

Module Manual

Master of Science
Civil Engineering

Cohort: Winter Term 2015 Updated: 11th May 2016

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Program description

Content

The graduates of the university course M.Sc. Civil Engineering are able to transfer the acquired knowledge in engineering, mathematics and natural sciences to practical application and to analyse and solve problems on a scientific basis, even if these are unusual or incompletely defined and comprise complex specifications. They are competent to autonomously work in civil and structural engineering or in a neighbouring discipline, and to apply, scrutinise and develop the methods and procedures that are used to solve technical problems or planning issues.

Furthermore, the graduates are qualified to elaborate designs for demanding projects in civil and structural engineering as well as in river and coastal engineering and to plan such construction proposals, including the necessary investigations and evaluation of available information. They can

- successfully collaborate with amateur and professional stakeholders from administration, economy and science
 autonomously define, plan and conduct scientific tasks to theoretically or experimentally investigate constructions, soils, materials, infrastructure systems as well as management duties
- responsibly evaluate and consider the interests of building partners, people concerned and the society as a whole.



Core qualification

Module M0523: Business	& Management
Module Responsible	Prof. Matthias Meyer
Admission Requirements	None
Recommended Previous	None
Knowledge	
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge Skills	 Students are able to find their way around selected special areas of management within the scope of business management. Students are able to explain basic theories, categories, and models in selected special areas of business management. Students are able to interrelate technical and management knowledge.
Personal Competence Social Competence Autonomy	
Workload in Hours	Depends on choice of courses
Credit points	6

Courses

Information regarding lectures and courses can be found in the corresponding module handbook published separately.



Module Responsible	Dagmar Richter				
-	None				
-	None				
Knowledge					
Educational Objectives	After taking part successfully, students have reached the following learning results				
Professional Competence					
Knowledge	The Non-technical Elective Study Area				
	imparts skills that, in view of the TUHH's training profile, professional engineering studies require but are not able to cover fully. Self-reliand				
	management, collaboration and professional and personnel management competences. The department implements these training object				
	its teaching architecture, in its teaching and learning arrangements, in teaching areas and by means of teaching offerings in which s				
	can qualify by opting for specific competences and a competence level at the Bachelor's or Master's level. The teaching offerings are portwo different catalogues for nontechnical complementary courses.				
	The Learning Architecture				
	consists of a cross-disciplinarily study offering. The centrally designed teaching offering ensures that courses in the "non-technical department"				
	follow the specific profiling of TUHH degree courses.				
	The learning architecture demands and trains independent educational planning as regards the individual development of competences				
	provides orientation knowledge in the form of "profiles".				
	The subjects that can be studied in parallel throughout the student's entire study program - if need be, it can be studied in one to two seme				
	view of the adaptation problems that individuals commonly face in their first semesters after making the transition from school to university				
	order to encourage individually planned semesters abroad, there is no obligation to study these subjects in one or two specific semesters				
	the course of studies.				
	Teaching and Learning Arrangements				
	provide for students, separated into B.Sc. and M.Sc., to learn with and from each other across semesters. The challenge of deali				
	interdisciplinarity and a variety of stages of learning in courses are part of the learning architecture and are deliberately encouraged in courses.				
	Fields of Teaching				
	are based on research findings from the academic disciplines cultural studies, social studies, arts, historical studies, communication stud				
	sustainability research, and from engineering didactics. In addition, from the winter semester 2014/15 students on all Bachelor's courses w				
	the opportunity to learn about business management and start-ups in a goal-oriented way.				
	The fields of teaching are augmented by soft skills offers and a foreign language offer. Here, the focus is on encouraging goal-				
	communication skills, e.g. the skills required by outgoing engineers in international and intercultural situations.				
	The Competence Level				
	of the courses offered in this area is different as regards the basic training objective in the Bachelor's and Master's fields. These different				
	reflected in the practical examples used, in content topics that refer to different professional application contexts, and in the higher scien				
	theoretical level of abstraction in the B.Sc.				
	This is also reflected in the different quality of soft skills, which relate to the different team positions and different group leadership func				
	Bachelor's and Master's graduates in their future working life.				
	Specialized Competence (Knowledge)				
	Students can				
	explain specialized areas in context of the relevant non-technical disciplines,				
	• outline basic theories, categories, terminology, models, concepts or artistic techniques in the disciplines represented in the learning				
	different specialist disciplines relate to their own discipline and differentiate it as well as make connections,				
	sketch the basic outlines of how scientific disciplines, paradigms, models, instruments, methods and forms of representation				
	 specialized sciences are subject to individual and socio-cultural interpretation and historicity, Can communicate in a foreign language in a manner appropriate to the subject. 				
	- כמה פרוהווטוווטמנס זה מ וטרפוצה ומחצט מצט זה מ חומווויפו מאףוטארומנס נט וווס שטטוסט.				
Skills	Professional Competence (Skills)				
-					
	In selected sub-areas students can				
	apply basic and specific methods of the said scientific disciplines,				
	• aquestion a specific technical phenomena, models, theories from the viewpoint of another, aforementioned specialist discipline,				
	to handle simple and advanced questions in aforementioned scientific disciplines in a successful manner,				
	 justify their decisions on forms of organization and application in practical questions in contexts that go beyond the technical relation the subject. 				

Personal Competence



Social Competence	Personal Competences (Social Skills)
	Students will be able
	 to learn to collaborate in different manner, to present and analyze problems in the abovementioned fields in a partner or group situation in a manner appropriate to the addressees, to express themselves competently, in a culturally appropriate and gender-sensitive manner in the language of the country (as far as this study-focus would be chosen), to explain nontechnical items to auditorium with technical background knowledge.
Autonomy	Personal Competences (Self-reliance)
	Students are able in selected areas
	• to reflect on their own profession and professionalism in the context of real-life fields of application
	to organize themselves and their own learning processes
	to reflect and decide questions in front of a broad education background
	 to communicate a nontechnical item in a competent way in writen form or verbaly to organize themselves as an entrepreneurial subject country (as far as this study-focus would be chosen)
Workload in Hours	Depends on choice of courses
Credit points	6

Courses

Information regarding lectures and courses can be found in the corresponding module handbook published separately.



Courses					
Title		Тур	Hrs/wk	CP	
Finite Element Methods (L0291)		Lecture	2	3	
Finite Element Methods (L0804)		Recitation Section (large)	2	3	
Module Responsible	Prof. Otto von Estorff				
Admission Requirements	none				
Recommended Previous	Mechanics I (Statics, Mechanics of Materials) and Mechanics II (Hydrostatics, Kinematics, Dynamics)				
Knowledge	Mathematics I, II, III (in particular differential equations)				
Educational Objectives	After taking part successfully, students have reached the foll	owing learning results			
Professional Competence					
	The students possess an in-depth knowledge regarding t	he derivation of the finite element metho	d and are able to g	ive an overview of t	
-	theoretical and methodical basis of the method.		-		
Skilla	The students are searchile to bendle ansing science problems.	ny famulatina avitable finite alamante accur	ombling the correspo	nding quatern motric	
Skills	The students are capable to handle engineering problems by formulating suitable finite elements, assembling the corresponding system mat and solving the resulting system of equations.				
Personal Competence					
Social Competence	-				
	The students are able to independently solve challenging	computational problems and develop ov	n finite element rou	tines. Problems can	
	identified and the results are critically scrutinized.				
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56				
Credit points	6				
Examination	Written exam				
Examination duration and scale	120 min				
Assignment for the Following					
	Energy Systems: Core qualification: Elective Compulsory				
	Aircraft Systems Engineering: Specialisation Aircraft System	as Engineering: Elective Compulsory			
	Aircraft Systems Engineering: Specialisation Air Transportat				
	Computational Science and Engineering: Specialisation En	gineering: Elective Compulsory			
	International Management and Engineering: Specialisation				
	International Management and Engineering: Specialisation	II. Product Development and Production: E	elective Compulsory		
	Mechatronics: Core qualification: Compulsory				
	Biomedical Engineering: Specialisation Artificial Organs and	d Regenerative Medicine: Elective Compu	sory		
	Biomedical Engineering: Specialisation Implants and Endop	prostheses: Compulsory			
	Biomedical Engineering: Specialisation Medical Technology	y and Control Theory: Elective Compulsory	1		
	Biomedical Engineering: Specialisation Management and B	Business Administration: Elective Compulse	ory		
	Product Development, Materials and Production: Core quali	fication: Compulsory			
	Technomathematics: Core qualification: Elective Compulsor	ry			
	Theoretical Mechanical Engineering: Core qualification: Co				



Course L0291: Finite Element Met	hods
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Otto von Estorff
Language	EN
Cycle	WiSe
Content	- General overview on modern engineering
	- Displacement method
	- Hybrid formulation
	- Isoparametric elements
	- Numerical integration
	- Solving systems of equations (statics, dynamics)
	- Eigenvalue problems
	- Non-linear systems
	- Applications
	- Programming of elements (Matlab, hands-on sessions)
	- Applications
Literature	Bathe, KJ. (2000): Finite-Elemente-Methoden. Springer Verlag, Berlin

