE	3
			Micromechanics of Heterogeneous Solids (G)	L		2	oE	3
M519:	Practical FE Analyses in Strength Analysis	6	Practical FE Analyses in Strength Analysis (G)	L/E	2/2		ngA [7)] oE	1 5
M707:	Applied Geotechnics [4)]	6	Foundations and Retaining Structures (G)	L/E		2	wE	6
			Special Foundation Engineering and Design (G)	L/E		2		
sum specialization modules		**210**			**76**	**66**		

explanations to Table 1:

in general:

LC	learning control
CP	credit point
HpW / SWS	hours per week
W / S	winter term / summer term
G / E	language German / English
#)	**Taking the modules M202, M301 and M702 or M715 (alternatively) is also mandatory in Profile Construction Engineering and can only be exchanged by taking other compulsory elective modules in agreement with the mentor.**
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 M715.
5)	Module must not be selected together with module M702 or module 707 and not as supplementary module.
6a)	Module must not be selected together with module M602 not offered any more.
6b)	Module must not be selected together with the modules M603 and M604.
6c)	Module must not be selected together with the modules M209 and M304.
6d)	Module must not be selected together with the modules M602 and M302 not offered any more.

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 [7)]	not graded accomplishment as examination prerequisite

2.2.2 Profile 'Modeling and Simulation in Construction Engineering' (P2)

The graduates of the qualification profile 'Modeling and Simulation in Construction Engineering' have scientifically based competence to develop theoretical-numerical modeling and simulation techniques for complex and innovative problems in construction engineering and to apply these. This comprises extensive knowledge on modern simulation techniques (particularly finite element methods) for the numerical analysis of engineering problems which includes a mechanic/static description of non-linear material behavior in construction, the complex static and dynamic load-bearing behavior of structures as well as structural-physical processes.

Table 2: Modules in Profile Modeling and Simulation in Construction Engineering

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(engi)					W	S		
Modules Modeling and Simulation in Construction Engineering - Basics (predefined)								
M101:	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
M401:	Non-linear Analysis of Beam Structures	6	Non-linear Analysis of Beam Structures (G)	L/E	2/2		wE	6
M601:	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
M501:	Basics of Finite Elements	6	Basics of Finite Elements (G)	L/E	2/2		ngA oE	1 5
M402:	Computational Analysis of Structures	6	Computational Analysis of Structures (G)	L/E		2/2	ngA [4] oE	2 4
sum basic modules		**30**			**16**	**4**		
Modules Modeling and Simulation in Construction Engineering - Specialization (selectable)								
M102:	Bracing and Stability in Reinforced Concrete	6	Bracing and Stability in Reinforced Concrete (G)	L/E		2/2	wE	6
M107:	Concrete Construction Technology	6	Concrete Technology (G)	L/E	3		oE	6
			Modelling in Concrete Technology (E)	L	1			
M112:	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			
M201:	Steel and Composite Structures	6	Steel and Composite Structures (G)	L/E		2/2	ngA wE	2 4
M202:	Material Science, Welding and Fatigue	6	Material Science, Welding and Fatigue (G)	L/E		4	wE	6
M206:	Tank Construction	6	Tank Constructionu (G)	L/E	3/1		EoT oE	3 3
M403:	FE-Applications in Practical Engineering	6	FE-Applications in Practical Engineering (G)	L/E		4	EoT	6
M404:	Shell Structures and Stability of Structures	6	Shell Structures (G)	L/E		1/1	ngA [4] oE	2 4
			Stability of Structures (G)	L/E		1/1		
M405:	Numerical Methods in Structural Analysis	6	Numerical Methods in Structural Analysis (G)	L/E	4		oE	6
M406:	Non-linear Analysis of Surface Structures	6	Non-linear Analysis of Surface Structures (G)	L/E	2/2		oE	6
M407:	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		

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

Table 2: Modules in Profile Modeling and Simulation in Construction Engineering (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(engi)					W	S		
M502:	Fracture and Damage Mechanics	6	Fracture and Damage Mechanics (G)	L/E		2/2	oE	6
M503:	Material Models in Solid Mechanics	6	Material Models in Solid Mechanics (G)	L/E	2/2		oE	6
M512:	Finite Elements in Solid Mechanics	6	Finite Elements in Solid Mechanics (G)	L/E		2/2	oE	6
M513:	Numerical Structural Dynamics	6	Numerical Structural Dynamics (G)	L/E		4	oE	6
M514:	Modelling in Solid Mechanics	6	Modelling in Solid Mechanics (G)	L/E		4	oE	6
M515:	Contact Mechanics	6	Contact Mechanics (G)	L/E	2/2		oE	6
M516:	Continuum Mechanics and Wave Propagation [1,2)]	6	Continuum Mechanics (G)	L	2		oE	3
			Wave Propagation on Solids (G)	L		2	oE	3
M518:	Mechanics of Composite Materials [3)]	6	Mechanics of Planar Laminates (G)	L	2		oE	3
			Micromechanics of Heterogeneous Solids (G)	L		2	oE	3
M519:	Practical FE Analyses in Strength Analysis [3)]	6	Practical FE Analyses in Strength Analysis (G)	L/E	2/2		ngA [4)] oE	1 5
sum specialization modules		**120**			**36**	**44**		

explanations to Table 2:

in general:

