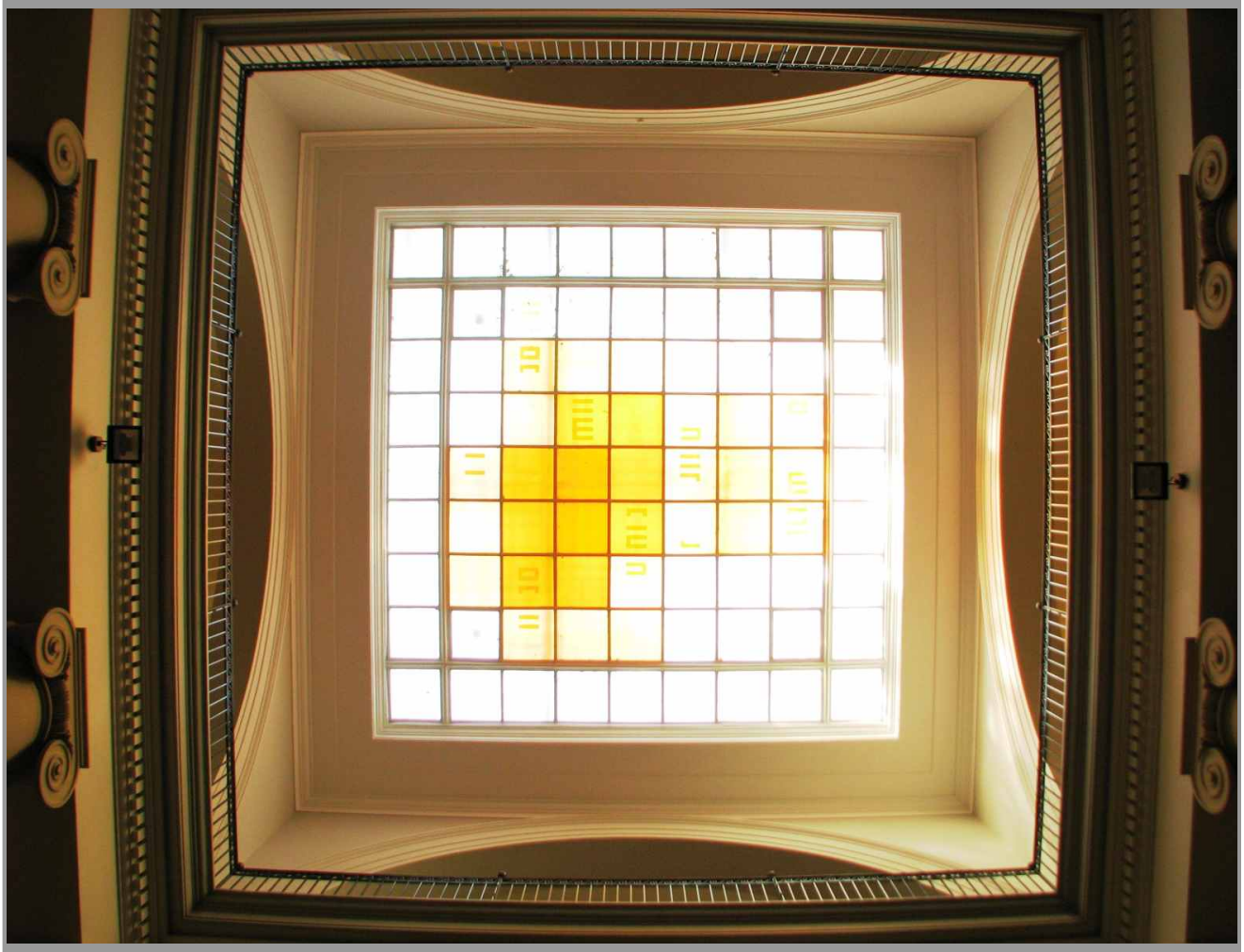
Karlsruhe Institute of Technology

Module Handbook
Civil Engineering ER/SPO 2013 (B.Sc.)

Summer Term 2014
Long version
Date: 14.03.2014

Department of Civil Engineering, Geo- and Environmental Sciences



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1 Structure of the Bachelor Programme in Civil Engineering (B.Sc.)

Course of Study Bachelor Curriculum Civil Engineering - according to statutes for amendment from 14.01.2014 - state 17.02.2014

		Subject	Module	Course	Module code	1. SS L	1. SS E	2. SS L	2. SS E	3. SS L	3. SS E	4. SS L	4. SS E	5. SS L	5. SS E	6. SS L	6. SS E	Σ HpW	LC	CP
Basic Studies	Compulsory	Mechanics	Statics of Rigid Bodies		bauiBGP01-TM1	3	2											5	wE, 100 min., OE	7
			Strength of Materials		bauiBGP02-TM2			4	2									6	wE, 100 min.	9
			Dynamics		bauiBGP03-TM3					2	2							4	wE, 100 min.	6
			Hydromechanics		bauiBGP04-HYDRO					2	2							4	wE, 100 min.	6
		Mathematics	Analysis and Linear Algebra		bauiBGP05-HM1	4	2											6	wE, 90 min.	9
			Integration and Multivariate Analysis		bauiBGP06-HM2			4	2									6	wE, 90 min.	9
			Applied Statistics		bauiBGP07-STATS			1	1									2	wE, 60 min.	3
			Differential Equations		bauiBGP08-HM3					2	1							3	wE, 60 min.	4
		Building Materials		Theory of Building Materials	bauiBGP09-BSTOF			1	1									2	wE, 60 min., OE	3
				Building Materials						4	2							6	wE, 120 min.	9
		Structural Design		Building Physics	bauiBGP10-BKONS			1	1									2	wE, 60 min., OE	3
				Stuctural Design						2	2							4	wE, 90 min.	6
			Planning Methodology		bauiBGP11-PLANM	1	1											2	wA, 2x30 min.	2
			Project Management		bauiBGP12-PMANG	1	1											2	wA, 45 min.	2
			Geology in Civil Engineering		bauiBGP13-GEOL			1	1									2	wA, 20 min.	2
			Introduction to Computer Programming I		bauiBGP14-BINF1	1	1											2	wA, 30 min. (prerequisite: cert. Prog.Excer.)	2
	SUM COMPULSORY					**17**		**20**		**21**								**58**		**82**
	Compulsory Elective		Key Qualifications		bauiBGW0-SQUAL			2		2								4		6
			Chemistry of Building Materials		bauiBGW1-BCHEM	1	1											2	wA, 30 min.	2
			Environmental Chemistry		bauiBGW2-UCHEM	1	1											2	wA, 30 min.	2
			Environmental Physics/ Energy		bauiBGW3-UPHYS	1	1											2	cert. exercises	2
			Technical Illustrations		bauiBGW5-TECDS	1	1											2	3 at home exercises, team exercise with present.	2
			Laboratory Course		bauiBGW6-LABOR	0	2											2	4 experiments	2
			Introduction to Computer Programming II		bauiBGW7-BINF2			1	1									2	wA, 30 min. (prerequisite: cert. Prog.Excer.)	2
	SUM COMPULSORY ELECTIVE (at least 4 CP to be elected + 6 CP Key Qualific.)					**10**		**2**										**4+12**		**10**
	SUM 1. - 3. SS					**19-21**		**22-24**		**23**								**66**		**92**
Basic Subject / Consolidation Studies	Compulsory	Structural Analysis		Structural Analysis I	bauiBFP1-BSTAT							2	2					4	wE, 120 min.	5
				Structural Analysis II										2	2			4	wE, 120 min.	5
		Structural Engineering	Basics of Reinforced Concrete	Basics of Reinforced Concrete I	bauiBFP2-KSTR.A									2	1			3	wE, 90 min.	4
				Basics of Reinforced Concrete II												1	1	2	wE, 60 min.	2
			Basics in Steel and Timber Structures	Basics in Steel Structures	bauiBFP3-KSTR.B									2	2			4	wE, 120 min.	9
				Basics in Timber structures										2	1			3		
		Water and Environment		Hydraulic Engineering and Water Management I	bauiBFP4-WASSER									2	1			3	wE, 150 min.	12
				Hydrology										1	1			2		
				Sanitary Environmental Engineering												1	1	2		
				Environmental Technologies												1	1	2		
		Mobility and Infrastructure		Spatial Planing and Planing Law	bauiBFP5-MOBIN							2	1					3	wE, 150 min. (prerequisite: 3 student research projects)	12
				Transportation								2	1					3		
				Design Basics in Highway Engineering								2	1					3		
		Technology and Management in Construction		Construction Technology	bauiBFP6-TMB							3	1					4	wE, 150 min.	11
				Economics in Construction Operation								2	1					3		
				Facility- and Real Estate Management								1	0					1		
		Geotechnical Engineering		Soil Mechanics I	bauiBFP7-GEOING							2	2					4	wE, 150 min.	9
				Foundation Engineering I										2	1			3		
			Bachelor Thesis		bauiBSC-THESIS											(7)		(7)	Thesis with presentation, 8 weeks	11
	SUM COMPULSORY											**25**		**22**		**6**		**53**		**80**
	Compulsory Elective		Partial Differential Equations		bauiBFW1-PDGL							1	1					2	wA, 60 min.	2
			Introduction to Continuum Mechanics		bauiBFW2-EKM											1	1	2	wA, 60 min.	2
			Physical Modelling in River Engineering		bauiBFW3-WASSVW											1	1	2	cert. experiment rep.	2
			Geotechnical Design		bauiBFW4-GEOPL											1	1	2	cert. student research project with colloqium	2
			Surveying		bauiBFW5-VERMK											1	1	2	cert. surveying exercise	2
			Project "Plan, Design, Engineering"		bauiBFW6-PPEK											0	2	2	team exercise	2
			Life Cycle Management		bauiBFW7-LZMAN											1	1	2	wA, 60 min.	2
			Basics of Track Guided Transport Systems		bauiBFW8-GSTS									2	0			2	wA, 60 min.	2
			Water Resources Management and Engineering Hydrology		bauiBFW9-WASSRM											1	1	2	wA	2
	SUM COMPULSORY ELECTIVE (at least 8 CP to be elected)											**2**		**2**		**14**		**18**		**8**
	SUM 4. - 6. SS											**25-27**		**22-24**		**10-14**		**61**		**88**
	MINIMUM SUM TOTAL 1. - 6. SS					**19**		**24**		**23**		**25**		**22**		**14**		**127**		**180**
Additional Studies	Elective		not elected Compulsory Elective Modules from the Basic and Basic Subject Studies															0-18		0-18
			5 advanced modules from Master Programme (max. 30 CP)															0-20		0-30
	MAXMUM SUM BACHELOR																	**147**		**210**