Course L0804: Finite Element Methods		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Otto von Estorff	
Language	EN	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Module M0962: Sustainab	ility and Risk Management					
Courses						
Title		Тур	Hrs/wk	СР		
Safety, Reliability and Risk Assessment	(L1145)	Seminar	2	3		
Environment and Sustainability (L0319)		Lecture	2	3		
Module Responsible	Prof. Kerstin Kuchta					
Admission Requirements	none					
Recommended Previous	none					
Knowledge						
Educational Objectives	After taking part successfully, students have reached the follow	ving learning results				
Professional Competence						
Knowledge	Students are able to describe single techniques and to give a	an overview for the field of safety a	and risk assessment as well	as environmental and		
	sustainable engineering, in detail:					
	 basics in safety and reliability of technical facilities 					
	 safety and reliability analysis methods 					
	 risk assessment 					
	 Production and usage of bio-char 					
	 energy production and supply 					
	 sustainable product design 					
Skills	Students are able apply interdisciplinary system-oriented me and costs for processes and select economically feasible treat		istainability reporting. They	can evaluate the effort		
Personal Competence						
Social Competence						
Autonomy	Students can gain knowledge of the subject area from given	sources and transform it to new o	questions. Furthermore, they	can define targets for		
	new application or research-oriented duties in for risk manage	new application or research-oriented duties in for risk management and sustainability concepts accordance with the potential social, economic				
	and cultural impact.					
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56					
Credit points	6					
Examination	Written elaboration					
Examination duration and scale	Elaboration and presentation (45 minutes in groups)					
Assignment for the Following	Civil Engineering: Core qualification: Compulsory					
Curricula	International Management and Engineering: Specialisation II.	Civil Engineering: Elective Comp	ulsory			
	Product Development, Materials and Production: Specialisatio	n Product Development: Elective	Compulsory			
	Product Development, Materials and Production: Specialisatio					
	Product Development, Materials and Production: Specialisatio	n Materials: Elective Compulsory				
	Water and Environmental Engineering: Core qualification: Cor					

Course L1145: Safety, Reliability and Risk Assessment				
Тур	Seminar			
Hrs/wk	2			
CP	3			
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28			
Lecturer	Dr. Marco Ritzkowski			
Language	DE			
Cycle	WiSe			
Content	 An introduction in safety and risk assessment is given and some typical problems of structural and environmental engineering are treated: basics in safety and reliability of technical facilities safety and reliability analysis methods risk assessment practical examples and excursions discussions and presentations 			
Literature	 Vorlesungsunterlagen Schneider, J., Schlatter, H.P.: Sicherheit und Zuverlässigkeit im Bauwesen. www.risksafety.ch/files/sicherheit_und_zuverlaessigkeit.pdf 			



Course L0319: Environment and S	ustainability
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Kerstin Kuchta
Language	EN
Cycle	WiSe
Content	This course presents actual methodologies and examples of environmental relevant, sustainable technologies, concepts and strategies in the field
	of energy supply, product design, water supply, waste water treatment or mobility. The following list show examples.
	Production and Usage of Bio-char
	Engergy production with algae
	Environmental product design
	Clean Development mechanism (CDM)
	Democracy and Energy
	New Concepts for a sustainable Energy Supply
	Recycling of Wind Turbines
	Alternative Mobility
	Disposal of Nuclear Wastes
	Waste2Energy
	Offshore Wind energy
Literature	Wird in der Veranstaltung bekannt gegeben.

Specialization Coastal Engineering

Module M0964: Structures in Foundation and Hydraulic Engineering

Courses					
Title		Тур	Hrs/wk	CP	
Design of Foundations and Retaining Walls (L0601)		Lecture	2	2	
Design of Foundations and Retaining Wa	alls (L0602)	Recitation Section (large)	1	1	
Steel Structures in Foundation and Hydr	aulic Engineering (L1146)	Lecture	2	3	
Underground Constructions (L0707)		Lecture	1	2	
Underground Constructions (L1811)		Recitation Section (large)	1	1	
Module Responsible	Prof. Jürgen Grabe				
Admission Requirements					
Recommended Previous					
Knowledge					
Educational Objectives	After taking part successfully, students have reached the following learning results				
Professional Competence					
Knowledge					
Skills	ills				
Personal Competence	Personal Competence				
Social Competence					
Autonomy					
Workload in Hours	Independent Study Time 82, Study Time in Lecture 98	8			
Credit points	6				
Examination	Written exam				
Examination duration and scale	120 minutes				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory				
Curricula	a Civil Engineering: Specialisation Geotechnical Engineering: Compulsory				
	Civil Engineering: Specialisation Coastal Engineering	g: Compulsory			
International Management and Engineering: Specialisation II. Civil Engineering: Elective Compulsory					

Course L0601: Design of Foundations and Retaining Walls		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	NN	
Language	DE	
Cycle	WiSe	
Content	Design of foutings and foundations	
Literature	Handouts	

Course L0602: Design of Foundations and Retaining Walls				
Тур	tation Section (large)			
Hrs/wk	1			
CP	1			
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14			
Lecturer	NN			
Language	DE			
Cycle	WiSe			
Content	See interlocking course			
Literature	See interlocking course			

Course L1146: Steel Structures in Foundation and Hydraulic Engineering		
Тур	Lecture	
Hrs/wk	2	
CP	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Frank Feindt	
Language	DE	
Cycle	WiSe	
Content		
Literature		



Course L0707: Underground Cons	tructions			
	Lecture			
Hrs/wk				
CP				
	dependent Study Time 46, Study Time in Lecture 14			
	Marius Milatz			
Language				
Cycle				
Content	 Definitions Historical development in tunneling Geology for tunneling Hard rock tunneling (construction composite and machines) Tunnelung in temporarly stable soil with conventional construction methods Tunneling in soft soils (form of supports, shield types, compressed air application) Pipe jacking Tunnel Lining, tunnel supporting structures Calculation approaches for supporting structures in shield-driven tunnels Surveying for tunneling 			
Literature	Safety requirements Construction Contract Literature and sources Vorlesung/Übung s. www.tu-harburg.de/gbt			

Course L1811: Underground Constructions				
Тур	Recitation Section (large)			
Hrs/wk				
CP	1			
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14			
Lecturer	Marius Milatz			
Language	DE			
Cycle	WiSe			
Content	See interlocking course			
Literature	See interlocking course			



Module M0699: Advanced Foundation Engineering and Soil Laboratory Course Courses Title Тур Hrs/wk СР 2 Soil Laboratory Course (L0499) Laboratory Course 1 Advanced Foundation Engineering (L0497) Lecture 2 2 Advanced Foundation Engineering (L0498) Recitation Section (large) 2 1 Module Responsible Prof. Jürgen Grabe Admission Requirements Recommended Previous Knowledge Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge Skills Personal Competence Social Competence Autonom Workload in Hours Independent Study Time 124, Study Time in Lecture 56 Credit points Examination Written exam Examination duration and scale 60 min Assignment for the Following Civil Engineering: Specialisation Structural Engineering: Compulsory Curricula Civil Engineering: Specialisation Geotechnical Engineering: Compulsory Civil Engineering: Specialisation Coastal Engineering: Compulsory International Management and Engineering: Specialisation II. Civil Engineering: Elective Compulsory

Course L0499: Soil Laboratory Co	urse			
Тур	Laboratory Course			
Hrs/wk				
CP				
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14			
Lecturer	Prof. Jürgen Grabe			
Language	DE			
Cycle	WiSe			
Content	 Field experiments Short lecture on laboratory tests soil analysis laboratory test soil clasification Creating a ground and foundation report 			
Literature	DIN-Taschenbuch 113, Erkundung und Untersuchung des Baugrundes			



Course L0497: Advanced Foundat			
	Lecture		
Hrs/wk			
CP			
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Jürgen Grabe		
Language	DE		
Cycle	WiSe		
Content	 Vertical drains Piles Ground improvement (Deep Compaction, Soil mixing) Vibration driving Jet grouting Slurry wall Deep excavation 		
Literature	 EAK (2002): Empfehlungen für Küstenschutzbauwerke EAU (2004): Empfehlungen des Arbeitsausschusses Uferbauwerke EAB (1988): Empfehlungen des Arbeitskreises Baugruben Grundbau-Taschenbuch, Teil 1-3, (1997), Ernst & Sohn Verlag 		

Course L0498: Advanced Foundation Engineering		
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Courses				
litle		Тур	Hrs/wk	CP
Basics of Coastal Engineering (L0807)		Lecture	3	4
Basics of Coastal Engineering (L1413)		Recitation Section (large)	1	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reach	ed the following learning results		
Professional Competence				
Knowledge	The students are able to define and explain the h	pasic concepts of coastal engineering and port engin	eering. They are ab	le to apply the conce
	to selected practical problems of coastal engine	eering. Students can define and determine the basi	cs for design and o	dimensioning of coas
	engineering constructions.			
Skille	The students are conclude to apply basis design a	pproaches to selected and pre-defined design tasks i	n agastal anginagrir	
SKIIIS	The sudents are capable to apply basic design a	oproacties to selected and pre-delined design tasks i	n coasiar engineeni	ig.
Personal Competence				
Social Competence				
•				
Social Competence Autonomy		ire 56		
Social Competence Autonomy	Independent Study Time 124, Study Time in Lect	ure 56		
Social Competence Autonomy Workload in Hours	Independent Study Time 124, Study Time in Lectu 6	ıre 56		
Social Competence Autonomy Workload in Hours Credit points	Independent Study Time 124, Study Time in Lectu 6 Written exam	rre 56 examination includes tasks with respect to the genera	I understanding of 1	the lecture contents a
Social Competence Autonomy Workload in Hours Credit points Examination	Independent Study Time 124, Study Time in Lectu 6 Written exam		I understanding of t	the lecture contents a
Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale	Independent Study Time 124, Study Time in Lectu 6 Written exam The duration of the examination is 2 hours. The d	examination includes tasks with respect to the genera	I understanding of t	the lecture contents a
Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale	Independent Study Time 124, Study Time in Lectr 6 Written exam The duration of the examination is 2 hours. The e calculations tasks. Civil Engineering: Specialisation Structural Engin	examination includes tasks with respect to the generate	I understanding of I	the lecture contents a
Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale Assignment for the Following	Independent Study Time 124, Study Time in Lectu 6 Written exam The duration of the examination is 2 hours. The calculations tasks. Civil Engineering: Specialisation Structural Engin	examination includes tasks with respect to the genera eering: Elective Compulsory gineering: Compulsory	I understanding of t	the lecture contents a