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)	Module must not be selected together with module M704 and module M507 not offered anymore.
3)	Module will be offered newly as from winter term 2024/25.

type of course:

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

type of learning control:

wE	written examination
oE	oral examination
EoT	examination of other type
ngA	not graded accomplishment
ngA 4)	not graded accomplishment as examination prerequisite

2.2.3 Profile 'Building Preservation, Building Materials and Building Physics' (P3)

The graduates of the qualification profile 'Building Preservation, Building Materials and Building Physics' can apply their scientifically based knowledge about material behavior, particularly of concrete, steel and timber, to problems of building preservation. With the extensive knowledge of relevant causes and procedures of damaging processes in concrete, masonry, steel and timber constructions as well as in-depth knowledge of the theoretical principles of structural-physical processes they are able to work independently on concepts of preservation, strengthening and reinforcement as well as on restoration proposals considering conditions related to energy and building technology, building physics and building materials as well as considering relevant regulations.

Table 3: Modules in Profile Building Preservation, Building Materials and Building Physics

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(engi)					W	S		
Modules Building Preservation, Building Materials and Building Physics - Basics (predefined)								
M109:	Building Preservation of Concrete and Masonry Constructions	6	Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions (G)	L/E		2/1	ngA oE	15
			Building Analysis (G)	L		1		
M603:	Building Preservation of Steel and Timber Structures [1)]	6	Preservation in Steel Structures (G)	L	2		wE	3
			Preservation of Timber Structures (G)	L/E	2		wE	3
M107:	Concrete Construction Technology	6	Concrete Technology (G)	L/E	3		oE	6
			Modelling in Concrete Technology (E)	L	1			
M202:	Material Science, Welding and Fatigue	6	Material Science, Welding and Fatigue (G)	L/E		4	wE	6
M110:	Building Physics I	6	Applied Building Physics (G)	L	2		ngA oE	12
			Building Technology (G)	L	2		oE	3
sum basic modules		**30**			**12**	**8**		
Modules Building Preservation, Building Materials and Building Physics - Specialization (selectable)								
M101:	Design and Construction of Components in Reinforced Concrete **#)**	6	Design and Construction of Components in Reinforced Concrete (G)	L/E	2/2		ngA oE	24
M303:	Timber Structures: Materials and Appropriate Design [2)] **#)**	6	Timber Structures: Materials and Appropriate Design (G)	L/E	4		oE	6
M102:	Bracing and Stability in Reinforced Concrete	6	Bracing and Stability in Reinforced Concrete (G)	L/E		2/2	wE	6
M201:	Steel and Composite Structures	6	Steel and Composite Structures (G)	L/E		2/2	ngA wE	24
M601:	Surface Structures and Dynamics of Structures	6	Surface Structures (G)	L	2		ngA wE	12
			Dynamics of Structures *) (G)	L	2		ngA wE	12
M402:	Computational Analysis of Structures	6	Computational Analysis of Structures (G)	L/E		2/2	ngA [3)] oE	24
M401:	Non-linear Analysis of Beam Structures	6	Non-linear Analysis of Beam Structures (G)	L/E	2/2		wE	6
M503:	Material Models in Solid Mechanics	6	Material Models in Solid Mechanics (G)	L/E	2/2		oE	6
M501:	Basics of Finite Elements	6	Basics of Finite Elements (G)	L/E	2/2		ngA oE	15
M111:	Building Physics II	6	Practical Noise Control (G)	L		2	oE	3
			Practical Fire Protection (G)	L		2	oE	3
M108:	Durability and Service Life Design	6	Corrosion Processes and Life Time (G)	L/E	3		oE	6
			Analytic Methods (G)	L	1			

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

Table 3: Modules in Profile Building Preservation, Building Materials and Building Physics (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(engi)					W	S		
M112:	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			
M205:	Glass, Plastic and Cable Structures	6	Glass, Plastic and Cable Structures (G)	L/E	3/1		oE	6
M801:	Upgrading of Existing Buildings and Energetic Refurbishment	6	Upgrading of Existing Buildings (G)	L/E	3		EoT	1,5
			Energetic Refurbishment (G)	L	1		wE	4,5
M305:	Interdisciplinary Design of Timber Structures	6	Interdisciplinary Design of Timber Structures **) (G)	L/E		4	EoT	6
M113:	Fire Behavior of Building Materials, Components and Constructions	6	Fire Behavior of Building Materials, Components and Constructions (G)	L/E	2/2		oE	6
sum specialization modules		**96**			**44**	**20**		