SS = subject-related semester
HpW = (contact) hours per week
LC = Learning Control
CP = credit point
wE = written exam
wA = written attestation
OE = orientation exam

Karlsruhe Institute of Technology

2 Useful tips and informative items

Structure of the Programme

The programme exists of several **subjects**, **modules** and **courses**. Every subject (e.g. mathematics or mechanics) is split into modules and every module itself exists of one or more interrelated courses and will be completed by one or more exams. The extent of every module is indicated by credit points (CP), which will be credited after the successful completion of the module.
The programme is structured in **Basic Studies** (semester 1-3) and **Basic Subjects** (consolidation studies, semester 4-6). Most of the modules of the Basic Studies as well as the Basic Subjects are **core modules**. Furthermore, a certain number of modules has to be selected freely from a specified catalogue as (**core elective modules**. In addition, courses on **Key Qualifications** has to be taken form the catalogue of the House of Competence (HoC) in extent of 6 credit points in total. Beyond that, additional accomplishments may be taken voluntarily (see below). This enables the students to customize content and time schedule of the interdisciplinary programme according to personal needs, interest and job perspective.

Module Handbook

The **module handbook** describes the modules belonging to the programme. It goes into:

- the structure of the modules
- the extent of the modules (in CP),
- the dependencies of the modules,
- the learning outcomes,
- the assessment and examinations.

It is the relevant document presenting the structure of the programme as regards content and aids with the orientation during the study.
In addition to the module handbook the **course catalogue** and the individual announcements of the institutes provide important information updated every semester concerning variable course details (e.g. time and location of the course) as well as short-term modifications.

Election and completion of a module

The decision whether a course is elected is made by the student at the time of signing in for the corresponding exam. After attendance of the exam, a module cannot be replaced by another anymore.
The module is **succeeded**, if the module exam has been passed (grade min 4.0). In case that the module exam consists of several partial exams (e.g. Structural Analysis I and II) it holds: the module is succeeded once all partial exams have been passed (grade min 4.0). In order to that the minimum requirement of credits of this module has been met.

General exams and partial exams

Module exams can be taken as a general exam or several partial exams. If the module exam is offered as a **general exam**, the entire content of the module will be reviewed in a single exam. If the module exam consists of **partial exams**, the content of each course will be reviewed in corresponding partial exams over several semesters.
The registration for the examinations takes place online via the self-service function for students. The following functions can be accessed on https://studium.kit.edu:

- Sign in and sign off exams
- Retrieve examination results
- Print transcript of records

Repeating exams, deadlines

Principally, a failed exam can be repeated only once within the examination period following the next but one semester of this exam. If the **repeat examination** (including an oral repeat examination) will be failed as well, the **examination claim** is lost. Requests for a second repetition of an exam have to be submitted to the examination committee immediately after losing the examination claim. Requests for a second repetition require the approval of the examination committee. A counseling interview is mandatory.
Orientation Exams are the exams in the module Statics of Rigid Bodies as well as the partial modules Theory of Building Materials and Building Physics. These have to be completed by the end of the exam period of the second subject-related semester. Those who do not succeed the Orientation Exams including possible repeated exams before the end of the exam period of the third subject-related semester will lose the examination claim in Civil Engineering.
Further information is available from the examination regulation of the programme, the examination committee or the "Fachschaft" (student council).

Additional accomplishments, master advance

Additional accomplishments are voluntarily taken exams, whose results are not used for the calculation of the overall grade of the student, which are not mentioned in the certificate but are listed in the transcript of records. It is also mandatory to declare an additional accomplishment as such at the time of registration for an exam. Additional accomplishments may be elected from the entire KIT catalogue and are limited to a maximum of 30 credit points in total.
Up to five modules, 30 credits resp., may be elected as **master advance** from the master study programmes of Civil Engineering, Mobility and Infrastructure or Functional and Construction Engineering, once 120 credits have been completed within the Bachelor' studies. In this way a simpler transition to the consecutive master programme shall be able outside the regular period of study. It has to be mentioned that these modules are not transferred to a master programme automatically. They need to be accredited by the respective examination committee at the beginning of the masters' studies, within the first semester.

Further information

More detailed information about the legal and general conditions of the programme can be found in the examination regulation of the programme (announced at 8.9.2009), and in the statutes for amendment of the examination regulation (announced at 24.3.2011 and 14.1.2014).

Used abbreviations

LP/CP	Credit Points/ECTS	Leistungspunkte/ECTS
LV	course	Lehrveranstaltung
RÜ	computing lab	Rechnerübung
S	summer term	Sommersemester
Sem.	semester/term	Semester
ER/SPO	examination regulations	Studien- und Prüfungsordnung
KS/SQ	key skills	Schlüsselqualifikationen
HpW/SWS	contact hour	Semesterwochenstunde
E/Ü	excercise course	Übung
L/V	lecture	Vorlesung
W	winter term	Wintersemester

3 Actual Changes

Important changes are pointed out in this section in order to provide a better orientation. Although this process was done with great care, other/minor changes may exist.

4 Modules

4.1 Core Modules Basic Studies

Module: Statics of Rigid Bodies [bauiBGP01-TM1]

Coordination: P. Betsch
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 1

ECTS Credits	Cycle	Duration
7	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170101	Statics of Rigid Bodies (p. 89)	3/2/2	W	7	P. Betsch, T. Seelig

Learning Control / Examinations
graded:
examination Statics of Rigid Bodies, written exam, 100 min., part of orientation exam
Marking:
module grade equal to examination grade

Conditions
none

Recommendations
none

Learning Outcomes
The basic concepts of the performance of structures carrying loads is taught using the model of rigid bodies. Relying on a few basic principles of physics, starting from simple bodies, systems of rigid bodies are investigated. Synthetic and analytic approaches and their realization in engineering methods are presented. In connection with principle methodical approaches the investigation of technical systems, especially of civil engineering structures is in the centre of the lecture. In addition, a major goal is the independent learning of the subjects taught, supported by classroom exercises and voluntary supervised group exercises.

Content

- Operations with forces – force systems -Method of sections
- Equilibrium of coplanar/spatial force systems
- Force systems, acting on bodies - resultants
- Force couple - moments
- Reduction of spatial force systems
- Equilibrium of rigid bodies
- Technical tasks – conventions for support and support conditions – statically determined support, equilibrium conditions
- Centroid of an assemblage and of continuous quantities, distributed loads/area loads
- Coplanar systems of rigid bodies – technical systems
- Internal forces and moments
- Ideal truss systems – buildup principle – Ritter's method of sections
- Section forces in beams – distribution of internal forces and moments – differential equation
- The principle of superposition
- Friction stick and slip (static and kinetic) – belt friction
- Work and energy - energy methods
- Kinematics of coplanar motion – the principle of virtual work
- Potential force, potential principles of work and energy
- Stable and unstable equilibrium, stability

Module: Strength of Materials [bauiBGP02-TM2]

Coordination: T. Seelig
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 2

ECTS Credits	Cycle	Duration
9	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170201	Strength of Materials (p. 68)	4/2/2	S	9	P. Betsch, T. Seelig

Learning Control / Examinations
graded:
examination Strength of Materials, written exam, 100 min.
Marking:
module grade equal to examination grade

Conditions
none

Recommendations
It is recommended to attend the module Statics of Rigid Bodies previously.

Learning Outcomes
Analysis of stresses and strains in one-dimensional structural member. Deformations of statically determinate and indeterminate structures can finally be computed. The students should then be able to judge arbitrary stress and strain states in structures concerning yield and fracture. The students should also be able to use energy principles for the solution of standard problems as well as for simple beam buckling problems.

Content

- Tension / compression in bars – stresses/ strains/constitutive equations
- Differential equation for bar
- Statically indeterminate problems
- Deformations – statically determinate truss systems
- Analysis of statically determinate truss systems
- Combined stress state – stress vector/ stress tensor
- Principle stresses – Mohr's circle of stress – transformation of stresses and strains
- Differential equations – plane stress state
- Strain state, relation between stresses and strains – elastic materials
- Yield and fracture criteria
- Beam bending – kinematic assumption and limitations of the theory
- Moments of inertia – principle axes of inertia
- Basic equations of pure bending – symmetrical cross section
- Normal stresses as the result of bending
- Differential equations for beam bending, moment distribution -Single- and multi-field beam structures/superposition law
- Shear stresses – prismatic, thin-walled open cross-sections
- Bending combined with normal force/skew bending unsymmetrical cross sections – temperature loading
- Torsion bar with circular cross section – thin-walled closed cross sections
- Energy methods and deformation energy

- Principle of virtual forces – truss systems, beam bending
- Influence coefficients – Betti-Maxwell principle
- Application of energy methods to statically indeterminate systems
- Stability and buckling of beams

Module: Dynamics [bauiBGP03-TM3]

Coordination: T. Seelig
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 3

ECTS Credits	Cycle	Duration
6	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170301	Dynamics (p. 65)	2/2/2	W	6	T. Seelig, P. Betsch

Learning Control / Examinations
graded:
examination Dynamics, written exam, 100 min.
Marking:
module grade equal to examination grade

Conditions
none

Recommendations
It is recommended to attend the following modules previously:
Statics of Rigid Bodies, Strength of Materials

Learning Outcomes
The major goal of the course are several selected themes of the classical kinetics that are of particular interest in the field of civil engineering. The basics of vibration theory are taught and provide first insight and understanding of the most important oscillation phenomena in civil engineering structures.