Course L0807: Basics of Coastal I	Engineering		
Тур	Lecture		
Hrs/wk	3		
CP	4		
Workload in Hours	lependent Study Time 78, Study Time in Lecture 42		
Lecturer	of. Peter Fröhle		
Language	DE		
Cycle	WiSe		
Content	Basics of planning and design		
	Water levels		
	• Currents		
	• Waves		
	• Ice		
	Planning and Design in Coastal Engineering		
	 Functional and constructional design 		
	 Determination of design parameters 		
	 Design-approaches 		
	 Filter 		
	 Rubble mound constructions 		
	Piles		
	 Vertical constructions 		
Literature	Coastal Engineering Manual, CEM		
	Vorlesungsumdruck		



Course L1413: Basics of Coastal Engineering				
Тур	Recitation Section (large)			
Hrs/wk	1			
CP	2			
Workload in Hours	pendent Study Time 46, Study Time in Lecture 14			
Lecturer	Prof. Peter Fröhle			
Language	DE			
Cycle	WiSe			
Content	See interlocking course			
Literature	See interlocking course			



Courses					
Title		Тур	Hrs/wk	CP	
Renewable Energy Projects in Emerged	Markets (L0014)	Project Seminar	1	1	
Hydro Power Use (L0013)		Lecture	1	1	
Wind Turbine Plants (L0011)		Lecture	2	3	
Wind Energy Use – Focus Offshore (L0	012)	Lecture	1	1	
Module Responsible	Dr. Joachim Gerth				
Admission Requirements	none				
Recommended Previous	Thermodynamics, Fluid Mechanics, Fundame	ntals of Fluid Flow Engines			
Knowledge					
Educational Objectives	After taking part successfully, students have re	ached the following learning results			
Professional Competence					
Knowledge	By ending this module students can explain in detail knowledge of wind turbines with a particular focus of wind energy use in offshore condit and can critical comment these aspects in consideration of current developments. Furthermore, they are able to describe fundamentally the us water power to generate electricity. The students reproduce and explain the basic procedure in the implementation of renewable energy proj in countries outside Europe.				
Skills	Students are able to apply the acquired theoretical foundations on exemplary water or wind power systems and evaluate and assess technicat the resulting relationships in the context of dimensioning and operation of these energy systems. They can in compare critically the spec procedure for the implementation of renewable energy projects in countries outside Europe with the in principle applied approach in Europe a can apply this procedure on exemplary theoretical projects.				
Personal Competence Social Competence	Students can discuss scientific tasks subjet-sp	pecificly and multidisciplinary within a seminar.			
Autonomy	Students can independently exploit sources in	the context of the emphasis of the lecture material t	to clear the contents of th	a locture and to acc	
Autonomy					
	the particular knowledge about the subject area.				
Workload in Hours	Independent Study Time 110, Study Time in L	ecture 70			
Credit points	6				
Examination	Written exam				
Examination duration and scale	3 hours written exam				
Assignment for the Following	Civil Engineering: Specialisation Structural En	gineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnica				
	Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory				
	Energy and Environmental Engineering: Spec	ialisation Energy Engineering: Elective Compulsory			
		Specialisation II. Renewable Energy: Elective Compu			
		Specialisation II. Energy and Environmental Enginee		ry	
	8 8 8	on: Specialisation Product Development: Elective Co	0	-	
		on: Specialisation Production: Elective Compulsory	, ,		
		on: Specialisation Materials: Elective Compulsory			
	•				
	Renewable Energies: Core qualification: Com				
	Renewable Energies: Core qualification: Com Water and Environmental Engineering: Specia				



Course L0014: Renewable Energy	Projects in Emerged Markete
Тур	Project Seminar
Hrs/wk	
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Andreas Wiese
Language	DE
Cycle	SoSe
Content	1. Introduction
	 Development of renewable energies worldwide
	 Bevelopment of relievable energies worldwide History
	 Future markets
	 Special challenges in new markets - Overview
	2. Sample project wind farm Korea
	 Survey
	Technical Description
	 Project phases and characteristics
	3. Funding and financing instruments for EE projects in new markets
	Overview funding opportunitie
	Overview countries with feed-in laws
	 Major funding programs
	4. CDM projects - why, how , examples
	Overview CDM process
	• Examples
	Exercise CDM
	5. Rural electrification and hybrid systems - an important future market for EE
	Rural Electrification - Introduction
	 Types of Elektrizifierungsprojekten
	 The role of the EEInterpretation of hybrid systems
	 Project example: hybrid system Galapagos Islands
	6. Tendering process for EE projects - examples
	 South Africa
	• Brazil
	7. Selected projects from the perspective of a development bank - Wesley Urena Vargas, KfW Development Bank
	Geothermal
	Wind or CSP
Literature	Folien der Vorlesung
Literature	, one of the order

urse L0013: Hydro Power Use			
Тур	Lecture		
Hrs/wk	1		
CP	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	Dr. Stephan Heimerl		
Language	DE		
Cycle	SoSe		
Content	 Introduction, importance of water power in the national and global context Physical basics: Bernoulli's equation, usable height of fall, hydrological measures, loss mechanisms, efficiencies Classification of Hydropower: Flow and Storage hydropower, low and high pressure systems Construction of hydroelectric power plants: description of the individual components and their technical system interaction Structural engineering components; representation of dams, weirs, dams, power houses, computer systems, etc. Energy Technical Components: Illustration of the different types of hydraulic machinery, generators and grid connection Hydropower and the Environment Examples from practice 		
Literature	 Schröder, W.; Euler, G.; Schneider, K.: Grundlagen des Wasserbaus; Werner, Düsseldorf, 1999, 4. Auflage Quaschning, V.: Regenerative Energiesysteme: Technologie – Berechnung - Simulation; Carl Hanser, München, 2011, 7. Auflage Giesecke, J.; Heimerl, S.; Mosony, E.: Wasserkraftanlagen Planung, Bau und Betrieb; Springer, Berlin, Heidelberg, 2009, 5. Auflage von König, F.; Jehle, C.: Bau von Wasserkraftanlagen – Praxisbezogene Planungsunterlagen; C. F. Müller, Heidelberg, 2005, 4. Auflage Strobl, T.; Zunic, F.: Wasserbau: Aktuelle Grundlagen – Neue Entwicklungen; Springer, Berlin, Heidelberg, 2006 		



Course L0011: Wind Turbine Plant	S
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dr. Rudolf Zellermann
Language	DE
Cycle	SoSe
Content	 Historical development Wind: origins, geographic and temporal distribution, locations Power coefficient, rotor thrust Aerodynamics of the rotor Operating performance Power limitation, partial load, pitch and stall control Plant selection, yield prediction, economy Excursion
Literature	Gasch, R., Windkraftanlagen, 4. Auflage, Teubner-Verlag, 2005

Course L0012: Wind Energy Use -	- Focus Offshore
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Martin Skiba
Language	DE
Cycle	SoSe
Content	 Introduction, importance of offshore wind power generation, Specific requirements for offshore engineering Physical fundamentals for utilization of wind energy Design and operation of offshore wind turbines, presentation of different concepts of offshore wind turbines, representation of the individual system components and their system-technical relationships Foundation engineering, offshore site investigation, presentation of different concepts of offshore foundation structures, planning and fabrication of foundation structures Electrical infrastructure of an offshore wind farm, Inner Park cabling, offshore substation, grid connection Installation of offshore wind farms, installation techniques and auxiliary devices, construction logistics Development and planning of offshore wind farms Operation and optimization of offshore wind farms Day excursion
Literature	 Gasch, R.; Twele, J.: Windkraftanlagen – Grundlagen, Entwurf, Planung und Betrieb; Vieweg + Teubner, Stuttgart, 2007, 7. Auflage Molly, J. P.: Windenergie – Theorie, Anwendung, Messung; C. F. Müller, Heidel-berg, 1997, 3. Auflage Hau, E.: Windkraftanlagen; Springer, Berlin, Heidelberg, 2008, 4.Auflage Heier, S.: Windkraftanlagen – Systemauslegung, Integration und Regelung; Vieweg + Teubner, Stuttgart, 2009, 5. Auflage Jarass, L.; Obermair, G.M.; Voigt, W.: Windenergie: Zuverlässige Integration in die Energieversorgung; Springer, Berlin, Heidelberg, 2009, 2. Auflage



Module M0663: Marine Ge	otechnics and Numerics			
Courses				
Title		Тур	Hrs/wk	CP
Marine Geotechnics (L0548)		Lecture	1	2
Marine Geotechnics (L0549)		Recitation Section (large)	1	1
Numerical Methods in Geotechnics (L03	375)	Lecture	3	3
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	none			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following	learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	90 min			
Assignment for the Following	Civil Engineering: Specialisation Coastal Engineering: Compulsory			
Curricula	Theoretical Mechanical Engineering: Specialisation Maritime Technology: Elective Compulsory			