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

explanations to Table 3:

in general:

LC	learning control
CP	credit point
HpW / SWS	hours per week
W / S	winter term / summer term
G / E	language German / English
#)	**Taking the modules M101 and M303 is also mandatory in Profile Building Preservation, Building Materials and Building Physic and can only be exchanged by taking other compulsory elective modules in agreement with the mentor.**
1)	Because the module is a basic module the modules M209 and M304 cannot be selected.
2)	Module must not be selected together with the modules M602 and M302 not any more offered.

type of course:

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

type of learning control:

wE	written examination
oE	oral examination
EoT	examination of other type
ngA	not graded accomplishment
ngA 3)	not graded accomplishment as examination prerequisite

2.2.4 Profile 'Geotechnics' (P4)

The graduates of the qualification profile 'Geotechnics' can apply their scientifically based knowledge on the mechanic-hydraulic behavior of soil and hard rock and the mathematically and physically precise description of material laws, including numerical tools, planning decisions, dimensioning and constructive design of geotechnical structures in foundation engineering and tunneling. They are able to critically select and evaluate the relevant construction methods of special underground engineering as well as the frequently used construction materials (concrete, steel, foundation improving materials and geosynthetics) considering relevant regulations, construction management organization, economics and long-term performance focused on solving problems.

Table 4: Modules in Profile Geotechnics

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(engi)					W	S		
Modules Geotechnics - Basics (predefined)								
M701:	Theoretical Soil Mechanics	6	Theoretical Soil Mechanics (G)	L/E		4	oE	6
M702:	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			
M703:	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		
M704:	Basics in Numerical Modelling [3)]	6	Continuum Mechanics (G)	L	2		oE	3
			Numerics in Geotechnics (G)	L	2		oE	3
M716:	Rock Mechanics and Rock Engineering [2)]	6	Rock Mechanics and Rock Engineering (G)	L/E		4	ngA wE	1 5
M101:	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 basic modules		**30**			**12**	**8**		
Modules Geotechnics - Specialization (selectable)								
M705:	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			
M706:	Ground Investigation	6	Soil Mechanical Laboratory Exercises (G)	E		2	oE	6
			Geomechanical Field Exercise (G)	E		2		
M707:	Applied Geotechnics	6	Foundations and Retaining Structures (G)	L/E		2	wE	6
			Special Foundation Engineering and Design (G)	L/E		2		
M708:	Ground Water and Earth Dams	6	Geotechnical Ground Water Problems (G)	L/E		2	oE	6
			Embankment Dams (Advanced) (G)	L/E		2		
M709:	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			
M710:	Numerical Modelling in Geotechnics	6	Exercises in Numerical Modelling (G)	E		2	oE	6
			FEM Applications in Geotechnical Modelling (G)	L		2		
M711:	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			

(continuing next page)

Table 4: Modules in Profile Geotechnics (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(engi)					W	S		
M712:	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
M713:	Environmental Geotechnics	6	Landfills (G)	L/E	2		oE	3
			Brownfield Sites - Investigation, Evaluation, Rehabilitation (G)	L	2		oE	3
M714:	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
M717:	Tunneling and Underground Construction [2)]	6	Tunneling and Underground Construction (G)	L/E	4		wE	6
sum specialization modules		**60**			**20**	**22**		

explanations to Table 4:

in general:

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 M703 and M709 not offered anymore.
3)	Because the module is basic module the module M516 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
EoT	examination of other type
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. This includes selecting one of the three study profiles 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 § 17 a). The mentor has to be a professor of the KIT Department Civil Engineering, Geo and Environmental Sciences and to be involved with one module in the selected profile. Possible mentors are:

Profile 1: Prof. P. Betsch, Prof. F. Dehn, Prof. P. Dietsch, Prof. S. Freitag, Prof. T. Seelig, Prof. A. Stark, Prof. H. Stutz, Prof. T. Ummenhofer, PD M. Frese, PD C. Sandhaas
Profile 2: Prof. P. Betsch, Prof. F. Dehn, Prof. S. Freitag, Prof. T. Seelig, Prof. A. Stark, Prof. T. Ummenhofer
Profile 3: Prof. P. Betsch, Prof. F. Dehn, Prof. P. Dietsch, Prof. S. Freitag, Prof. K. Lennerts, Prof. T. Seelig, Prof. A. Stark, Prof. T. Ummenhofer, PD M. Frese, PD C. Sandhaas
Profile 4: Prof. A. Stark, Prof. H. Stutz

The selected profile determines the five **basic modules**. The seven **specialization modules** are chosen from the corresponding module catalog (see Tab. 1 - 4). Within the Supplementary Studies two **subject-specific modules** are selected freely from the master degree program 'Funktionaler und Konstruktiver Ingenieurbau - Engineering Structures' or any related program.