Content

- Kinematics of a single mass point (cartesian, polar and natural coordinates)
- Kinetics of a single mass point: Newton's fundamental law, equations of equilibrium
- Work-energy equation
- Principle of linear momentum (impact law)
- Plane relative motion -Kinematics and kinetics of rigid bodies (moments of inertia, principle of angular momentum)
- Systems of rigid bodies: synthetic and analytic (Lagrangian equations and approaches, constraints, the degree of freedom, potential and non-potential forces)
- Introduction into linear vibration theory: mechanical models, free and focused vibrations of 1 DOF-systems, vibration of 2 DOF-systems

Module: Hydromechanics [bauiBGP04-HYDRO]

Coordination: M. Uhlmann
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 3

ECTS Credits	Cycle	Duration
6	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170304	Hydromechanics (p. 78)	2/2	W	6	N. N.

Learning Control / Examinations
graded:
examination Hydromechanics, written exam, 100 min.
Marking:
module grade equal to examination grade

Conditions
none

Recommendations
It is recommended to attend the following modules previously:
Analysis and Linear Algebra, Integration and Multivariate Analysis, Statics of Rigid Bodies

Learning Outcomes
Participants are capable of denoting and explaining fundamental concepts and relations in fluid mechanics. They are able to apply these to simple fluid mechanical problems and thus to describe and analyse quantitatively simple application examples.

Content

- physical properties of fluids
- hydrostatics: pressure profile in stagnant fluids, buoyancy
- kinematics: translation, rotation und deformation of fluids
- balance equations: kinematic transport theorem, continuity law, momentum, Navier-Stokes-, energy equation
- ideal fluids: irrotational flows, Bernoulli equation, pressure and energy lines
- viscous flows: laminar and turbulent flows, boundary layers, friction losses, velocity distributions
- flow around solid bodies: drag, pressure and strain distribution, boudary layer separation, friction coefficients
- pipe flows: strain distributions, friction losses, energy losses, flow control, cavitation
- open channel flows: classification, friction losses, local discharge characteristics
- spezific phenomenons: energy transformation, transient flows, measurement methods

Module: Analysis and Linear Algebra [bauiBGP05-HM1]

Coordination: M. Hochbruck, V. Grimm, M. Neher
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 1

ECTS Credits	Cycle	Duration
9	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0131900	Analysis and Linear Algebra (p. 50)	4/2/2	W	9	M. Neher, V. Grimm, M. Hochbruck

Learning Control / Examinations
graded:
examination Analysis und Linear Algebra, written exam, 90 min.
Marking:
module grade equal to examination grade

Conditions
none

Recommendations
none

Learning Outcomes

Content

Module: Integration and Multivariate Analysis [bauiBGP06-HM2]

Coordination: M. Hochbruck, V. Grimm, M. Neher
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 2

ECTS Credits	Cycle	Duration
9	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0181300	Integration and Multivariate Analysis (p. 79)	4/2/2	S	9	V. Grimm, M. Neher, M. Hochbruck

Learning Control / Examinations
graded:
examination Integration and Multivariate Analysis, written exam, 90 min.
Marking:
module grade equal to examination grade

Conditions
none

Recommendations
It is recommended to attend the module pAnalysis and Linear Algebra reviously.

Learning Outcomes

Content

Module: Applied Statistics [bauiBGP07-STATS]

Coordination: J. Ihringer
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 2

ECTS Credits	Cycle	Duration
3	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170204	Applied Statistics (p. 51)	1/1	S	3	J. Ihringer

Learning Control / Examinations
graded:
examination Applied Statistics, written exam, 60 min.
Marking:
module grade equal to examination grade

Conditions
none

Recommendations
none

Learning Outcomes
The Students will get knowledge about the basics for application of statistical Methods in Civil Engineering. With this knowledge they will be able to select and apply statistical Methods for specific problems and will be able to perfomr and discuss the calculation and results.

Content

- objektives of statistical analysis and terminology
- statistical values and frequency distribution
- change from frequency distribution to likelihood
  random sample and basic population
  probability density function and probability density distribution function
  calculation with probabilities
- discrete random variable
  selected probability density functions
- continuous random variable
  selected probability density functions
  transformation of probability density distributions
- evaluative statistics
  parameter estimation, estimation error, confidenz intervalls and theorie of testing
- regression analysis
  two-dimensional probability density distribution
  linear regression analysis and correlation analysis

Module: Differential Equations [bauiBGP08-HM3]

Coordination: M. Hochbruck, V. Grimm, M. Neher
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 3

ECTS Credits	Cycle	Duration
4	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0132200	Differential Equations (p. 64)	2/1	W	4	V. Grimm, M. Neher, M. Hochbruck

Learning Control / Examinations
graded:
examination Differential Equations, written exam, 60 min.
Marking:
module grade equal to examination grade

Conditions
none

Recommendations
It is recommended to attend the following modules previously:
knowledge of Analysis and Linear Algebra, Integration and Multivariate Analysis

Learning Outcomes

Content

Module: Building Materials [bauiBGP09-BSTOF]

Coordination: H. Müller
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 2+3

ECTS Credits	Cycle	Duration
12	Every 2nd term, Summer Term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170206	Theory of Building Materials (p. 61)	1/1	S	3	H. Müller
0170306	Building Materials (p. 80)	4/2	W	9	H. Müller

Learning Control / Examinations
graded:
examination part Theory of Building Materials, written exam, 60 min., part of orientation exam
examination part Building Materials, written exam, 120 min.
Marking:
weighting acc. CP

Conditions
none

Recommendations
none

Learning Outcomes
The students get familiarised with the fundamental terms of material science and the specific properties of numerous building materials. They obtain profound knowledge of the physical, chemical and mechanical relations, which result from the material structure and its time- and load-dependent modification. By using the learnt basic knowledge the students gain insight into methods of production, moulding, processing and protection of the durability of building materials. Furthermore, an understanding of the general procedures when selecting applicable materials is given to the students, considering environmental aspects and sustainability. Their understanding for certain building material phenomena is promoted by several examples from building practice.

Content
In this module the fundamental terms and the essential properties of building materials are introduced. Firstly the building materials are classified. Based on this classification, the principal physical and mechanical properties as well as the most important characteristical parameters are specified. Furthermore, the basic knowledge about the atomic structure and its influence on the physical and mechanical properties of the material is given.
For important materials, commonly used in building and construction (e. g. steel, concrete, ceramics, glasses, polymers, timber, bituminous materials), the fundamental terms and essential properties of the materials are supplemented and exemplified. Especially the production and the source materials as well as their influence on the rheological and mechanical properties are in the focus of interest. Damage types and processes in connection with the durability of building materials are another essential part of the module. In addition the legal regulations regarding testing, supervision and certification of building materials are briefly introduced.

Module: Structural Design [bauiBGP10-BKONS]

Coordination: H. Müller, H. Blaß
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 2+3

ECTS Credits	Cycle	Duration
9	Every 2nd term, Summer Term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170208	Building Physics (p. 58)	1/1	S	3	H. Müller
0170308	Stuctural design (p. 57)	2/2	W	6	H. Blaß

Learning Control / Examinations
graded:
examination part Building Physics, written exam, 60 min., part of orientation exam
examination part Structural Design, written exam, 90 min.
Marking:
weighting acc. CP

Conditions
none

Recommendations
none

Learning Outcomes
Attending the two lectures „Building Physics“ and „Structural Design” the students gain a basic knowledge on the design of different structures considering the normative requirements regarding the preservation of structures.
By the lecture “Structural Design” the students get to know the basis of design, the safety concept and the process of structural design for buildings. They know the different structural components like roof structures, floor and wall structures as well as foundations. The students get the idea of the load transfer and the distribution of forces in structures. The students are able to determine loads on structures, to persecute the loads to the foundation based on the choice of load elements and to prove simple elements. They know the functionality of load elements and are able to design simple structures.
By the lecture “Building Physics” and the corresponding tutorials the students get a comprehensive understanding of physical problems concerning heat protection, moisture protection, noise control and fire protection. They get to know the normative requirements regarding the preservation of structures and the related methods of calculation. Based on various examples the students also learn about the realization of these requirements in the praxis of construction.

Content
Lecture Building Physics:

- Introduction: Climate, hygiene in housing, security, environment and energy.
- Heat insulation: stationary and non-stationary heat transport, thermal bridges, heat insulation of buildings, energy saving regulation, construction examples.
- Moisture protection: moisture storage and moisture transport, formation of condensate, normative calculation methods, construction examples, development of molds.
- Noise control: acoustic measurements, sound propagation, airborne and structure-borne sound insulation, noise control according to standard, construction examples.
- Fire protection: fire process, behaviour of building materials and construction units in case of fire, calculation of fire resistance, guidelines and regulations.

Lecture Structural Design:

- Basis of design and safety concept: Design concepts, safety standards for structures
- Load bearing systems: Elements, bracings
- Actions on structures: Permanent, live and exceptional loads
- Roof constructions: Steep roofs, flat roofs

- Floor constructions: Reinforced concrete, steel, timber
- Wall constructions: Dimensions, brickwork, timber, design
- Stairs: Standards for stairs, design of stairs
- Foundations: Pad foundations, base failure, tilting, sliding, stresses

Module: Planning Methodology [bauiBGP11-PLANM]

Coordination: P. Vortisch, W. Jung, M. Kagerbauer
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 1

ECTS Credits	Cycle	Duration
2	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170104	Planning Methodology (p. 84)	1/1	W	2	P. Vortisch, W. Jung, M. Kagerbauer

Learning Control / Examinations
attested:
attestation part A, written, 30 min.
attestation part B, written, 30 min.
Marking:
n. a., but both attestation parts have to be passed separately

Conditions
none

Recommendations
none

Learning Outcomes
Learning and understanding of general terms and relationships and general methods and techniques in the field of spatial and infrastructure planning. The module forms an first access into the field of planning (theory, methodologies) at the examples of transport and spatial planning.