Course L0548: Marine Geotechnics		
	ecture	
Hrs/wk		
CP		
	Independent Study Time 46, Study Time in Lecture 14	
	Prof. Jürgen Grabe	
Language		
Cycle	SoSe	
Content	 Geotechnical investigation an description of the seabed Foundations of Offshore-Constructions cCliff erosion Sea dikes Port structures Flood protection structures 	
Literature	 EAK (2002): Empfehlungen für Küstenschutzbauwerke EAU (2004): Empfehlungen des Arbeitsausschusses Uferbauwerke Poulos H.G. (1988): Marine Geotechnics. Unwin Hyman, London Wagner P. (1990): Meerestechnik: Eine Einführung für Bauingenieure. Ernst & Sohn, Berlin 	

course L0549: Marine Geotechnics	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course



Course L0375: Numerical Methods	s in Gentenhnins
	Lecture
Hrs/wk	3
CP	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Dr. Hans Mathäus Hügel
Language	DE
Cycle	SoSe
Content	Topics:
	 numerical simulations numerical algorithms finite element method application of finite element method in geomechanics constitutive models for soils contact models for soil structure interaction selected applications
Literature	 Wriggers P. (2001): Nichtlineare Finite-Elemente-Methoden, Springer Verlag, Berlin Bathe Klaus-Jürgen (2002): Finite-Elemente-Methoden. Springer Verlag, Berlin



Courses				
Title		Тур	Hrs/wk	СР
Anchor Technology and Design, Post Installed Rebar Connections (L0257)		Recitation Section (small)	1	1
Repair of Structures (L0255)		Lecture	1	1
Mineral Building Materials (L0253)		Lecture	2	2
Fechnology of mineral Building Materials	; (L0256)	Recitation Section (small)	1	1
Fransport Processes in Building Materia	als and Damage Processes (L0254)	Lecture	1	1
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials, building	physics and building chemistry, for example by the	he modules Principl	es of Building Mate
Knowledge	and Building Physics and Building Materials and Bu	ilding Chemistry.		
Educational Objectives	After taking part successfully, students have reached	d the following learning results		
Professional Competence				
Knowledge	The students are able to describe the components of	of mineral building materials and their function in d	etail and to use ther	m for the manufactu
	special mineral building materials. They are able	to show the characteristics of mineral building	materials. They ar	e able to describe
	manufacture, properties and fields of application of			
	are able to show the principles of anchor technology			
	are able to show the principles of another technology			
Skills	Its The students are able to perform an optimization of granulometry of a mineral building material. They are able to design a special mineral		a special mineral m	
and to manufacture this mortar. The students are able to manufacture post installed rebar connections. They are able to recogniz		recognize damage		
	assess possible causes, to use the fundamentals of	construction preservation and to select repair and	strengthening meas	ures.
Personal Competence				
Social Competence	The students are able to develop in small grous the	mixture of a special mortar. They present their res	ults to the lecturer a	nd the other student
	a critical discussion they defend and adjust their re-			
	feedback.			
Autonomy	The students are able to responsibly use the resolution	urces of materials and lab equipment for their pr	oject and to investig	gate and to get mis
	components.			
Workload in Hours	Independent Chudu Time 00, Chudu Time in Lestrus (24		
Credit points		34		
Examination				
Examination duration and scale				
	Civil Engineering: Specialisation Structural Engineering: Compulsory			
	Civil Engineering: Specialisation Structural Enginee	ring: Compulsory		
		• • •		
Assignment for the Following		neering: Compulsory		

Course L0257: Anchor Technology	y and Design, Post Installed Rebar Connections
Тур	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Gernod Deckelmann
Language	DE
Cycle	SoSe
Content	 Working principles of friction, keying and bonding anchors Selection of anchors Anchor design Installation of anchors Post installed rebar connections and additional german regulations
Literature	Vortragsfolien der Lehrveranstaltung stehen über STUD.IP zum download zur Verfügung Beton-Kalender 2012: Infrastrukturbau, Befestigungstechnik. Eurocode 2. Herausgegeben von Konrad Bergmeister, Frank Fingerloos und Johann-Dietrich Wörner; 2012 Ernst & Sohn GmbH & Co. KG. Published by Ernst & Sohn GmbH & Co. KG. DIBt: Hinweise für die Montage von Dübelverankerungen; Oktober 2010 Ratgeber Dübeltechnik, Basiswissen - Metalldübel, chemische Dübel, Kunststoffdübel; Herausgeber Hilti AG



Course L0255: Repair of Structures		
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Frank Schmidt-Döhl, Dr. Gernod Deckelmann	
Language	DE	
Cycle	SoSe	
Content	Maintenance of structures, repair and strengthening, subsequent waterproofing of structures	
Literature	BetonMarketing Deutschland (Hrsg.): Stahlbetonoberflächen – schützen, erhalten, instandsetzen	

Course L0253: Mineral Building Materials		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	SoSe	
Content	Components of mineral building materials and their function, binding materials, concrete and mortar, special mortars, special concretes	
Literature	Taylor, H.F.W.: Cement Chemistry	
	Springenschmid, R.: Betontechnologie für die Praxis	

Course L0256: Technology of mineral Building Materials	
Тур	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Frank Schmidt-Döhl
Language	DE
Cycle	SoSe
Content	Design and production of mineral building materials
Literature	Taylor, H.F.W.: Cement Chemistry
	Springenschmid, R.: Betontechnologie für die Praxis

Course L0254: Transport Process	course L0254: Transport Processes in Building Materials and Damage Processes	
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Frank Schmidt-Döhl, Dr. Gernod Deckelmann	
Language	DE	
Cycle	SoSe	
Content	Transport Processes in Building Materials and Damage Processes	
Literature	Blaich, J.: Bauschäden, Analyse und Vermeidung	



Courses				
Title		Тур	Hrs/wk	CP
Design of Prestressed Structures and C	Concreet Bridges (L0603)	Lecture	3	4
Design of Prestressed Structures and C		Recitation Section (large)	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	None			
Recommended Previous	Detailed knowledge on the design of concrete stru	Detailed knowledge on the design of concrete structures.		
Knowledge				
Educational Objectives	After taking part successfully, students have reach	After taking part successfully, students have reached the following learning results		
Professional Competence				
Knowledge	The students know the main bridge types, their applications and the various loads. They can explain the basic design methods. They can expla			
	the design of a prestressed bridge.			
01:11-	The shull at our ship to desire as informed and a			
Skills	The students are able to design reinforced or pres	tressed concrete bridges.		
Personal Competence				
Social Competence	The students can design in teamwork a real concrete bridge.			
A				
Autonomy	The students are able to design a prestressed con	crete bridge and discuss the problems and results v	vith other students.	
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	180 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Er	gineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer			



	sed Structures and Concreet Bridges
Тур	Lecture
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	SoSe
Content	prestressed structures
	basis of prestressed structures
	differences between reinforced and prestressed concrete structures
	 history of prestressing
	 construction materials: concrete, tendons, ducts, anchorage systems
	 construction: prestressing methods
	 prestressing forces and member forces (friction, elongation)
	 tendon layout
	time dependant prestressing losses
	design of prestressed structures
	design of anchorage region
	non-bonded prestressing
	prestressed flat slabs
	Concrete bridges
	a bistory of bidges
	history of bridges
	 design of bridges loads on bridges
	 neads on bridges member forces for slab, T-beam, hollow box, frame and arch bridges
	 inclusion breast signed and bridges precast bridges - precast segmental bridges
	bearings
	abutments, columns
	construction methods
Literature	Vorlesungsumdruck
	Rombach, G. (2003): Spannbetonbau. Ernst & Sohn, Berlin
	 Wicke, M. (2002): Anwendung des Spannbetons. Betonkalender 2002, Teil II, S. 113-180, Verlag Ernst & Sohn, Berlin
	 Leonhardt, F. (1980): Vorlesungen über Massivbau. Teil 5: Spannbeton. Berlin
	 Mehlhorn, G. (2007): Handbuch Brücken, Springer Verlag
	 Schäfer, H.; Kaufeld, K. (1997): Massivbrücken. Betonkalender Teil II, S. 443ff, Ernst & Sohn, Berlin
	 Menn, Ch. (1986): Stahlbetonbrücken. Springer Verlag, Wien
	- , - (),

Course L0604: Design of Prestressed Structures and Concreet Bridges	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course



Module M0756: Soil Mecha	anics and -Dynamics			
Courses				
Title		Тур	Hrs/wk	CP
Soil Mechanics - Selected Topics (L0374	·)	Lecture	2	2
Soil Dynamics (L0452)		Lecture	3	2
Experimental Researches in Geotechnic	s (L0706)	Laboratory Course	1	2
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	none			
Recommended Previous	Soil Mechanics, Vibration Theory			
Knowledge				
Educational Objectives	After taking part successfully, students have rea	ched the following learning results		
Professional Competence				
Knowledge	After the successful completion of the module th	e students should be able to:		
	 to derive and to apply the basic equation 			
		he soil under dynamic excitation and to detect the re		
		d tests to determine soil dynamic characteristics and	d to evaluate them,	
	 to design machine foundations to dynamic 			
	 to measure shocks to perform vibration features 			
	 to evaluate shocks in term to their effect of 	on people and buildings,		
	to evaluate possibilities of isolation,			
	• to understand mechanisms that cause earthquakes and evaluate earthquake in term of their magnitude and intensity,			
	 to know methods to determine axial pile capacity, integrity and the dynamic bedding modulus, 			
	 to know the mechanisms that lead to a deformation accumulation due to cyclic loading and to estimate these deformations mathematically, 			
	 to distinguish the area of application of the area of applicat	he method of elastodynamics and plastodynamics,		
	 to detect the undrained shear strength as 	s a function of a number of state variables,		
	 to capture the visous behaviour of cohes 	sive soils and to consider the effects of creep and ra	te-dependent shear stre	ngth in calculations,
	 to consider the impact of the partly saturate 	ated of a seepage and shear strength.		
Skills				
Personal Competence				
Social Competence				
Autonomy	la des est de st Oberle Time e OO Oberle Time i de si			
	Independent Study Time 96, Study Time in Lect	UIE 04		
	6			
	Written exam			
Examination duration and scale	150 min			
	Civil Engineering: Specialisation Structural Eng			
Curricula	Civil Engineering: Specialisation Geotechnical I	Engineering: Compulsory		
	Civil Engineering: Specialisation Coastal Engine	eering: Elective Compulsory		