The form for selecting modules within the study profiles 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 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 module 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, Profile 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 of the module selection are generally possible.

2.4 Interdisciplinary Qualifications

Students compile their own module **Interdisciplinary Qualifications** (comp. 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 at 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 permit or approve further suitable courses as interdisciplinary qualifications beyond the mentioned options. This requires the mentor's support.

Registration for courses on key competences of HoC and FORUM (formerly ZAK) as well as to the language courses of SpZ is done directly at HoC, FORUM (formerly ZAK) or SpZ. The examination 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-ZAK-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 attending the examination, especially 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 requirements 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-engineering-structures.php; *in German*), and from the Examination Committee Master Civil Engineering or the 'Fachschaft' (student council).

2.7 Students with disability or chronic disease

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 44; *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 the selected profile (comp. ER/SPO § 14). The topic of the master's thesis has to be assigned by a professor of the KIT Department of Civil Engineering, Geo- and Environmental Sciences. 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 Engineering Structures. 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 German or English. 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
S	summer term	Sommersemester
Sem.	semester	Semester
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:

Rock Mechanics and Tunneling [engiM703-FMTUB]

Rock Engineering and Underground Construction [engiM709-FELSHOHL]

modules newly offered as from summer term 2025:

Construction Chemistry II [engiM114-BCHEM2]

Rock Mechanics and Rock Engineering [engiM716-FMFB]

Tunneling and Underground Construction [engiM717-TBUHB]

5 Modules

M 5.1 Module: Design and Construction of Components in Reinforced Concrete (engiM101-BEMISTB) [M-BGU-100033]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Construction Engineering
Profile Basics / Modeling and Simulation in Construction Engineering
Profile Basics / Geotechnics
Profile Specialization / Building Preservation, Building Materials and Building Physics

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

M 5.2 Module: Bracing and Stability in Reinforced Concrete (engiM102-STABISTB) [M-BGU-100003]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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 [engiM101-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 5.3 Module: Basics of Prestressed Concrete (engiM103-GDLSPANNB) [M-BGU-100036]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
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'

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 5.4 Module: Solid Construction Bridges (engiM104-MASSBRUE) [M-BGU-100037]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
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 [engiM103-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 5.5 Module: Applied Dynamics of Structures (engiM105-BAUDYN) [M-BGU-100038]

Responsible: Prof. Dr.-Ing. Alexander Stark
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
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 5.6 Module: Concrete Construction Technology (engiM107-BETONTECH) [M-BGU-100056]

Responsible: Prof. Dr.-Ing. Frank Dehn
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Building Preservation, Building Materials and Building Physics
Profile Specialization / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
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 5.7 Module: Durability and Service Life Design (engiM108-DAUERLEB) [M-BGU-100057]

Responsible: Dr.-Ing. Michael Vogel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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 5.8 Module: Building Preservation of Concrete and Masonry Constructions (engiM109-BBM) [M-BGU-100058]

Responsible: Dr.-Ing. Michael Vogel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Building Preservation, Building Materials and Building Physics
Profile Specialization / Construction Engineering
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 5.9 Module: Building Physics I (engiM110-BAUPH-I) [M-BGU-100059]

Responsible: Prof. Dr.-Ing. Frank Dehn
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Building Preservation, Building Materials and Building Physics
Profile Specialization / Construction Engineering
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-100039	Applied Building Physics	2 CR	Altmann
T-BGU-100040	Building Technology	3 CR	Wirth
T-BGU-100177	Student Research Project 'Building Physics I'	1 CR	Altmann, Vogel, Wirth

Competence Certificate
- 'Teilleistung' T-BGU-100177 with not graded accomplishment according to § 4 Par. 3
- '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 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: 10 h
- preparation of student research project 'Building Physics I' (not graded accomplishment): 40 h
- examination preparation Applied Building Physics (partial exam): 30 h
- preparation and follow-up lectures Building Technology: 10 h
- examination preparation Building Technology (partial exam): 30 h

total: 180 h

Recommendation
none

M 5.10 Module: Building Physics II (engiM111-BAUPH-II) [M-BGU-100060]

Responsible: Prof. Dr.-Ing. Frank Dehn
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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 5.11 Module: Materials Testing and Measuring Techniques (engiM112-MATPRÜF) [M-BGU-100061]

Responsible: Dr.-Ing. Nico Herrmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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

M 5.12 Module: Fire Behavior of Building Materials, Components and Constructions (engiM113-BRAND) [M-BGU-105936]

Responsible: Prof. Dr.-Ing. Frank Dehn
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering (Usage from 4/1/2023)
Profile Specialization / Building Preservation, Building Materials and Building Physics (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 5.13 Module: Construction Chemistry II (engiM114-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: Profile Specialization / Construction Engineering (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 5.14 Module: Steel and Composite Structures (engiM201-STAHLBAU) [M-BGU-100034]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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.