Content
Basic concepts and relationships about the methodologies of planning will be mediated, e.g.:

- typologies of planning
- planning systems
- sequences of acting and its coordination
- dealing with scare resources
- need for forecasts
- uncertainty in planning
- simple forecasting approaches
- evaluation methodologies
- sensitivity analyses (approaches and applications)

Module: Project Management [bauiBGP12-PMANG]

Coordination: S. Haghsheno
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 1

ECTS Credits	Cycle	Duration
2	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170106	Project Management (p. 86)	1/1	W	2	S. Haghsheno, H. Schneider

Learning Control / Examinations
attested:
attestation Project Management, written, 45 min.
Marking:
n. a.

Conditions
none

Recommendations
none

Learning Outcomes
After this module the students have basic knowledge in the subject of project management, particular in the field of project management in civil construction.

Content
This module gives an introduction into the concepts project management. The general organisation of projects (particular in civil engineering) and the description of the different phases of projects were imparted as well as the three main parts of project management, namely time, cost an quality management.

Module: Geology in Civil Engineering [bauiBGP13-GEOL]

Coordination: J. Eckhardt
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 2

ECTS Credits	Cycle	Duration
2	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170210	Geology in Civil Engineering (p. 69)	1/1	S	2	J. Eckhardt, T. Mutschler

Learning Control / Examinations
attested:
attestation Geology in Civil Engineering, written, 20 min.
Marking:
n. a.

Conditions
none

Recommendations
none

Learning Outcomes
Getting to know the common basis for a cooperation of civil engineers and geologists.
Understanding the system earth, ist structure and dynamics
Recognizing the most important kinds of rock.
Introduction into geological investigation methods.
Knowledge of basics in hydrogeology.

Content

- Introduction
- Movement, shape, structure, exogenous and endogenous dynamics of the earth
- Crystals, minerals, rocks and formations
- Magmatic rocks
- Metamorphic rocks
- Sedimentary rocks
- Genesis, classification and addressing of soil and rock formation
- Geology and ground properties
- Basics of tectonics
- Representation of stratification planes and cleaving
- Geological investigation and methodology
- Basics of hydrogeology

Module: Introduction to Computer Programming I [bauiBGP14-BINF1]

Coordination: M. Uhlmann
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 1

ECTS Credits	Cycle	Duration
2	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170114	Introduction to computer programming I (p. 55)	1/1	W	2	M. Uhlmann

Learning Control / Examinations
attested:
attestation Introduction to Computer Programming I, written, 30 min.
mandatory: attested programming exercises
Marking:
n. a.

Conditions
none

Recommendations
none

Learning Outcomes
Participants receive a fundamental understanding of digital data processing. They are capable of tackling problems of data processing independently, which involves the capacity to learn to use new software tools on their own. Participants will aquire basic programming skills.

Content

- Fundamentals of digital data processing: Information and coding, data structures, algorithms, computer architectures
- Introduction to programming: Basic elements of high-level programming languages, structured programming, practical examples
- Software applications: Operating systems, selected software applications of interest for engineers

Remarks
Literature/Study Materials:
J.G. Brookshear, “Computer Science: An Overview”, Pearson, 2009;
B.W. Kernighan and D.M. Ritchie, “The C Programming Language”, Prentice Hall, 1988;
S. Prata, “C++ Primer Plus”, Sams, 2005;
J. Liberty and B. Jones, “Teach yourself C++ in 21 days”, Sams, 2005;
RRZN, “Die Programmiersprache C”, 2008 (Skriptenverkauf am SCC)
RRZN, “C++ für C Programmierer”, 2005 (Skriptenverkauf am SCC)

4.2 Core Elective Modules Basic Studies

Module: Key Qualifications [bauiBFW0-SQUAL]

Coordination: Studiendekan Bauingenieurwesen
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject:

ECTS Credits	Cycle	Duration
6	Every term	

Learning Control / Examinations
according to elected courses, freely be chosen from the course offerings of HoC (see description on HoC pages)
Marking:
n. a.
(marks can be requested in agreement with lecturer, but do not contribute to overall grade)

Conditions
none

Recommendations
none

Learning Outcomes
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 qualifications, the House of Competence offers a wide selection 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 (http://www.hoc.kit.edu/studium).

Module: Chemistry of Building Materials [bauiBGW1-BCHEM]

Coordination: J. Eckhardt
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 1

ECTS Credits	Cycle	Duration
2	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170108	Chemistry of Building Materials (p. 54)	1/1	W	2	J. Eckhardt

Learning Control / Examinations
attested:
attestation Chemistry of Building Materials, wirtten, 30 min.
Marking:
n. a.

Conditions
none

Recommendations
none

Learning Outcomes
The student will be impart topics of general and inorganic chemistry, which are partly handled in the upper school. Particular attention is paid to chemical problems in the building material, which are having more specialized and to some overriding importance for further study in higher semesters.

Content

- Atomic structure and the periodic table of elements
- chemical bonding
- boundary conditions of substances
- Stoichiometry and examples from the construction: chemical reactions, chemical equilibrium (law of mass action)
- electrolytes and non electrolytes
- building material
- redox reaction
- solutions, colloids, dispersions, emulsions
- silicate chemistry, silicates in construction

Module: Environmental Chemistry [bauiBGW2-UCHEM]

Coordination: J. Winter
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 1

ECTS Credits	Cycle	Duration
2	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170110	Environmental Chemistry (p. 91)	1/1	W	2	J. Winter

Learning Control / Examinations
attested:
attestation Environmental Chemistry, written, 30 min.
Marking:
n. a.

Conditions
none

Recommendations
none

Learning Outcomes
Basic chemistry for civil engineers

Content

- Introduction into physical and organic chemistry
- Elements, chemical substances, Types of bondages, Solubility
- reaction equilibria, buffer systems, pH, redox reactions
- Corrosion, Chemistry of construction material,
- Environmental chemistry in civil engineering

Module: Environmental Physics/ Energy [bauiBGW3-UPHYS]

Coordination: F. Nestmann
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 1

ECTS Credits	Cycle	Duration
2	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170112	Environmental Physics/ Energy (p. 92)	1/1	W	2	F. Nestmann

Learning Control / Examinations
ungraded:
certificated practice sheets
Marking:
n. a.

Conditions
none

Recommendations
none

Learning Outcomes
The students are capable of environmental phenomena. They can describe the use of forces from the natural envoironment in the sense of energy recovery.

Content

- Defintion of energy
- natural ressources
- regenerative and non-regenerative kinds of energy
- energy balance
- production of electric energy: water power, wind energy, solar energy, geothermal power plants, conventional power plants
- environmental transport-cycles
- presentation of ongoing research projects at KIT

Module: Technical Illustrations [bauiBGW5-TECDS]

Coordination: R. Roos
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 1

ECTS Credits	Cycle	Duration
2	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170116	Technical Illustrations (p. 90)	1/1	W	2	R. Roos

Learning Control / Examinations
attested:
3 term papers, 1 group exercize with presentation (10 minutes)
Marking:
n. a.

Conditions
none

Recommendations
none

Learning Outcomes
Main goal is the gain of basic knowledge in the representation of technical objects and presentation methods

Content
Illustration of the following representation techniques and presentation methods:

- basic principles
- representation techniques
- representation methods (freehand and technical art work)
- presentation methods

Module: Laboratory Course [bauiBGW6-LABOR]

Coordination: J. Winter
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 1

ECTS Credits	Cycle	Duration
2	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170118	Laboratory course (p. 81)	0/2	W	2	Mitarbeiter der beteiligten Institute

Learning Control / Examinations
attested:
participation at 4 chosen experiments in 4 institutes
Marking:
n. a.

Conditions
None.

Learning Outcomes
The main goal is to gain basic knowledge in laboratories of different fields
Experience of practical work of specific institutes

Content
Carrying out practical laboratory training in different fields.

Module: Introduction to Computer Programming II [BauiBGW7-BINF2]

Coordination: M. Uhlmann
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 2

ECTS Credits	Cycle	Duration
2	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170212	Introduction to computer programming II (p. 56)	1/1	S	2	M. Uhlmann

Learning Control / Examinations
attested:
attestation Introduction to Computer Programming II, written, 30 min.
mandatory: attested programming exercises
Marking:
n. a.

Conditions
participation in “Introduction to Computer Programming I”

Recommendations
none

Learning Outcomes
Participants deepen their understanding of digital data processing and of the algorithmes involved therein. They will enhance their programming skills, particularly with respect to object-oriented programming; they will apply this to practical tasks.

Content

- Introduction to object-oriented programming: basic elements of object-oriented programming languages and their realisation with one particular high-level programming language
- Practical examples of the implementation of common algorithms, application to problems of interest for engineers

Remarks
Literature/Teaching Materials:
S. Prata, “C++ Primer Plus”, Sams, 2005;
J. Liberty and B. Jones, “Teach yourself C++ in 21 days”, Sams, 2005;
R. Lischner, “C++ in a Nutshell”, O’Reilly, 2003;
RRZN, “C++ für C Programmierer”, 2005 (Skriptenverkauf am SCC)

4.3 Core Modules Basic Subjects

Module: Structural Analysis [bauiBFP1-BSTAT]

Coordination: W. Wagner
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 4+5

ECTS Credits	Cycle	Duration
10	Every 2nd term, Summer Term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170401	Structural Analysis I (p. 59)	2/2/1	S	5	W. Wagner
0170501	Structural Analysis II (p. 60)	2/2/1	W	5	W. Wagner

Learning Control / Examinations
graded:
examination part Structural Analysis I, written, 120 min.
examination part Structural Analysis II, written, 120 min.
Marking:
weighting acc. CP

Conditions
keine

Recommendations
It is recommended to attend the following modules previously:
Statics of Rigid Bodies, Strength of Materials

Learning Outcomes
Students will learn the essential principles for modeling and calculation of 2D- and 3D-beam structures. This allows the calculation of displacement and stress resultant fields for the design and construction of associated structures.