Course L0374: Soil Mechanics - Selected Topics	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Hans Mathäus Hügel
Language	DE
Cycle	SoSe
Content	selected topis:
	- continuum mechanis
	- constitutive modelling
	- time and rate dependend material behavior of soils
	- cyclic loading
	- undrained conditions
Literature	Kolymbas D. (2007): Geotechnik - Bodenmechanik, Grundbau und Tunnelbau. Springer Verlag



Course L0452: Soil Dynamics	
Тур	Lecture
Hrs/wk	3
CP	2
Workload in Hours	Independent Study Time 18, Study Time in Lecture 42
Lecturer	Dr. Sascha Henke
Language	DE
Cycle	SoSe
Content	mass-spring-damper systems,
	• wave propagation in soils,
	dynamic soil parameters,
	Determination of dynamic soil parameters,
	machine foundations,
	• in-situ measurement of ground motion, ground motion prediction, evaluation of ground motion,
	• ground motion shielding,
	introduction into earthquake engineering,
	dynamic pile tests,
	• cyclic accumulation,
	plastodynamics
Literature	 Das B.M.: Fundamentals of Soil Dynamics, Elsevier Empfehlungen des Arbeitskreises Baugrunddynamik. Hrsg. Deutsche Gesellschaft für Geotechnik (DGGT) Haupt W.: Bodendynamik. Vieweg und Teubner Meskouris K. und Hinzen KG.: Bauwerke und Erdbeben. Vieweg Verlag Studer J.A., Koller M.G. und Laue J.: Bodendynamik, Springer Verlag

Course L0706: Experimental Researches in Geotechnics	
Тур	Laboratory Course
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Marius Milatz
Language	DE
Cycle	SoSe
Content	 1g-model tests ng-modfel tests high-grade laboratory tests field tests measurement technology
Literature	



Module M0807: Boundary				
Courses				
Title		Тур	Hrs/wk	СР
Boundary Element Methods (L0523)		Lecture	2	3
Boundary Element Methods (L0524)		Recitation Section (large)	2	3
Module Responsible	Prof. Otto von Estorff			
Admission Requirements	none			
Recommended Previous	Mechanics I (Statics, Mechanics of Materials) and N	lechanics II (Hydrostatics, Kinematics, Dynamics)		
Knowledge	Mathematics I, II, III (in particular differential equation	ns)		
Educational Objectives	After taking part successfully, students have reache	d the following learning results		
Professional Competence				
Knowledge		arding the derivation of the boundary element me	thod and are able to	give an overview of t
- Anomougo	theoretical and methodical basis of the method.			gire an evenien er i
Skills	The students are capable to handle engineering		nents, assembling the	e corresponding syste
	matrices, and solving the resulting system of equati	ons.		
Personal Competence				
Social Competence				
Autonomy				
	identified and the results are critically scrutinized.	- · · · · · · · · · · · · · · · · · · ·		
	· · · · · · · · · · · · · · · · · · ·			
Workload in Hours		9 56		
Credit points				
Examination	Oral exam			
Examination duration and scale				
Assignment for the Following		• • •		
Curricula	0 0 1 0			
	Civil Engineering: Specialisation Coastal Engineer	• • •		
	Energy Systems: Core qualification: Elective Comp			
	International Production Management: Specialisation	•••		
	Mechatronics: Specialisation System Design: Election			
	Product Development, Materials and Production: C			
	Technomathematics: Core qualification: Elective Co			
	Theoretical Mechanical Engineering: Core qualification	ttion: Elective Compulsory		

Course L0523: Boundary Element	Methods
-	
	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Otto von Estorff
Language	EN
Cycle	SoSe
Content	- Boundary value problems
	- Integral equations
	- Fundamental Solutions
	- Element formulations
	- Numerical integration
	- Solving systems of equations (statics, dynamics)
	- Special BEM formulations
	- Coupling of FEM and BEM
	- Hands-on Sessions (programming of BE routines)
	- Applications
Literature	Gaul, L.; Fiedler, Ch. (1997): Methode der Randelemente in Statik und Dynamik. Vieweg, Braunschweig, Wiesbaden
	Bathe, KJ. (2000): Finite-Elemente-Methoden. Springer Verlag, Berlin



ourse L0524: Boundary Element Methods	
Тур	Recitation Section (large)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Otto von Estorff
Language	EN
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course



<u>_</u>					
Courses					
Title		Тур	Hrs/wk	CP	
Applied Groundwater Modeling (L0543)		Lecture	1	1	
Applied Groundwater Modeling (L0544)		Recitation Section (small)	2	2	
Modeling of Water Supply and Sewer Ne		Problem-based Learning	2	3	
Module Responsible	Prof. Wilfried Schneider				
Admission Requirements	none				
Recommended Previous	Groundwater				
Knowledge	groundwater hydraulics and transport of sub	ostances			
	Pipe Systems				
	 Knowledge on urban water infrastructures, i 	n particular drinking water systemsand urban d	rainage systems includi	ng special structures	
	 Hydraulics of drinking water supply systems 	and sewer systems			
	Basic knowledge on water management				
5	A0				
Educational Objectives	After taking part successfully, students have reache	d the following learning results			
Professional Competence					
Knowledge	The students are able to describe the modelling				
	systems analyses and can detect technical and c		case studies. Besides t	hey are able to analy	
	interdependencies of hydraulic and toxic phenome	na in soil and water.			
Skills	The students are able to construct and apply scientific groundwater models indipendently. They can work on different scenarios and can compare				
	or assess different solutions for existing problems by application of selected software products. The students are able to use different software				
	solutions (e.g. EPANET, EPA-SWMM).				
Personal Competence					
Social Competence					
Autonomy					
Workload in Hours	Independent Study Time 110, Study Time in Lectur	e 70			
Credit points	6				
Examination	Written exam				
Examination duration and scale					
Assignment for the Following	Civil Engineering: Specialisation Structural Engine	ering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engine				
et. nould	Civil Engineering: Specialisation Coastal Engineer				
	Water and Environmental Engineering: Specialisat				
	Water and Environmental Engineering: Specialisat	on Environment: Elective Compulsory			

Course L0543: Applied Groundwat	ter Modeling
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Wilfried Schneider
Language	DE/EN
Cycle	SoSe
Content	Introduction and application of the groundwater model MODFLOW (PMWIN); theoretical backround of the modell, students do work with the model
	PMWIN for practical case studies.
Literature	MODFLOW-Handbuch
	Chiang, Wen Hsien: PMWIN



Course L0544: Applied Groundwat	ter Modeling		
Тур	Recitation Section (small)		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Wilfried Schneider		
Language	DE/EN		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		
Course L0875: Modeling of Water	Supply and Sewer Network		
Тур	Problem-based Learning		
Hrs/wk	2		

	-
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dr. Klaus Johannsen, NN
Language	DE
Cycle	SoSe
Content	
Literature	



Module M0828: Urban Env	vice products Management			
Module M0626: Orban En	nonmental management			
Courses				
Title		Тур	Hrs/wk	СР
Noise Protection (L1109)		Lecture	2	2
Urban Infrastructures (L0874)		Problem-based Learning	2	4
Module Responsible	NN			
Admission Requirements	none			
Recommended Previous				
Knowledge	 Urban planning Measures for climate protection and climate c 	hange adaptation		
	Basics of urban drainage	anange adaptation		
	· Dasios of a ball drainage			
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 124, Study Time in Lecture	56		
Credit points	6			
Examination	Written exam			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ring: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engin	neering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	g: Elective Compulsory		
	Joint European Master in Environmental Studies - Ci		sory	
	Logistics, Infrastructure and Mobility: Specialisation I			
	Water and Environmental Engineering: Specialisatio			
	Water and Environmental Engineering: Specialisatio	n Cities: Compulsory		

Course L1109: Noise Protection	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Bitte auswählen
Language	EN
Cycle	SoSe
Content	
Literature	

Course L0874: Urban Infrastructu	res
Тур	Problem-based Learning
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	SoSe
Content	 Problem/Project Based Learning Main topics are: Design of future cities, concepts and technical approaches for future-proof drinking water supply and wastewater disposal Climate Change Impacts, Adaptation and Mitigation Rainwater Management & urban flash floods New water sources: rainwater harvesting and wastewater reuse Urban greening & urban agriculture Water sensitive urban design How to better link urban planning and urban water issues
Literature	