M 5.15 Module: Material Science, Welding and Fatigue (engiM202-SCHWEISSEN) [M-BGU-100039]

Responsible: Dr.-Ing. Philipp Weidner
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Building Preservation, Building Materials and Building Physics
Profile Specialization / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
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 5.16 Module: Construction of Steel and Composite Bridges (engiM203-STAHLBRÜ) [M-BGU-100040]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
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 [engiM201-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 5.17 Module: Hollow Section Structures (engiM204-HOHLPROFIL) [M-BGU-100004]

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
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 5.18 Module: Glass, Plastic and Cable Structures (engiM205-GlaKunSe) [M-BGU-100041]

Responsible: Dr.-Ing. Daniel Ruff
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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 5.19 Module: Tank Construction (engiM206-BEHBAU) [M-BGU-100580]

Responsible: Dr.-Ing. Peter Knödel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
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 [engiM601-FTW-BD] as well as Steel and Composite Structures [engiM201-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 5.20 Module: Digital Planning and Building Information Modeling (engiM207-DIGIPLAN) [M-BGU-105135]

Responsible: Dr.-Ing. Tim Zinke
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
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-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 5.21 Module: Design and Construction in Metal and Lightweight Structures (engiM208-ENTW-MLB) [M-BGU-105370]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering (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 [engiM602-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 [engiM201-STAHLBAU]

M 5.22 Module: Building Preservation and Innovations in Metal and Lightweight Structures (engiM209-BWE-INNO-MLB) [M-BGU-105373]

Responsible: Prof. Dr.-Ing. Thomas Ummenhofer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering (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 [engiM603-BSH] as well as Innovations and Developments in Steel and Timber Structures [engiM604-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 5.23 Module: Timber Structures (engiM301-HB) [M-BGU-100044]

Responsible: Prof. Dr.-Ing. Philipp Dietsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
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 5.24 Module: Timber Structures: Materials and Appropriate Design (engiM303-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: Profile Specialization / Construction Engineering (Usage from 4/1/2020)
Profile Specialization / Building Preservation, Building Materials and Building Physics (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 [engiM302-HHW] as well as Structures in Steel and Timber [engiM602-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 [engiMM301-HB]

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

M 5.25 Module: Building Preservation and Innovations in Timber Structures (engiM304-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: Profile Specialization / Construction Engineering (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 [engiM603-BSH] as well as Innovations and Developments in Steel and Timber Structures [engiM604-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 [engiMM301-HB]

Literature
lecture accompanying documents

M 5.26 Module: Interdisciplinary Design of Timber Structures (engiM305-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: Profile Specialization / Construction Engineering (Usage from 10/1/2022)
Profile Specialization / Building Preservation, Building Materials and Building Physics (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);

strongly recommended:
module Timber Structures [engiM301-HB] or module "Timber Structures: Materials and Appropriate Design" [engiM303-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 5.27 Module: Non-linear Analysis of Beam Structures (engiM401-NILI-STAB) [M-BGU-100046]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Construction Engineering
Profile Basics / Modeling and Simulation in Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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 5.28 Module: Computational Analysis of Structures (engiM402-CTWM) [M-BGU-100047]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Modeling and Simulation in Construction Engineering
Profile Specialization / Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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.

M 5.29 Module: FE-Applications in Practical Engineering (engiM403-FE-PRAXIS) [M-BGU-100048]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
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 [engiM601-FTW-BD]

Literature
to be announced in the course

M 5.30 Module: Shell Structures and Stability of Structures (engiM404-STABISHELL) [M-BGU-100049]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
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 5.31 Module: Numerical Methods in Structural Analysis (engiM405-FEM-BS) [M-BGU-100050]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
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 [engiM402-CTWM]

Literature
lecture notes Computational Analysis of Structures

M 5.32 Module: Non-linear Analysis of Surface Structures (engiM406-NILI-FTW) [M-BGU-100051]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
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 [engiM402-CTWM]

Literature
lecture notes

M 5.33 Module: Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis (engiM407-KNN) [M-BGU-105929]

Responsible: Prof. Dr.-Ing. Steffen Freitag
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering (Usage from 4/1/2022)
Profile Specialization / Modeling and Simulation in Construction Engineering (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

M 5.34 Module: Basics of Finite Elements (engiM501-GRUNDFE) [M-BGU-100052]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Modeling and Simulation in Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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 5.35 Module: Fracture and Damage Mechanics (engiM502-BRUCHMECH) [M-BGU-100053]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Modeling and Simulation in Construction Engineering
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 5.36 Module: Material Models in Solid Mechanics (engiM503-MATTHEO) [M-BGU-100054]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Modeling and Simulation in Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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 5.37 Module: Finite Elements in Solid Mechanics (engiM512-FEFKM) [M-BGU-100578]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Modeling and Simulation in Construction Engineering
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 [engiM501-GRUNDFE]