Content
Calculation of stat. determined and un-determined 2D- and 3D-Beam Structures:

- Idealisation
- load bearing behaviour
- stress resultants
- discrete displacements
- controls
- symmetry
- application of numerical programs
- influence lines, KV, VV
- FEM for 2d truss structures
- prestress

Outlook: Surface structures, FE-modeling, nonlinearities

Module: Basics of Reinforced Concrete [bauiBFP2-KSTR.A]

Coordination: L. Stempniewski
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 5+6

ECTS Credits	Cycle	Duration
6	Every 2nd term, Winter Term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170601	Basics of Reinforced Concrete I (p. 74)	2/1	W	4	L. Stempniewski
0170615	Basics of Reinforced Concrete II (p. 75)	1/1	S	2	L. Stempniewski

Learning Control / Examinations
graded:
examination Basics of Reinforced Concrete I, written, 90 min.
examination Basics of Reinforced Concrete II, written, 60 min.
Marking:
according to contact hours per week

Conditions
Qualifying examinations in the subjects Mechanics, Mathematics, Structural Design, except maximum two modules

Recommendations
It is recommended to attend the following modules previously:
Building Materials, Statics of Structures I+II

Learning Outcomes
Understanding of the Materials and learning how to design simple components + Getting familiar with the safety concept in structural engineering

Content
Characteristics of Reinforced Concrete, Design of Sections and Components, Safety Concept, Design for bending and Transverse forces

Module: Basics in Steel and Timber Structures [bauiBFP3-KSTR.B]

Coordination: H. Blaß, T. Ummenhofer
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 5

ECTS Credits	Cycle	Duration
9	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170504	Basics in steel structures (p. 73)	2/2	W	4,5	T. Ummenhofer
0170507	Timber structures (p. 72)	2/1	W	4,5	H. Blaß

Learning Control / Examinations
graded:
examination Structural Engineering B, written, 120 min.
Marking:
module grade equal to examination grade

Conditions
Qualifying examinations in the core subjects Mechanics, Mathematics, Structural design, except maximum two modules

Recommendations
none

Learning Outcomes
Steel structures:
The Students have knowledge in design, construction and assembly of predominantly static loaded steel constructions made of bar-shaped support links. The students are able to construct and design common steel structures.

Timber structures:
The students get to know timber as construction material and the basic characteristics of timber. They get familiar with grading of timber into strength classes. The students are able to design common timber structures according to DIN 1052 and Eurocode 5. They know the backgrounds of design rules for timber elements and joints. The students get to know different fasteners used in timber structures and the appropriate design theory. They are able to design elements prone to buckling, tapered, curved and pitched cambered beams as wells as bracings.

Content
Steel structures:

- tension bars
- bending stressed bars without compressive forces
- bolted and welded connections
- shear due to shear force - shear center
- flexural buckling
- lateral torsional buckling
- constructional aspects: load transfer, structural types (hall construction, construction with multiple floors), support links (beams, columns, column bases, frame corners)

Timber structures:

- Basics: Timber in construction, wood as building material, solid timber and glued laminated timber – strength classes, limit state design and safety format, volume and stress distribution effects on the strength
- Design of elements: Tension and compression, bending, shear and torsion, columns and buckling lengths, tapered, curved and pitched cambered beams, bracing
- Joints: Mechanical timber joints – general, joints with dowel-type fasteners – theory, nailed joints, bolted and dowelled joints, joints with screws, ring and shear-plate connector joints, toothed-plate connector joints

Module: Water and Environment [bauiBFP4-WASSER]

Coordination: F. Seidel, E. Zehe, S. Fuchs, J. Winter
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 5+6

ECTS Credits	Cycle	Duration
12	Every 2nd term, Winter Term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170509	Hydrological engineering and water management I (p. 96)	2/1	W	4,5	F. Nestmann
0170511	Hydrology (p. 77)	1/1	W	3	E. Zehe
0170603	Siedlungswasserwirtschaft (p. 88)	1/1	S	3	S. Fuchs
0170605	(p. 93)	1/1	S	1,5	J. Winter

Learning Control / Examinations
graded:
examination Water and Environment, written, 150 min.
Marking:
module grade equal to examinatino grade

Conditions
Qualifying examinations in the subjects Mechanics, Mathematics, Structural design, except maximum two modules

Recommendations
It is recommended to attend the module Environmental Physics / Energy previously.

Learning Outcomes
The students will get a basic knowledge about the essential meteorological, hydro-meteorological processes of the water cycle on the land surface. They will get knowledge about the hydrological processes and their simplified reproduction in hydrological models so that the students will be capable to calculate rainfall-runoff relations. They will learn to dimension and calculate measures for water management and hydraulic engineering and to quantify the possible failure of such measures. In addition, the knowledge of how the human impact influences hydrological processes will be discussed. They have extensive knowledge about the basic requirements of water management tasks. They know the operation conditions, the functions and the technical design of water management systems.

Content
Hydraulic Engineering and Water Ressources Management I:

- basics and applications of open channel hydraulics
- Aims of water management in europe and germany
- classification of tasks in the field of water management
- floot protection: concepts, measures and models
- Constructions for discharge controlling: function and hydraulic dimensioning
- river engineering: navigation and restauration

Hydrology:

- introduction to the cycles of energy, water and air
- hydrological processes in a catchment and water balances
- measurement, evaluation and statistical interpretation of hydrological data
- introduction to runoff generation and concentration, including relevant model concepts
- methods for regionalising hydrological parameters and model parameters
- evaluation of flooding with the help of rainfall-runoff models
- planning, dimensioning and operation of flood preventien measures
- dimensioning the working capacity for dams

- security concepts for dams and embankments after DIN 19700
- impact of changing border conditions (e.g. landuse-change, climate change) on the runoff of catchments

Urban water ressources:

- methods to evaluate the water quality
- water supply
- water treatment
- dewatering of urban areas
- waste water treatment
- prevention of water pollution: methods and models

Environmental Technologies

- for off-gas treatment: Filtration, Biofiltration, Air waschers
- for soil: insitu soil sanitation '-chemical oxidation, biological treatment exsitu soil sanitation: pump and treat, excavation and thermal treatment
- for groundwater: funnel and gate, natural sanitation, enhanced natural sanitation
- for water/waste water: mechanical treatment chemical treatment: oxidation, precipitation biological treatment: aerobic/anaerobic C-mN-,P-Elimination
- for solid wastes: sorting and material recycling, energetic recycling Biological treatment: Composting, Digestion Mechanical/biological treatment Thermic treatment: pyrolysis, incineration/combustion Residue treatment and utilization

Module: Mobility and Infrastructure [bauiBFP5-MOBIN]

Coordination: R. Roos
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 4

ECTS Credits	Cycle	Duration
12	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170404	Regional Planning and Planning Law (p. 87)	2/1	S	4	W. Jung
0170405	Transportation (p. 94)	2/1	S	4	P. Vortisch
0170407	Design Basics in Highway Engineering (p. 62)	2/1	S	4	R. Roos

Learning Control / Examinations
graded:
examination Mobiliy and Infrastructure, written, 150 min.
prerequisite for examination: attestation of three term papers (one per lecture)
Marking:
module grade equal to examination grade

Conditions
none

Recommendations
none

Learning Outcomes
Learning the fundamental terminology and methodology of spatial and transportation planning, traffic engineering as well as highway engineering

Content
Regional Planning and Planing Law: basic tasks and contents of different planning levels, for example

- Land use and conflicts
- provision of services and infrastructure as well as their costs, planning on local, regional, national and European level

Transportation:

- Fundamentals of transportation planning (convention for analyses, surveys of travel behaviour)
- fundamentals of traffic engineering

Design Basics in Highway Engineering:

- Road network layout
- driving dynamics
- principles of highway design
- earthworks
- pavements and their dimensioning.

Module: Technology and Management in Construction Operation [bauiBFP6-TMB]

Coordination: S. Haghsheno
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 4

ECTS Credits	Cycle	Duration
11	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170409	Construction Technology (p. 52)	3/1	S	5,5	S. Haghsheno, S. Gentes
0170411	Economics in Construction Operation (p. 53)	2/1	S	4	K. Lennerts
0170513	Facility- and Real Estate Management (p. 67)	1/0	S	1,5	K. Lennerts

Learning Control / Examinations
graded:
examination Technology and Management in Construction Operation, written, 150 min.
Marking:
module grade equal to examination grade

Conditions
none

Recommendations
none

Learning Outcomes
The students have basic knowledge about all essential sectors of construction management. They know the most important construction methods and are able to make simple calculations in construction operation. Beside construction technology they have basic knowledge in engineering economics like accounting cost and results or cost-benefit analysis. Furthermore tey have basic knowledge in facility and real estate management.

Content
This module contains an basic introduction into all sectors of construction operation an management. This includes site management techniques as well as construction methods and construction equipement planning.
A further main part of the module is an introduction in the methods of engineering economics or business management, such as cost and results accounting or cost-benefit analysis.
Other subjects are the organization of construction companies, forms of contracts, taxes, etc.
At least the module includes an introduction in the subject of facility management.