Courses				
Title		Тур	Hrs/wk	CP
Coastal- and Flood Protection (L0808)		Lecture	2	3
Coastal- and Flood Protection (L1415)		Recitation Section (large)	1	1
Maintennance and Defence of Flood Pro	otection Structures (L1411)	Lecture	2	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous	Coastal Engineering I			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the fol	lowing learning results		
Professional Competence				
Knowledge	The students have the capability to define and explain in detail the important aspects of erosion protection and flood protection and are able			
0	apply the aspects to practical coastal protection problems. They are able to design and dimension important coastal protection measures from the			
	functional and from the constructional point of view.			
Skills	The students are able to select design approaches for the	e functional and constructional design of e	erosion and flood pr	
Skills		e functional and constructional design of $\boldsymbol{\varepsilon}$	prosion and flood p	
	The students are able to select design approaches for the	e functional and constructional design of e	erosion and flood p	
Personal Competence	The students are able to select design approaches for the	e functional and constructional design of e	erosion and flood pi	
	The students are able to select design approaches for the	e functional and constructional design of e	prosion and flood p	
Personal Competence Social Competence	The students are able to select design approaches for the apply these approaches to practical design tasks.	e functional and constructional design of e	prosion and flood p	
Personal Competence Social Competence Autonomy	The students are able to select design approaches for the apply these approaches to practical design tasks.	e functional and constructional design of e	prosion and flood p	
Personal Competence Social Competence Autonomy Workload in Hours	The students are able to select design approaches for the apply these approaches to practical design tasks.	e functional and constructional design of e	erosion and flood p	
Personal Competence Social Competence Autonomy Workload in Hours Credit points	The students are able to select design approaches for the apply these approaches to practical design tasks.		· · · · · · · · · · · · · · · · · · ·	rotection measures a
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination	The students are able to select design approaches for the apply these approaches to practical design tasks.		· · · · · · · · · · · · · · · · · · ·	rotection measures a
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale	The students are able to select design approaches for the apply these approaches to practical design tasks. Independent Study Time 110, Study Time in Lecture 70 6 Written exam The duration of the examination is 130 min. The examination	on includes tasks with respect to the genera	· · · · · · · · · · · · · · · · · · ·	rotection measures a
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale	The students are able to select design approaches for the apply these approaches to practical design tasks. Independent Study Time 110, Study Time in Lecture 70 6 Written exam The duration of the examination is 130 min. The examination calculations tasks. Civil Engineering: Specialisation Structural Engineering: El	on includes tasks with respect to the genera	· · · · · · · · · · · · · · · · · · ·	rotection measures a

Course L0808: Coastal- and Flood	Protection
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	SoSe
Content	Protection of sandy coasts
	Sediment transport
	Morphology
	Technical solution for the protection of sandy coasts
	 Construction in direction of the coast
	 Constructions perpendicular to the coast
	Other Concepst
	Calculation approaches and numerical models
	Flood Protection
	Classification of constructions / measures
	• Dikes
	• Dunes
	Foreland – constructions
	Flood-Protection Walls
	Drainage of the hinterland
Literature	Vorlesungsumdruck
	Coastal Engineering Manual CEM



Course L1415: Coastal- and Flood	Course L1415: Coastal- and Flood Protection	
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Peter Fröhle	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L1411: Maintennance and	Defence of Flood Protection Structures
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Olaf Müller
Language	DE
Cycle	SoSe
Content	 Dike protection Maintennance of flood protection measures
Literature	Vorlesungsumdruck



Courses				
Title		Тур	Hrs/wk	CP
Habour Engineering (L0809)		Lecture	2	2
Habour Engineering (L1414)		Problem-based Learning	1	2
Port Planning and Port Construction (L0	378)	Lecture	2	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reach	ed the following learning results		
Professional Competence				
Knowledge	The students are able to define in details and to choose design approaches for the functional design of a port and apply them to design ta			
	They can design the fundamental elements of a p	ort.		
01.77				
Skills	The students are able to select and apply appropriate	late approaches for the functional design of ports.		
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in Lectu	ire 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 150 min. The	examination includes tasks with respect to the generation	al understanding of	the lecture contents a
	calculations tasks.		0	
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	eering: Elective Compulsory		
• •	Civil Engineering: Specialisation Geotechnical Er	• • •		
		ving Compulsor		
	Civil Engineering: Specialisation Coastal Engineer	anng: Compulsory		
		cialisation II. Civil Engineering: Elective Compulsory		

Course L0809: Habour Engineering	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	SoSe
Content	 Fundamentals of harbor engineering Maritime transportation and waterways engineering Ships Elements of harbors Harbor approaches and water-side harbor areas Terminal design and handling of cargo Quay-walls and piers Equipment of harbors Sluices and other special constructions Connection to inland transportation / inland waterway transportation Protection of harbors Breakwaters and Jetties Wave protection of harbors Fishery and other small harbors
Literature	Brinkmann, B.: Seehäfen, Springer 2005



Course L1414: Habour Engineering	
Тур	Problem-based Learning
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0378: Port Planning and F	Port Construction
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Frank Feindt
Language	DE
Cycle	SoSe
Content	 Planning and implementation of major projects Market analysis and traffic relations Planning process and plan Port planning in urban neighborhood Development of the logistics center "Port of Hamburg" in the metropolis Quays and waterfront structure Special planning Law Harbor - securing of a flexible use of the port Dimensioning of quays Flood protection structures Port of Hamburg - Infrastructure and development Preparation of areas Scour formation in front of shore structures
Literature	Vorlesungsumdruck, s. www.tu-harburg.de/gbt



Courses						
Title		Тур	Hrs/wk	CP		
Hydraulic Models (L0813)		Lecture	1	1		
Modelling of Waves (L0812)		Lecture	1	1		
Modelling of Flow in Rivers and Estuarie	es (L0810)	Lecture	3	4		
Module Responsible	Prof. Peter Fröhle					
Admission Requirements	none					
Recommended Previous						
Knowledge						
Educational Objectives	After taking part successfully, students have read	hed the following learning results				
Professional Competence						
Knowledge	Students are able to define in detail the basic	Students are able to define in detail the basic processes that are related to the modelling of flows in hydraulic engineering. Besides, they detail the basic processes that are related to the modelling of flows in hydraulic engineering.				
	describe the basic aspects of numerical modelling and actual numerical models for the simulation of flows and waves.					
	describe the basic aspects of numerical modellin	g and actual numerical models for the simulati		sing. Desides, they of		
		-	ion of flows and waves.	inig. Dolidos, incy of		
Skills	describe the basic aspects of numerical modellin Students are able to apply hydrodynamic-numer	-	ion of flows and waves.	ning. Deoleeo, ney ee		
Skills Personal Competence	Students are able to apply hydrodynamic-numer	-	ion of flows and waves.			
	Students are able to apply hydrodynamic-numer	-	ion of flows and waves.	ung. Sources, ney a		
Personal Competence	Students are able to apply hydrodynamic-numer	-	ion of flows and waves.	ang. Douco, noj o		
Personal Competence Social Competence	Students are able to apply hydrodynamic-numer	cal models to practical hydraulic engineering t	ion of flows and waves.			
Personal Competence Social Competence Autonomy	Students are able to apply hydrodynamic-numer	cal models to practical hydraulic engineering t	ion of flows and waves.			
Personal Competence Social Competence Autonomy Workload in Hours	Students are able to apply hydrodynamic-numer Independent Study Time 110, Study Time in Lect	cal models to practical hydraulic engineering t	ion of flows and waves.	, mg. 200100, are y o		
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination	Students are able to apply hydrodynamic-numer Independent Study Time 110, Study Time in Lect	cal models to practical hydraulic engineering f ure 70	ion of flows and waves. tasks.			
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination	Students are able to apply hydrodynamic-numer Independent Study Time 110, Study Time in Lect 6 Written exam	cal models to practical hydraulic engineering f ure 70	ion of flows and waves. tasks.			
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale	Students are able to apply hydrodynamic-numer Independent Study Time 110, Study Time in Lect 6 Written exam The duration of the examination is 3 hours. The	cal models to practical hydraulic engineering t ure 70 examination includes tasks with respect to the	ion of flows and waves. tasks.			
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale Assignment for the Following	Students are able to apply hydrodynamic-numer Independent Study Time 110, Study Time in Lect 6 Written exam The duration of the examination is 3 hours. The calculations tasks.	cal models to practical hydraulic engineering t ure 70 examination includes tasks with respect to the neering: Elective Compulsory	ion of flows and waves. tasks.			