M 5.38 Module: Numerical Structural Dynamics (engiM513-NUMSTRDYN) [M-BGU-100579]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Modeling and Simulation in Construction Engineering
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 [engiM501-GRUNDFE]

M 5.39 Module: Modeling in Solid Mechanics (engiM514-MODFEST) [M-BGU-101673]

Responsible: Prof. Dr.-Ing. Peter Betsch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Modeling and Simulation in Construction Engineering
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 [engiM501-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 5.40 Module: Contact Mechanics (engiM515-KONTMECH) [M-BGU-104916]

Responsible: Dr.-Ing. Marlon Franke
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Modeling and Simulation in Construction Engineering
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-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 [engiM501-GRUNDFE]

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

M 5.41 Module: Continuum Mechanics and Wave Propagation (engiM516-KMWAVE) [M-BGU-106115]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Modeling and Simulation in Construction Engineering (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 [engiM704-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 (engiM517-PRAKTFKM) [M-BGU-106116]

Responsible: Dr.-Ing. Martin Helbig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering (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

M 5.43 Module: Mechanics of Composite Materials (engiM518-MVW) [M-BGU-106817]

Responsible: Prof. Dr.-Ing. Thomas Seelig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering (Usage from 10/1/2024)
Profile Specialization / Modeling and Simulation in Construction Engineering (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

M 5.44 Module: Practical FE Analyses in Strength Analysis (engiM519-FEAFEST) [M-BGU-106818]

Responsible: Dr.-Ing. Martin Helbig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering (Usage from 10/1/2024)
Profile Specialization / Modeling and Simulation in Construction Engineering (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 5.45 Module: Surface Structures and Dynamics of Structures (engiM601-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: Profile Basics / Construction Engineering
Profile Basics / Modeling and Simulation in Construction Engineering
Profile Specialization / Building Preservation, Building Materials and Building Physics
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-102467)

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 5.46 Module: Building Preservation of Steel and Timber Structures (engiM603-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: Profile Basics / Building Preservation, Building Materials and Building Physics
Profile Specialization / Construction Engineering
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 [engiM209-BWE-INNO-MLB] as well as Building Preservation and Innovations in Timber Structures [engiM304-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 [engiMM301-HB]

Literature
lecture accompanying documents

M 5.47 Module: Innovations and Developments in Steel and Timber Structures (engiM604-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: Profile Specialization / Construction Engineering (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 [engiM209-BWE-INNO-MLB] as well as Building Preservation and Innovations in Timber Structures [engiM304-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 [engiMM301-HB]

Literature
lecture accompanying documents

M 5.48 Module: Theoretical Soil Mechanics (engiM701-THEOBM) [M-BGU-100067]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Geotechnics
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 5.49 Module: Earthworks and Foundation Engineering (engiM702-ERDGB) [M-BGU-100068]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Geotechnics
Profile Specialization / Construction Engineering
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
This module must not be selected together with the module Geotechnical Constructions [engiM715-GEOKONSTR].

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-101674 - Geotechnical Constructions must not have been started.

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 5.50 Module: Basics of Numeric Modeling (engiM704-NUMGRUND) [M-BGU-100070]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Geotechnics
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 [engiM507-KONTIMECH] not offered anymore and not with the module Continuum Mechanics and Wave Propagation [engiM516-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 [engiM701-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 5.51 Module: Special Issues of Soil Mechanics (engiM705-SPEZBM) [M-BGU-100005]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Geotechnics
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 [engiM705-THEOBM]

M 5.52 Module: Ground Investigation (engiM706-BERKUND) [M-BGU-100071]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Geotechnics
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 5.53 Module: Applied Geotechnics (engiM707-ANGEOTEC) [M-BGU-100072]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Profile Specialization / Geotechnics
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
This module must not be selected together with the module Geotechnical Constructions [engiM715-GEOKONSTR].

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-101674 - Geotechnical Constructions must not have been started.

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 [engiM702-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 5.54 Module: Ground Water and Earth Dams (engiM708-GWDAMM) [M-BGU-100073]

Responsible: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Geotechnics
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 [engiM702-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 5.55 Module: Numerical Modelling in Geotechnics (engiM710-NUMMOD) [M-BGU-100075]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Geotechnics
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 [engiM704-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 5.56 Module: Geotechnical Testing and Measuring Technology (engiM711-VERSMESS) [M-BGU-100076]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Geotechnics
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 (engiM706-BERKUND)

M 5.57 Module: Special Underground Engineering (engiM712-SPEZTIEF) [M-BGU-100078]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Geotechnics
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 5.58 Module: Environmental Geotechnics (engiM713-UMGEOTEC) [M-BGU-100079]