Module: Geotechnical Engineering [bauiBFP7-GEOING]

Coordination: T. Triantafyllidis
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 4+5

ECTS Credits	Cycle	Duration
9	Every 2nd term, Summer Term	2

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170412	Soil Mechanics I (p. 63)	2/2	S	4,5	T. Triantafyllidis
0170514	Foundation Engineering I (p. 71)	2/1	W	4,5	T. Triantafyllidis

Learning Control / Examinations
graded:
examination Geotechnical Engineering, written, 150 min.
Marking:
module grade equal to examination grade

Conditions
Qaulifying examinations in Mechanics, Mathematics, Structural Design, except maximum two modules

Recommendations
It is recommended to have passed the qualifying examinations in the module Geology in Civil Engineering previously

Learning Outcomes
Understanding and Description of the mechanical behaviour of the building material “soil”, based on fundamental physics, in particular mechanics and hydraulics.
Self-dependent proofs of ultimate limit state and serviceability limit state of natural slopes and geotechnical constructions.
Knowledge and understanding of the most important geotechnical construction methods, based on soil mechanics and physics: see content.
Self-dependent selection, design and dimensioning of usual geotechnical construction methods for standard applications, such as building foundations, retaining structures and walls.

Content

- Standards and codes, definitions, soil classification
- soil properties and soil parameters, subsoil investigation
- permeability and seepage
- compression behaviour, stress distributions
- settlement calculation, consolidation
- shear resistance of soils
- earth pressure and earth resistance
- stability of slopes (slope failure) and foundations (base failure)
- safety concepts in foundation engineering
- dewatering
- spread foundations
- retaining structures
- retaining walls for excavations
- pile foundations, deep foundations and caisson foundations in open water
- soil improvement
- tunneling

4.4 Module Bachelor Thesis

Module: Bachelor Thesis [bauiBSC-THESIS]

Coordination: Studiendekan Bauingenieurwesen
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core semester 6

ECTS Credits	Cycle	Duration
11	Every term	1

Learning Control / Examinations
thesis with a duration of 8 weeks and final presentation
Marking:
The mark results from the grading of the Bachelor Thesis and the concluding presentation.

Conditions
attestation of acknowledged practical work acc. § 12 of SPO
Passed examinations in all modules acc. § 17 no. 2 of SPO ('Grundstudium', sem. 1-3)

Recommendations
none

Learning Outcomes
The student learns, how to investigate a complex problem within a particular field of his choice in limited time, following scientific methods. He searches autonomously for literature, finds own approaches, evaluates his results and compares them with the state of the art. He clearly represents the essential matter and results in his bachelor thesis.

Content
The Bachelor Thesis is a first major written report and comprises the theoretical or experimental treatise of a complex problem within a particular field of civil engineering with scientific methods. The student chooses a particular field and can make proposals for the theme.

4.5 Core Elective Modules Basic Subjects

Module: Partial Differential Equations [bauiBFW1-PDGL]

Coordination: M. Hochbruck, V. Grimm, M. Neher
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 4

ECTS Credits	Cycle	Duration
2	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0181600	Partial Differential Equations (p. 83)	1/1	S	2	V. Grimm, M. Neher, M. Hochbruck

Learning Control / Examinations
attested:
attestation Partial Differential Equations, written, 60 min.
Marking:
n. a.

Conditions
none

Recommendations
It is recommended to attend the module Differential Equations previously.

Learning Outcomes

Content

Module: Introduction to Continuum Mechanics [bauiBFW2-EKM]

Coordination: T. Seelig
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 6

ECTS Credits	Cycle	Duration
2	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170607	Introduction to Continuum Mechanics (p. 66)	1/1	S	2	T. Seelig, P. Betsch

Learning Control / Examinations
attested:
attestation Introduction to Continuum Mechanics, written (under examination-like conditions), 60 min.
Marking:
n. a.

Conditions
none

Recommendations
It is recommended to have passed the following subjects and modules previously:
Mechanics, Mathematics, Partial Differential Equations

Learning Outcomes
Fundamentals for the analysis of multiaxial loading states and deformation in elastic solids are presented.
This includes the formulation of engineering problems in terms of boundary value problems as well as the interpretation of solutions, e.g. with respect to stress concentrations.
Besides analytical solution techniques in 2D (plane) problems, special emphasis is put on variational (energy) methods which form the basis of numerical methods such as the finite element method.

Content

- vectors, tensors, index notation
- stress and equilibrium
- displacement and strain
- linear elastic material law
- boundary value problems of elasticity theory
- plane problems
- Airy's stress function
- local stress concentrations
- work and energy principles of elasticity theory
- approximate solution methods

Module: Physical Modelling in River Engineering [bauiBFW3-WASSVW]

Coordination: F. Seidel
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 6

ECTS Credits	Cycle	Duration
2	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170609	Physical Modelling in River Engineering (p. 97)	1/1	S	2	F. Seidel, C. Lang

Learning Control / Examinations
attested:
certificated experiment report
Marking:
n. a.

Conditions
none

Recommendations
It is recommended to attend the following modules and lectures previously:
Water and Environment, Hydraulic Engineering and Ressources Management I, Hydromechanics

Learning Outcomes
The students have the competence, the apply the possibilities and limitations of hydraulic tests on situational water problems. They can design, construct an operation a hydraulic model and they can evaluate the develloped results/solutions.

Content
The course gives an detailled overview about the application of hydraulic models for the optimzation of hjydrodynamic processes.
Content:

- Definition of a hydraulic model
- affinity between hydraulic model an nature
- provisions of working with hydraulic models
- planning and construction of a hydraulic model
- hydrometric methods
- Exercize in the laboratory
- Exemples from the practice
- excursion to the waterlabs in Karlsruhe

Module: Geotechnical Design [bauiBFW4-GEOPL]

Coordination: T. Triantafyllidis
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 6

ECTS Credits	Cycle	Duration
2	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170611	Geotechnical Design (p. 70)	1/1	S	2	T. Triantafyllidis

Learning Control / Examinations
attested:
term paper with passed colloquium
Marking:
n. a.

Conditions
none

Recommendations
It is recommended to attend the module Geotechnical Engineering previously.

Learning Outcomes
Gaining of confidence and detailed knowledge in the selection and design of geotechnical constructions for standard applications.
Knowledge and trained application of the relevant standards and recommendations.
Extended training in geotechnical proofs and calculations, eventually by application of Geotechnical Software Tools.
Ability to consider aspects of site management and budgeting during the comparison of alternative solutions for geotechnical standard applications.

Content
Specialized exercises based on project studies:

- soil investigation, classification and material properties,
- consolidation under ballast loads,
- settlement analysis of structures,
- shear strength,
- slope stability analysis,
- anchored sheetpile retaining wall,
- dewatering of construction pits,
- spread foundations under multiaxial load,
- design of pile foundations

Module: Surveying [bauiBFW5-VERMK]

Coordination: N. Rösch
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 6

ECTS Credits	Cycle	Duration
2	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
20714	Surveying (p. 95)	1/1	S	2	N. Rösch

Learning Control / Examinations
attested:
attested surveying exercise
Marking:
n. a.

Conditions
none

Recommendations
none

Learning Outcomes
It is the main objective of this course to make the students familiar with surveying. Thus the application of typical surveying instruments is presented. Further the basic methods and procedures are explained.

Content
The following items are covered:

- The surveying authorities in Germany
- Reference frames (local and international)
- Coordinate systems (e.g. UTM, Gauß-Krüger)
- Height determination
- 2D point determination
- Basic surveying computations (e. g. polar method, intersection, resection)
- Computation of areas based on different readings
- Computation of volumes

Module: Project “Plan, Design, Engineering” [bauiBFW6-PPEK]

Coordination: R. Roos
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 6

ECTS Credits	Cycle	Duration
2	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170516	Project “Plan, Design, Engineering” (p. 85)	0/2	S	2	R. Roos, P. Vortisch, B. Brester, E. Hohnecker

Learning Control / Examinations
attested:
group exercise with intermediate and final presentation
Marking:
n. a.

Conditions
none

Recommendations
It is recommended to attend the module Planning Methodology previously

Learning Outcomes
Main goal is the gain of competences in planning tasks by balancing multidisciplinary objectives and competing tasks. A secondary goal is the learning of basic competences in the diffrent fields and the understanding of relationships between it.

Content
A typical practical task in the field of spatial and infarastructure planning has to be elaborated. The students have to take charge of certain planning tasks and to gain the relevant competences. Mentors will deliver the relevant background information in terms of functional or engineering skills. During this gaming simulation solutaions will be elaborated in diffent scales of detailing.

Module: Life Cycle Management [bauiBFW7-LZMAN]

Coordination: K. Lennerts, H. Müller
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 6

ECTS Credits	Cycle	Duration
2	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170613	Life Cycle Management (p. 82)	1/1	S	2	K. Lennerts, H. Müller, E. Kotan, M. Vogel

Learning Control / Examinations
ungraded:
attestation Life Cycle Management, written, 60 min.
Marking:
n. a.

Conditions
none

Recommendations
It is recommended to attend the following modules previously:
Building Materials, Applied Statistics, Economics in Construction Operation, Facility- and Real Estate Management

Learning Outcomes
After this module the students have basic knowledge about the subject of life cycle management (LCM).
They know the characteristics of the life cycle of buildings as well as their influence on the environment. The students are able to explain the life cycle phases of buildings and their specific characteristics. They are able to describe the influencing parameters with impact on the life time of construction elements. They know suitable calculation methods as well as the required input parameters and are able to conduct simple calculations of life cycle costs.
The students have knowledge about the methods of durability design of concrete structures as well as about the maintenance (service, inspection, repair and im-provement) of constructions.

Content
This module contains an introduction into the concepts of life cycle management. Particularly the different methods of calculation and optimisation of life cycle costs are presented.
A further main part of the module is an introduction in the methods of registration and modelling of damages in order to assess the degree of damage and to perform a service life prediction of concrete structures in a proper manner.
The assessment of the durability of concrete structures is managed with the help of reliability considerations. Therefore, it is necessary to get a basic overview in the reliability theory. Through this it is possible to arrange a service life design of structures, which are under environmental stress (frost attack, salt, carbon dioxide).
Anymore, this course also contains an introduction into the methods of maintenance planning and maintenance realisation for concrete structures, which are damaged by different environmental attacks.