Course L0813: Hydraulic Models	
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Peter Fröhle
Language	DE/EN
Cycle	SoSe
Content	 Fundamentals of hydraulic models Model laws Pi theorem of Buckingham Practical examples of hydraulic models
Literature	Strobl, Zunic: Wasserbau, Kap. 11 Hydraulische Modelle, Springer



Course L0812: Modelling of Waves	3
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Peter Fröhle
Language	DE/EN
Cycle	SoSe
Content	 Waves, interactions with shallow water and constructions Wave theories Sea state and surges Development of waves Wave spectra Modelling of Waves / phase averaged and phase resolved models Application of a phase averaged model for wave prediction (SWAN) Application of phase resolved wave models (Mike)
Literature	Vorlesungsumdruck

Course L0810: Modelling of Flow in	Rivers and Estuaries
Тур	Lecture
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Peter Fröhle
Language	DE/EN
Cycle	SoSe
Content	Basics of numerial models / application of models
	 classification of models model concept modelling 1D Working Equation Mathematical description of physical processes Equation of motions o conservation of mass o conservation of momentum Initial conditions and boundary conditions Numerical Methods
	 Time step procedure Finite differences Finite volumes
Literature	Vorlesungsskript



Module M0874: Wastewate	or Systems				
woulde woor4. wastewat	er Systems				
Courses					
Title		Тур	Hrs/wk	CP	
Wastewater Systems - Collection, Treatment and Reuse (L0934)		Lecture	2	2	
Wastewater Systems - Collection, Treat	ment and Reuse (L0943)	Recitation Section (large	9) 1	1	
Advanced Wastewater Treatment (L035	,	Lecture	2	2	
Advanced Wastewater Treatment (L035	8)	Recitation Section (large	9) 1	1	
Module Responsible					
Admission Requirements	None				
Recommended Previous	Knowledge of wastewater management and the l	key processes involved in wastewater treatme	nt.		
Knowledge					
Educational Objectives	After taking part successfully, students have react	ned the following learning results			
Professional Competence					
Knowledge	Students are able to outline key areas of the full	range of treatment systems in waste water m	anagement, as well as thei	r mutual dependence fo	
	sustainable water protection. They can describe r	elevant economic, environmental and social f	actors.		
01:11-					
Skills	s Students are able to pre-design and explain the available wastewater treatment processes and the scope of their application in municipal and f				
	some industrial treatment plants.				
Personal Competence					
Social Competence					
Autonomy	Students are in a position to work on a subject an	d to organize their work flow independently. T	hey can also present on th	is subject.	
Workload in Hours	Independent Study Time 96, Study Time in Lectur	re 84			
Credit points	6				
Examination	Written exam				
Examination duration and scale	120 min				
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	eering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical E	ngineering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engine	ering: Elective Compulsory			
	Bioprocess Engineering: Specialisation A - Gene	ral Bioprocess Engineering: Elective Compute	sory		
	Energy and Environmental Engineering: Speciali	sation Environmental Engineering: Elective C	ompulsory		
	International Management and Engineering: Specialisation II. Energy and Environmental Engineering: Elective Compulsory				
	International Management and Engineering: Specialisation II. Process Engineering and Biotechnology: Elective Compulsory				
	Process Engineering: Specialisation Environmen	tal Process Engineering: Elective Compulsory	/		
	Process Engineering: Specialisation Process Eng	gineering : Elective Compulsory			
	Water and Environmental Engineering: Specialis	ation Water: Compulsory			
	Water and Environmental Engineering: Specialis	ation Environment: Elective Compulsory			
	Water and Environmental Engineering: Specialis	ation Cities: Compulsory			

Course L0934: Wastewater Systems - Collection, Treatment and Reuse					
Тур	Lecture				
Hrs/wk					
CP	2				
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28				
Lecturer	Prof. Ralf Otterpohl				
Language	EN				
Cycle	SoSe				
Content	*Understanding the global situation with water and wastewater				
	•Regional planning and decentralised systems				
	+Overview on innovative approaches				
	+In depth knowledge on advanced wastewater treatment options for different situations, for end-of-pipe and reuse				
	*Mathematical Modelling of Nitrogen Removal				
	•Exercises with calculations and design				
Literature	Henze, Mogens:				
	Wastewater Treatment: Biological and Chemical Processes, Springer 2002, 430 pages				
	George Tchobanoglous, Franklin L. Burton, H. David Stensel:				
	Wastewater Engineering: Treatment and Reuse, Metcalf & Eddy				
	McGraw-Hill, 2004 - 1819 pages				



Course L0943: Wastewater Systems - Collection, Treatment and Reuse	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0357: Advanced Wastew	ater Treatment
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Joachim Behrendt
Language	DE
Cycle	SoSe
Content	Survey on advanced wastewater treatment
	reuse of reclaimed municipal wastewater
	Precipitation
	Flocculation
	Depth filtration
	Membrane Processes
	Activated carbon adsorption
	Ozonation
	"Advanced Oxidation Processes"
	Disinfection
Literature	Metcalf & Eddy, Wastewater Engineering: Treatment and Reuse, McGraw-Hill, Boston 2003
	Wassertechnologie, H.H. Hahn, Springer-Verlag, Berlin 1987
	Membranverfahren: Grundlagen der Modul- und Anlagenauslegung, T. Melin und R. Rautenbach, Springer-Verlag, Berlin 2007
	Trinkwasserdesinfektion: Grundlagen, Verfahren, Anlagen, Geräte, Mikrobiologie, Chlorung, Ozonung, UV-Bestrahlung, Membranfiltration, Qualitätssicherung, W. Roeske, Oldenbourg-Verlag, München 2006
	Organische Problemstoffe in Abwässern, H. Gulyas, GFEU, Hamburg 2003



Course L0358: Advanced Wastew	ater Treatment			
	Recitation Section (large)			
Hrs/wk				
CP	1			
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14			
Lecturer	Dr. Joachim Behrendt			
Language	DE			
Cycle	SoSe			
Content	Aggregate organic compounds (sum parameters)			
	Industrial wastewater			
	Processes for industrial wastewater treatment			
	Precipitation			
	Flocculation			
	Activated carbon adsorption			
	Recalcitrant organic compounds			
Literature	Metcalf & Eddy, Wastewater Engineering: Treatment and Reuse, McGraw-Hill, Boston 2003			
	Wassertechnologie, H.H. Hahn, Springer-Verlag, Berlin 1987			
	Membranverfahren: Grundlagen der Modul- und Anlagenauslegung, T. Melin und R. Rautenbach, Springer-Verlag, Berlin 2007			
	Trinkwasserdesinfektion: Grundlagen, Verfahren, Anlagen, Geräte, Mikrobiologie, Chlorung, Ozonung, UV-Bestrahlung, Membranfiltration, Qualitätssicherung, W. Roeske, Oldenbourg-Verlag, München 2006			
	Organische Problemstoffe in Abwässern, H. Gulyas, GFEU, Hamburg 2003			



	Тур	Hrs/wk	CP
	Problem-based Learning	2	3
	Problem-based Learning	2	3
Carsten Gertz			
e			
Principles of Urban Planning": none			
Designing Urban Streetscapes": some knowledge	of transport planning, e.g. through taking the u	ndergraduate class "	Transport Planning
ic Engineering"			
taking part successfully, students have reached t	a following loarning results		
taking part successiony, students have reached to	le lonowing learning lesuits		
onte aro ablo to:			
 use technical terms of urban planning. 			
	ow urban development can be influenced.		
• explain the importance of street design.			
ents are able to:			
 read and analyze urban development concept 	s and designs for streetscapes		
 appraise such concepts in the context of composition 	eting requirements.		
 design, justify and reflect their own solutions for 	r concrete examples.		
ents are able to:			
discuss intermediate results with each other.			
 constructively accept feedback on their own wo 	ork.		
 provide constructive feedback to others. 			
ents are able to:			
 independently complete a written report includ 	ng drawings following a broadly pre-defined pr	ocess.	
 independently acquire knowledge and apply the second second	is to new issues or problem areas.		
pendent Study Time 124, Study Time in Lecture 5	6		
ect			
Engineering: Specialisation Structural Engineering	g: Elective Compulsory		
Engineering: Specialisation Geotechnical Engine	ering: Elective Compulsory		
er and Environmental Engineering: Specialisation	Environment: Elective Compulsory		
	fic Engineering" r taking part successfully, students have reached th dents are able to: use technical terms of urban planning. describe the main determinants of urban devel explain and compare different possibilities of h discuss requirements for public streetscapes. explain the importance of street design. dents are able to: read and analyze urban development concepts appraise such concepts in the context of compe design, justify and reflect their own solutions fo dents are able to: discuss intermediate results with each other. constructively accept feedback on their own we provide constructive feedback to others. dents are able to: independently complete a written report includi assess the consequences of their proposed so independently acquire knowledge and apply th pendent Study Time 124, Study Time in Lecture 56 ect I Engineering: Specialisation Structural Engineering istics, Infrastructure and Mobility: Specialisation Infer and Environmental Engineering: Specialisation	Problem-based Learning Problem-based Learning Carsten Gertz e Principles of Urban Planning": none Designing Urban Streetscapes*: some knowledge of transport planning, e.g. through taking the u fice Engineering" rtaking part successfully, students have reached the following learning results dents are able to: use technical terms of urban planning. describe the main determinants of urban development. explain and compare different possibilities of how urban development can be influenced. discuss requirements for public streetscapes. explain the importance of street design. dents are able to: read and analyze urban development concepts and designs for streetscapes appraise such concepts in the context of competing requirements. design, justify and reflect their own solutions for concrete examples. dents are able to: design, justify and reflect their own work. provide constructive feedback to others. dents are able to: independently complete a written report including drawings following a broadly pre-defined pr assess the consequences of their proposed solutions. independently acquire knowledge and apply this to new issues or problem areas.	Problem-based Learning 2 Carsten Gentz e Carsten Gentz e Principles of Urban Planning*: none Designing Urban Streetscapes*: some knowledge of transport planning, e.g. through taking the undergraduate class, its Engineering* taking part successfully, students have reached the following learning results terts are able fo: use technical terms of urban planning. describe the main determinants of urban development. explain and compare different possibilities of how urban development can be influenced. discuss requirements for public streetscapes. explain the importance of street design. Herts are able to: read and analyze urban development concepts and designs for streetscapes appraise such concepts in the context of competing requirements. design, justify and reflect their own solutions for concrete examples. discuss informediate results with each other. constructively accept feedback to others. independently complete a written report including drawings following a broadly pre-defined process. assess the consequences of their proposed solutions. independently complete a written report including drawings following a broadly pre-defined process. assess the consequences of their proposed solutions. independently acquire knowledge and apply this to new issues or problem areas.