Responsible: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Geotechnics
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 5.59 Module: Coupled Geomechanic Processes (engiM714-GEKOPPRO) [M-BGU-100077]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Geotechnics
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 [engiM703-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 5.60 Module: Geotechnical Constructions (engiM715-GEOKONSTR) [M-BGU-101674]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Construction Engineering
Subject-Specific Supplements (Usage from 4/1/2021)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	2 terms	German	4	3

Mandatory			
T-BGU-111604	Foundation Types	3 CR	Stutz
T-BGU-111605	Foundations and Retaining Structures	3 CR	Stutz

Competence Certificate
- 'Teilleistung' T-BGU-111604 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-111605 with written examination according to § 4 Par. 2 No. 1

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

Prerequisites
This module must not be selected together with the modules Earthworks and Foundation Engineering [engiM702-ERDGB] or Applied Geotechnics [engiM707-ANGEOTEC].

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-100068 - Earthworks and Foundation Engineering must not have been started.
2. The module M-BGU-100072 - Applied Geotechnics 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):

- Foundation Types lecture/exercise: 30 h
- Foundations and Retaining Structures lecture/exercise: 30 h
- field trips: 10 h

independent study:

- preparation and follow-up lecture/exercises Foundation Types: 25 h
- examination preparation Foundation Types (partial examination): 30 h
- preparation and follow-up lecture/exercises Foundations and Retaining Structures: 25 h
- examination preparation Foundations and Retaining Structures (partial examination): 30 h

total: 180 h

Recommendation
basic knowledge of Soil Mechanics and Foundation Engineering

Literature

[1] Ernst & S. Schmidt, H.G. & Seitz, J. (1998), Grundbau , Bilfinger & Berger
[2] Triantafyllidis, Th. (1990), Planung und Bauausführung im Spezialtiefbau, Teil 1, Ernst & S.
[3] Seitz, J. & Schmidt, H.-G. (2000), Bohrpfähle Ernst & S.
[4] Weißenbach, A. (2001), Baugruben, Teil 1-3, Wiley
[5] Witt, J. (Hrsg.), Grundbau-Taschenbuch Teil 1-3, 7. Aufl. (2009), Ernst & Sohn
[6] EA Pfähle (2012), Deutsche Ges. f. Geotechnik, 2. Aufl. Ernst & S.
[7] EAB (2012), Deutsche Ges. f. Geotechnik, 5. Aufl., Ernst & S.

M 5.61 Module: Rock Mechanics and Rock Engineering (engiM716-FMFB) [M-BGU-107001]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Basics / Geotechnics (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' [engiM703-FMTUB] and 'Rock Engineering and Underground Construction' [engiM709-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

M 5.62 Module: Tunneling and Underground Construction (engiM717-TBUHB) [M-BGU-107002]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Geotechnics (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 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' [engiM703-FMTUB] and 'Rock Engineering and Underground Construction' [engiM709-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

M 5.63 Module: Upgrading of Existing Buildings and Energetic Refurbishment (engiM801-) [M-BGU-100108]

Responsible: Prof. Dr.-Ing. Kunibert Lennerts
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Profile Specialization / Building Preservation, Building Materials and Building Physics
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

M 5.64 Module: Module Master's Thesis (engiMSC-THESIS) [M-BGU-105184]

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

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

Mandatory			
T-BGU-110458	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 Key Competences [engiMW0-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 5.65 Module: Interdisciplinary Qualifications (engiMW0-UEQUAL) [M-BGU-105185]

Responsible: Studiendekan:in der KIT-Fakultät für Bauingenieur-, Geo- und Umweltwissenschaften
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Interdisciplinary Qualifications

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	pass/fail	Each term	2 terms	German/English	4	3

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-111635	Self Assignment HoC-FORUM-SpZ 1 not graded	2 CR	
T-BGU-111636	Self Assignment HoC-FORUM-SpZ 2 not graded	2 CR	
T-BGU-111637	Self Assignment HoC-FORUM-SpZ 3 not graded	2 CR	
T-BGU-112838	Self Assignment HoC-FORUM-SpZ 7 not graded	2 CR	
T-BGU-111638	Self Assignment HoC-FORUM-SpZ 4 graded	2 CR	
T-BGU-111639	Self Assignment HoC-FORUM-SpZ 5 graded	2 CR	
T-BGU-111640	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 'General Studies. Forum Science and Society' (FORUM, formerly 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'. 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 5.66 Module: Further Examinations (engiMZL) [M-BGU-102467]

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	2

Additional Examinations (Election: at most 30 credits)			
T-BGU-111044	Practical Exercises Dynamics of Structures	2 CR	Betsch

M 5.67 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-aktuellland 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: 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

T 6.2 Course: Applied Building Physics [T-BGU-100039]

Responsible: Frank Altmann
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100059 - Building Physics I

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	2	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
60 hours

T 6.3 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 6.4 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 6.5 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