Module: Basics of Track Guided Transport Systems [bauiBFW8-GSTS]

Coordination: E. Hohnecker
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 5

ECTS Credits	Cycle	Duration
2	Every 2nd term, Winter Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170517	Basics of Track Guided Transport Systems (p. 76)	2	W	2	E. Hohnecker

Learning Control / Examinations
attested:
attestation Basics of Track Guided Transport Systems, written, 60 min.
Marking:
n. a.

Conditions
none

Recommendations
none

Learning Outcomes
to know the basics of track guided systems

Content
definitions and classifications; basics of rail vehicles, track guided operation and railway alignment

Module: Water Tersources Management and Engineering Hydrology [bauiBFW9-WASSRM]

Coordination: J. Ihringer
Degree programme: Bauingenieurwesen SPO 2013 (B.Sc.)
Subject: core elective semester 6

ECTS Credits	Cycle	Duration
2	Every 2nd term, Summer Term	1

Courses in module

ID	Course	Hours per week C/E/T	Term	CP	Responsible Lecturer(s)
0170617	(p. 98)	1/1	S	2	J. Ihringer

Learning Control / Examinations
attested:
attestation Water Tersources Management and Engineering Hydrology, written
Marking:
n. a.

Conditions
compulsory:
lecture Hydrology

Recommendations
Environmental Physics/Energy/Soil Science

Learning Outcomes

Content

5 Courses

all Courses, in alphabetic order

Course: Analysis and Linear Algebra [0131900]

Coordinators: M. Neher, V. Grimm, M. Hochbruck
Part of the modules: Analysis and Linear Algebra (p. 14)[bauiBGP05-HM1]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2/2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
T. Arens et al.: Mathematik. Spektrum-Verlag, 2008.
T. Westermann: Mathematik für Ingenieure. Springer, 5. Aufl. 2008.

Course: Applied Statistics [0170204]

Coordinators: J. Ihringer
Part of the modules: Applied Statistics (p. 16)[bauiBGP07-STATS]

ECTS Credits	Hours per week	Term	Instruction language
3	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Kreyszig, E.: Statistische Methoden und ihre Anwendung; Verlag Vandenhoeck und Ruprecht
Plate, E. (1993): Statistik und angewandte Wahrscheinlichkeitslehre für Bauingenieure, Verlag Ernst und Sohn, Berlin
Sachs, L. (1969): Statistische Auswertemethoden; Springer-Verlag

Course: Construction Technology [0170409]

Coordinators: S. Haghsheno, S. Gentes
Part of the modules: Technology and Management in Construction Operation (p. 38)[bauiBFP6-TMB]

ECTS Credits	Hours per week	Term	Instruction language
5,5	3/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Economics in Construction Operation [0170411]

Coordinators: K. Lennerts
Part of the modules: Technology and Management in Construction Operation (p. 38)[bauiBFP6-TMB]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Vorlesungsskripte / weitere Literatur wird in der Lehrveranstaltung vorgestellt.

Course: Chemistry of Building Materials [0170108]

Coordinators: J. Eckhardt
Part of the modules: Chemistry of Building Materials (p. 26)[bauiBGW1-BCHEM]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Erwin Riedel: Allgemeine und Anorganische Chemie, Gruyter Verlag

Course: Introduction to computer programming I [0170114]

Coordinators: M. Uhlmann
Part of the modules: Introduction to Computer Programming I (p. 24)[bauiBGP14-BINF1]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Introduction to computer programming II [0170212]

Coordinators: M. Uhlmann
Part of the modules: Introduction to Computer Programming II (p. 31)[BauiBGW7-BINF2]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Stuctural design [0170308]

Coordinators: H. Blaß
Part of the modules: Structural Design (p. 19)[bauiBGP10-BKONS]

ECTS Credits	Hours per week	Term	Instruction language
6	2/2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Skript “Baukonstruktionslehre”
Lehrbuch der Hochbaukonstruktionen (Hrsg.: Cziesielski, Erich)
Baukonstruktion im Planungsprozess (Hrsg.: Franke, Lutz)
Porenbetonhandbuch
Informationsdienst Holz, Holzbau Handbuch, Reihe 2, Teil 3 - Dachbauteile, Folge 1 - Berechnungsgrundlagen
Informationsdienst Holz, Holzbau Handbuch, Reihe 2, Teil 3 - Dachbauteile, Folge 2 - Hausdächer

Course: Building Physics [0170208]

Coordinators: H. Müller
Part of the modules: Structural Design (p. 19)[bauiBGP10-BKONS]

ECTS Credits	Hours per week	Term	Instruction language
3	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Skript “Bauphysik”
Lutz, Jenisch, Klopfer et. al: Lehrbuch der Bauphysik. Schall, Wärme, Feuchte, Licht, Brand, Klima. Teubner Verlag
Hohmann, Setzer, Wehling: Bauphysikalische Formeln und Tabellen. Wärmeschutz, Feuchteschutz, Schallschutz. Werner Verlag
Gösele, Schüle, Künzel: Schall, Wärme, Feuchte. Grundlagen, neue Erkenntnisse und Ausführungshinweise für den Hochbau. Bauverlag

Course: Structural Analysis I [0170401]

Coordinators: W. Wagner
Part of the modules: Structural Analysis (p. 32)[bauiBFP1-BSTAT]

ECTS Credits	Hours per week	Term	Instruction language
5	2/2/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature

- Vorlesungsmanuskript Baustatik I
- Krätzig, W.B., Harte, R., Meskouris, K., Wittek, U. (1999): Tragwerke 1 - Theorie und Berechnungsmethoden statisch bestimmter Stabtragwerke, Springer.
- Krätzig, W.B., Harte, R., Meskouris, K., Wittek, U. (2005): Tragwerke 2 - Theorie und Berechnungsmethoden statisch unbestimmter Stabtragwerke, Springer.
- Wunderlich, W., Kiener, G. (2004): Statik der Stabtragwerke, Teubner.

Course: Structural Analysis II [0170501]

Coordinators: W. Wagner
Part of the modules: Structural Analysis (p. 32)[bauiBFP1-BSTAT]

ECTS Credits	Hours per week	Term	Instruction language
5	2/2/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature

- Vorlesungsmanuskript Baustatik II
- Krätzig, W.B., Harte, R., Meskouris, K., Wittek, U. (1999): Tragwerke 1 - Theorie und Berechnungsmethoden statisch bestimmter Stabtragwerke, Springer.
- Krätzig, W.B., Harte, R., Meskouris, K., Wittek, U. (2005): Tragwerke 2 - Theorie und Berechnungsmethoden statisch unbestimmter Stabtragwerke, Springer.
- Wunderlich, W., Kiener, G. (2004): Statik der Stabtragwerke, Teubner.

Course: Theory of Building Materials [0170206]

Coordinators: H. Müller
Part of the modules: Building Materials (p. 18)[bauiBGP09-BSTOF]

ECTS Credits	Hours per week	Term	Instruction language
3	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
script “Baustoffkunde und Konstruktionsbaustoffe”;
further references are given in the script

Course: Design Basics in Highway Engineering [0170407]

Coordinators: R. Roos
Part of the modules: Mobility and Infrastructure (p. 37)[bauiBFP5-MOBIN]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Soil Mechanics I [0170412]

Coordinators: T. Triantafyllidis
Part of the modules: Geotechnical Engineering (p. 39)[bauiBFP7-GEOING]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Differential Equations [0132200]

Coordinators: V. Grimm, M. Neher, M. Hochbruck
Part of the modules: Differential Equations (p. 17)[bauiBGP08-HM3]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
T. Arens et al.: Mathematik. Spektrum-Verlag, 2008.
T. Westermann: Mathematik für Ingenieure. Springer, 5. Aufl. 2008.

Course: Dynamics [0170301]

Coordinators: T. Seelig, P. Betsch
Part of the modules: Dynamics (p. 12)[bauiBGP03-TM3]

ECTS Credits	Hours per week	Term	Instruction language
6	2/2/2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
[1] Vielsack - Skriptum “Dynamik”
[2] Gross / Hauger / Schröder Wall - Technische Mechanik 3

Course: Introduction to Continuum Mechanics [0170607]

Coordinators: T. Seelig, P. Betsch
Part of the modules: Introduction to Continuum Mechanics (p. 42)[bauiBFW2-EKM]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature

- Doghri, I. (2000): Mechanics of Deformable Solids. Springer,
- Fung, Y.C. (1965): Foundations of Solid Mechanics. Prentice Hall,
- Gross, D., Hauger, W., Wriggers, P. (2007): Technische Mechanik IV, Springer,
- Gould, P.L. (1983): Introduction to Linear Elasticity. Springer,
- Szabo, I. (2001): Höhere Technische Mechanik. Springer,
- Vielsack, P.: Einführung in die Kontinuumsmechanik, Skript zur Vorlesung (nur noch teilweise)

Course: Facility- and Real Estate Management [0170513]

Coordinators: K. Lennerts
Part of the modules: Technology and Management in Construction Operation (p. 38)[bauiBFP6-TMB]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1/0	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Strength of Materials [0170201]

Coordinators: P. Betsch, T. Seelig
Part of the modules: Strength of Materials (p. 10)[bauiBGP02-TM2]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2/2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
[1] Gross / Hauger / Schröder Wall - Technische Mechanik 2

Course: Geology in Civil Engineering [0170210]

Coordinators: J. Eckhardt, T. Mutschler
Part of the modules: Geology in Civil Engineering (p. 23)[bauiBGP13-GEOL]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Press, F. & Siever, R. (2003): Allgemeine Geologie, 3. Aufl., Spektrum
Fecker, E. & Reik, G. (1996): Baugeologie, 2. Aufl., F. Enke

Course: Geotechnical Design [0170611]

Coordinators: T. Triantafyllidis
Part of the modules: Geotechnical Design (p. 44)[bauiBFW4-GEOPL]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature

- Triantafyllidis, Th. (2011): Arbeitsblätter und Übungsblätter Bodenmechanik
- Triantafyllidis, Th. (2011): Arbeitsblätter und Übungsblätter Grundbau
- Gudehus, G (1981): Bodenmechanik, F. Enke
- Grundwissen „Der Ingenieurbau“ (1995) Bd. 2: Hydrotechnik – Geotechnik, Ernst u. Sohn

Course: Foundation Engineering I [0170514]

Coordinators: T. Triantafyllidis
Part of the modules: Geotechnical Engineering (p. 39)[bauiBFP7-GEOING]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Timber structures [0170507]

Coordinators: H. Blaß
Part of the modules: Basics in Steel and Timber Structures (p. 34)[bauiBFP3-KSTR.B]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Blaß, H.J.; Görlacher, R.; Steck, G. (Herausgeber) Holzbauwerke STEP 1 – Bemessung und Baustoffe. Fachverlag Holz, Düsseldorf, 1995 (ISSN-Nr. 04462114)

Course: Basics in steel structures [0170504]

Coordinators: T. Ummenhofer
Part of the modules: Basics in Steel and Timber Structures (p. 34)[bauiBFP3-KSTR.B]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature

- Skript “Grundlagen des Stahlbaus”, Lehrstuhl für Stahl- und Leichtmetallbau, Universität Karlsruhe (TH)
- DIN 18800-1: Stahlbauten - Teil 1: Bemessung und Konstruktion
- DIN 18800-2: Stahlbauten - Teil 2: Stabilitätsfälle-Knicken von Stäben
- DIN 18800-3: Stahlbauten - Teil 3: Plattenbeulen
- DIN 18800-4: Stahlbauten - Teil 4: Schalenbeulen

Course: Basics of Reinforced Concrete I [0170601]

Coordinators: L. Stempniewski
Part of the modules: Basics of Reinforced Concrete (p. 33)[bauiBFP2-KSTR.A]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Basics of Reinforced Concrete II [0170615]

Coordinators: L. Stempniewski
Part of the modules: Basics of Reinforced Concrete (p. 33)[bauiBFP2-KSTR.A]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Summer term	

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Basics of Track Guided Transport Systems [0170517]

Coordinators: E. Hohnecker
Part of the modules: Basics of Track Guided Transport Systems (p. 48)[bauiBFW8-GSTS]

ECTS Credits	Hours per week	Term	Instruction language
2	2	Winter term	de

Learning Control / Examinations
See module description.

Conditions
See module description.

Learning Outcomes
See German version.

Content
Definitions and classifications, basics of railway vehicles, track guided operation, railway alignment and operation

Literature
Zilch, Diederichs, Katzenbach, Beckmann (Hrsg): Handbuch für Bauingenieure, Springer-Verlag 2012

Remarks
See German version.

Course: Hydrology [0170511]

Coordinators: E. Zehe
Part of the modules: Water and Environment (p. 35)[bauiBFP4-WASSER]

ECTS Credits	Hours per week	Term	Instruction language
3	1/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Hydromechanics [0170304]

Coordinators: N. N.
Part of the modules: Hydromechanics (p. 13)[bauiBGP04-HYDRO]

ECTS Credits	Hours per week	Term	Instruction language
6	2/2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Jirka, Gerhard H. (2007). Einführung in die Hydromechanik, Universitätsverlag Karlsruhe, Karlsruhe. http://digbib.ubka.uni-karlsruhe.de/volltexte/1000007165
Herbert Oertel; Martin Böhle; Ulrich Dohrmann (2006). Strömungsmechanik, 4. überarb. u. erw. Aufl., Vieweg, Wiesbaden.
Herbert Oertel; Martin Böhle; Ulrich Dohrmann (2006). Übungsbuch Strömungsmechanik, 5., überarb. und erw. Aufl., Vieweg, Wiesbaden.

Course: Integration and Multivariate Analysis [0181300]

Coordinators: V. Grimm, M. Neher, M. Hochbruck
Part of the modules: Integration and Multivariate Analysis (p. 15)[bauiBGP06-HM2]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2/2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
T. Arens et al.: Mathematik. Spektrum-Verlag, 2008.
T. Westermann: Mathematik für Ingenieure. Springer, 5. Aufl. 2008.

Course: Building Materials [0170306]

Coordinators: H. Müller
Part of the modules: Building Materials (p. 18)[bauiBGP09-BSTOF]

ECTS Credits	Hours per week	Term	Instruction language
9	4/2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
script “Baustoffkunde und Konstruktionsbaustoffe”;
further references are given in the script

Course: Laboratory course [0170118]

Coordinators: Mitarbeiter der beteiligten Institute
Part of the modules: Laboratory Course (p. 30)[bauiBGW6-LABOR]

ECTS Credits	Hours per week	Term	Instruction language
2	0/2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Life Cycle Management [0170613]

Coordinators: K. Lennerts, H. Müller, E. Kotan, M. Vogel
Part of the modules: Life Cycle Management (p. 47)[bauiBFW7-LZMAN]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Summer term	

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Vorlesungsskript / entsprechende Literatur wird in der Lehrveranstaltung vorgestellt.

Course: Partial Differential Equations [0181600]

Coordinators: V. Grimm, M. Neher, M. Hochbruck
Part of the modules: Partial Differential Equations (p. 41)[bauiBFW1-PDGL]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Planning Methodology [0170104]

Coordinators: P. Vortisch, W. Jung, M. Kagerbauer
Part of the modules: Planning Methodology (p. 21)[bauiBGP11-PLANM]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Skriptum
Fürst, D.; Scholles, F. (Hrsg.) 2008: Handbuch Theorien und Methoden derraum-und Umweltplanung; Detmold: Dorothea Rohn

Course: Project “Plan, Design, Engineering” [0170516]

Coordinators: R. Roos, P. Vortisch, B. Brester, E. Hohnecker
Part of the modules: Project “Plan, Design, Engineering” (p. 46)[bauiBFW6-PPEK]

ECTS Credits	Hours per week	Term	Instruction language
2	0/2	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Project Management [0170106]

Coordinators: S. Haghsheno, H. Schneider
Part of the modules: Project Management (p. 22)[bauiBGP12-PMANG]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
DIETHELM, G.: Projektmanagement, Band 1: Grundlagen, Verlag Neue Wirtschafts-Briefe, Herne, 2000
HAHN, R.: Projektmanagement für Ingenieure, Wiley-VCH Verlag, Weinheim, 2002
KERZNER, H.: Project Management – A Systems Approach to Planning, Scheduling and Controlling, Wiley & Sons, 2006
KOCHENDÖRFER, B., LIEBCHEN, J.: Bau-Projekt-Management, Verlag B. G. Teubner, Stuttgart, 2001

Course: Regional Planning and Planning Law [0170404]

Coordinators: W. Jung
Part of the modules: Mobility and Infrastructure (p. 37)[bauiBFP5-MOBIN]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Siedlungswasserwirtschaft [0170603]

Coordinators: S. Fuchs
Part of the modules: Water and Environment (p. 35)[bauiBFP4-WASSER]

ECTS Credits	Hours per week	Term	Instruction language
3	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Statics of Rigid Bodies [0170101]

Coordinators: P. Betsch, T. Seelig
Part of the modules: Statics of Rigid Bodies (p. 9)[bauiBGP01-TM1]

ECTS Credits	Hours per week	Term	Instruction language
7	3/2/2	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
[1] Gross / Hauger / Schröder Wall - Technische Mechanik 1

Course: Technical Illustrations [0170116]

Coordinators: R. Roos
Part of the modules: Technical Illustrations (p. 29)[bauiBGW5-TECDS]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Environmental Chemistry [0170110]

Coordinators: J. Winter
Part of the modules: Environmental Chemistry (p. 27)[bauiBGW2-UCHEM]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Environmental Physics/ Energy [0170112]

Coordinators: F. Nestmann
Part of the modules: Environmental Physics/ Energy (p. 28)[bauiBGW3-UPHYS]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: [0170605]

Coordinators: J. Winter
Part of the modules: Water and Environment (p. 35)[bauiBFP4-WASSER]

ECTS Credits	Hours per week	Term	Instruction language
1,5	1/1	Summer term	

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Transportation [0170405]

Coordinators: P. Vortisch
Part of the modules: Mobility and Infrastructure (p. 37)[bauiBFP5-MOBIN]

ECTS Credits	Hours per week	Term	Instruction language
4	2/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: Surveying [20714]

Coordinators: N. Rösch
Part of the modules: Surveying (p. 45)[bauiBFW5-VERMK]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Literature
Script

Course: Hydrological engineering and water management I [0170509]

Coordinators: F. Nestmann
Part of the modules: Water and Environment (p. 35)[bauiBFP4-WASSER]

ECTS Credits	Hours per week	Term	Instruction language
4,5	2/1	Winter term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

- Motivation and visit to the Theodor-Rehbock-Water engineering laboratory
- Fundamentals of Hydrology
- Hydraulic calculations in stream water systems
- Numeric flow simulation
- Floodwater and measurement of flood protection structures
- Constructions in water management; their sizing and handling

Course: Physical Modelling in River Engineering [0170609]

Coordinators: F. Seidel, C. Lang
Part of the modules: Physical Modelling in River Engineering (p. 43)[bauiBFW3-WASSVW]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Summer term	de

Learning Control / Examinations

Conditions
None.

Learning Outcomes

Content

Course: [0170617]

Coordinators: J. Ihringer
Part of the modules: Water Tersources Management and Engineering Hydrology (p. 49)[bauiBFW9-WASSRM]

ECTS Credits	Hours per week	Term	Instruction language
2	1/1	Summer term	

Learning Control / Examinations

Conditions
None.

Learning Outcomes

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