T 6.6 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 6.7 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 6.8 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 6.9 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 6.10 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

T 6.11 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 6.12 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 6.13 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 6.14 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-100059 - 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, ✕ Cancelled

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
90 hours

T 6.15 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 6.16 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 6.17 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 6.18 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 6.19 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 6.20 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, × Cancelled

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.21 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 6.22 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

T 6.23 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, × Cancelled

Competence Certificate
structure and construction proposal, report appr. 20 pages, colloquium appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

Workload
180 hours

T 6.24 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 6.25 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 6.26 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 6.27 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 6.28 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 6.29 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 6.30 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 6.31 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 6.32 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 6.33 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 6.34 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 6.35 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 6.36 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 6.37 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 6.38 Course: Foundation Types [T-BGU-111604]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-101674 - Geotechnical Constructions

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 24/25	6251701	Foundation Types	2 SWS	Lecture / Practice (/	Stutz

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

Competence Certificate
written exam, 60 min.

Prerequisites
This exam must not be selected if one of the modules Earthworks and Foundation Engineering [engiM702-ERDGB] or Applied Geotechnics [engiM707-ANGEOTEC] was selected.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-100068 - Earthworks and Foundation Engineering must not have been started.
2. The module M-BGU-100072 - Applied Geotechnics must not have been started.

Recommendation
none

Annotation
none

Workload
90 hours

T 6.39 Course: Foundations and Retaining Structures [T-BGU-111605]

Responsible: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-101674 - Geotechnical Constructions

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
ST 2025	6251810	Foundations and Retaining Structures	2 SWS	Lecture / Practice (/	Stutz

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

Competence Certificate
written exam, 60. min.

Prerequisites
This exam must not be selected if one of the modules Earthworks and Foundation Engineering [engiM702-ERDGB] or Applied Geotechnics [engiM707-ANGEOTEC] was selected.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-BGU-100072 - Applied Geotechnics must not have been started.
2. The module M-BGU-100068 - Earthworks and Foundation Engineering must not have been started.

Recommendation
none

Annotation
none

Workload
90 hours

T 6.40 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 6.41 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 6.42 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 6.43 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 6.44 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 6.45 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 6.46 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 6.47 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 6.48 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 6.49 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 6.50 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 6.51 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-105185 - 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, 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 6.52 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-105185 - 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 6.53 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 6.54 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 6.55 Course: Master's Thesis [T-BGU-110458]

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-105184 - 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 6.56 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 6.57 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 6.58 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 6.59 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 6.60 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 6.61 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
Module 'Model Formation in Strength of Materials and Theory of Kinetic Stability for Structures' must not be selected already.

Recommendation
none

Annotation
none

Workload
180 hours

T 6.62 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 6.63 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 6.64 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 6.65 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 6.66 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 6.67 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 6.68 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-102467 - 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-102467)

Workload
50 hours

T 6.69 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 6.70 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 6.71 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 6.72 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 6.73 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 6.74 Course: Self Assignment HoC-FORUM-SpZ 1 not graded [T-BGU-111635]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105185 - 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 6.75 Course: Self Assignment HoC-FORUM-SpZ 2 not graded [T-BGU-111636]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105185 - 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 6.76 Course: Self Assignment HoC-FORUM-SpZ 3 not graded [T-BGU-111637]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105185 - 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 6.77 Course: Self Assignment HoC-FORUM-SpZ 4 graded [T-BGU-111638]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105185 - 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 6.78 Course: Self Assignment HoC-FORUM-SpZ 5 graded [T-BGU-111639]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105185 - 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 6.79 Course: Self Assignment HoC-FORUM-SpZ 6 graded [T-BGU-111640]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105185 - 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 6.80 Course: Self Assignment HoC-FORUM-SpZ 7 not graded [T-BGU-112838]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105185 - 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 6.81 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

T 6.82 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 6.83 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 6.84 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 6.85 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

T 6.86 Course: Student Research Project 'Building Physics I' [T-BGU-100177]

Responsible: Frank Altmann
Dr.-Ing. Michael Vogel
PD Dr.-Ing. Stephan Wirth

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

Part of: M-BGU-100059 - Building Physics I

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each winter term	1 terms	2

Events					
WT 24/25	6211909	Angewandte Bauphysik	2 SWS	Lecture / 🗣	Vogel, Dehn, Altmann

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

Competence Certificate
student research paper, 15-20 pages;

definition of a project available from lecturer

Prerequisites
none

Recommendation
none

Annotation
none

Workload
40 hours

T 6.87 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 6.88 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 6.89 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 6.90 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 6.91 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 6.92 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 6.93 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 6.94 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 6.95 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 6.96 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 6.97 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 6.98 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 6.99 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 6.100 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 6.101 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 6.102 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 6.103 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 6.104 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 6.105 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 6.106 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 6.107 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