Course L1066: Prinicples of City P	Planning
Тур	Problem-based Learning
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	SoSe
Content	"Principles of Urban Planning" deals with the determinants of urban development and their interactions. Topics include:
	 legal framework, instruments and methods of planning, functional requirements, stakeholders and actors basic design requirements different planning levels and historical contexts. The objective of the course is for students to acquire a basic understanding of urban development problems and approaches for solving them. They will also be able to comprehend the process of urban planning. The project work deals with a real life scenario and includes drawing up a development plan, an urban design concept as well as a building masterplan.
Literature	Albers, Gerd; Wekel, Julian (2009) Stadtplanung: Eine illustrierte Einführung. Primus Verlag. Darmstadt. Frick, Dieter (2008) Theorie des Städtebaus: Zur baulich-räumlichen Organisation von Stadt. Wasmuth-Verlag. Tübingen Jonas, Carsten (2009) Die Stadt und ihr Grundriss. Wasmuth-Verlag. Tübingen Kostof, Spiro; Castillo, Greg (1998) Die Anatomie der Stadt. Geschichte städtischer Strukturen. Campus-Verlag. Frankfurt/New York.

Course L1067: Street Design	
Тур	Problem-based Learning
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	SoSe
Content	
	elements of public space. The class deals with:
	technical and design requirements,
	the effects of streetscapes on the behaviour of their users,
	 possible measures relating to changes in traffic development.
	For their applied project, students will be required to redesign the streetscape of an actual case study.
	· · · ···· ···························
Literature	Forschungsgesellschaft für Straßen- und Verkehrswesen (2011) Empfehlungen zur Straßenraumgestaltung innerhalb bebauter Gebiete - ESG.
	FGSV-Verlag. Köln (FGSV, 230).
	Forschungsgesellschaft für Straßen- und Verkehrswesen (2007) Richtlinien für die Anlage von Stadtstraßen – RASt 06. FGSV-Verlag. Köln
	(FGSV, 200).



Module M0961: Conceptu	al Design of Structures			
Courses				
Title		Тур	Hrs/wk	СР
Dimensioning and Detailing (L1144)		Project Seminar	3	4
Conception of Structures (L1142)		Lecture	1	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	none			
Recommended Previous	Basics in structural engineering (structural analysis, reinfo	prced and prestressed concrete structures	s, steel structures)	
Knowledge				
Educational Objectives	After taking part successfully, students have reached the f	ollowing learning results		
Professional Competence				
Knowledge	The students are able to outline selected aspects of the b	uilding and technical history and to explai	n basic design strategie	S.
Personal Competence Social Competence	The students are able to explain and defend problems ar work in plenary.	nd proposals in front of a professional au	dience, by presenting a	nd discussing the grou
Autonomy	On the basis of the feedback given during the semester, th	ne students develop independent solutior	is for complex technical	problems.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	Oral exam (15-30 minutes per student) and project work (FE calculation)		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering:	Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	ng: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: El	ective Compulsory		
	International Management and Engineering: Specialisation	on II. Civil Engineering: Elective Compulse	ory	

Course L1144: Dimensioning and	ourse L1144: Dimensioning and Detailing		
Тур	Project Seminar		
Hrs/wk	3		
CP	4		
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42		
Lecturer	Prof. Günter Rombach		
Language	DE		
Cycle	SoSe		
Content	With help of several (small) project works the subjects the conception and design of structures is practiced. The practical problems are elaborated in teamwork and have to be presented and discussed in the class.		
Literature	- Projektbezogene Unterlagen		

Course L1142: Conception of Structures		
Тур	ecture	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	SoSe	
Content	The students learn to design and gain competencies in shaping of structures and decision making. The following topics are addressed:	
	 elements of structural engineering importance of design, basics and conditions site analysis, service conditions, limit states, possibilities for execution, economy, durability structural design (shaping), structural detailing structural analysis, dimensioning of main elements assessment and discussion of proposals 	
Literature	- Vorlesungsunterlagen, Fachzeitschriften	



Courses				
Title		Тур	Hrs/wk	CP
Construction Logistics (L1163)		Lecture	1	2
Construction Logistics (L1164)		Recitation Section (small)	1	2
Project Development and Management ((L1161)	Lecture	1	1
Project Development and Management (Recitation Section (small)	1	1
Module Responsible	Prof. Heike Flämig			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have rea	ached the following learning results		
Professional Competence				
Knowledge	Students can			
-				
	 give definitions of the main terms of con 	struction logistics and project development and manag	ement	
	 name advantages and disadvantages of 	f internal or external construction logistics		
	 explain characteristics of products, dem 	and and production of construction objects and their c	onsequences for cor	struction specific supp
	chains			
	differentiate constructions logistics from	other logistics systems		
Skills	Students can			
	carry out project life cycle assessments			
	 apply methods and instruments of const 	•		
	 apply methods and instruments of proje 			
	 apply methods and instruments of conflict 	ct management		
	 design supply and waste removal concerning 	epts for a construction project		
Personal Competence				
Social Competence	Students can			
	hold presentations in and for groups			
	 apply methods of conflict solving skills in 	n group work and case studies		
Autonomy	Students can			
	 solve problems by holistic, systemic and 	I flow originated thinking		
		-	a of moderation in as	
	 Improve their creativity, negotiation skill 	s, conflict and crises solution skills by applying method	s of moderation in ca	ise studies
Workload in Hours	Independent Study Time 124, Study Time in Le	cture 56		
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	Two written compositions and two short presen	tations		
Assignment for the Following	Civil Engineering: Specialisation Structural Eng	ineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical			
Garricula	Civil Engineering: Specialisation Coastal Engin			
		•		
	Logistics, intrastructure and wobility: Specialisa	ation Production and Logistics: Elective Compulsory		



Turn		
	Lecture	
Hrs/wk		
CP		
Workload in Hours		
	Prof. Heike Flämig	
Language	DE	
Cycle	SoSe	
Content	The lecture gives deeper insight how important logistics are as a competetive factor for construction projects and which issues are to be adressed	
	The following toppics are covered:	
	competetive factor logistics	
	the concept of systems, planning and coordination of logistics	
	material, equipment and reverse logistics	
	IT in construction logistics	
	elements of the planning model of construction logistics and their connections	
	flow oriented logistics systems for construction projects	
	 logistics concepts for ready to use construction projects (especially procurement and waste removel logistics) 	
	best practice examples (construction logistics Potsdamer Platz, recent case study of the region)	
	Contents of the lecture are deepened in special exercises.	
Literature	Flämig, Heike: Produktionslogistik in Stadtregionen. In: Forschungsverbund Ökologische Mobilität (Hrsg.) Forschungsbericht Bd. 15.2. Wupper 2000.	
	Krauss, Siri: Die Baulogistik in der schlüsselfertigen Ausführung, Bauwerk Verlag GmbH Berlin 2005.	
	Lipsmeier, Klaus: Abfallkennzahlen für Neubauleistungen im Hochbau : Verlag Forum für Abfallwirtschaft und Altlasten, 2004.	
	Schmidt, Norbert: Wettbewerbsfaktor Baulogistik. Neue Wertschöpfungspotenziale in der Baustoffversorgung. In: Klaus, Peter: Edition Logis Band 6. Deutscher Verkehrs-Verlag. Hamburg 2003.	
	Seemann, Y.F. (2007): Logistikkoordination als Organisationseinheit bei der Bauausführung Wissenschaftsverlag Mainz in Aachen, Aach (Mitteilungen aus dem Fachgebiet Baubetrieb und Bauwirtschaft (Hrsg. Kuhne, V.): Heft 20)	

ourse L1164: Construction Logistics		
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Heike Flämig	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L1161: Project Developme	course L1161: Project Development and Management		
Тур	Lecture		
Hrs/wk	1		
CP	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	Prof. Heike Flämig		
Language	DE		
Cycle	SoSe		
Content	 Within the lecture, the main aspects of project development and management are tought: Terms and definitions of project management Advantages and disadvantages of different ways of project handling organization, information, coordination and documentation cost and fincance management in projects time- and capacity management in projects specific methods and instruments for successful team work Contents of the lecture are deepened in special exercises.		
Literature	Projektmanagement-Fachmann. Band 1 und Band 2. RKW-Verlag, Eschborn, 2004.		



Course L1162: Project Developme	ourse L1162: Project Development and Management		
Тур	Recitation Section (small)		
Hrs/wk	1		
CP	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	Prof. Heike Flämig		
Language	DE		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		



Courses				
Title		Тур	Hrs/wk	СР
Structural Dynamics (L1202)		Lecture	2	2
Structural Dynamics (L1203)		Recitation Section (large)	2	2
Fracture Mechanics and Fatigue (L0564	+)	Lecture	1	1
Fracture Mechanics and Fatigue (L0565	i)	Recitation Section (large)	1	1
Module Responsible	Prof. Uwe Starossek			
Admission Requirements				
Recommended Previous	Knowledge of linear structural analysis of statically determine	nate and indeterminate structures; Mechan	ics I/II, Mathematics I/	II, Differential equatio
Knowledge	1			
Educational Objectives	After taking part successfully, students have reached the for	llowing loarning results		
,	Alter taking part successionly, students have reached the to	nowing learning results		
Professional Competence	After successful completion of this module, the student can			
Skills	After successful completion of this module, the students will be able to predict the response of material and structures to dynamics loading using the appropriate computational approaches and methods.			
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: C	ompulsory		
Curricula				

Course L1202: Structural Dynamic	CS		
Тур	Lecture		
Hrs/wk			
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Uwe Starossek		
Language	DE		
Cycle	SoSe		
Content	 Single-degree-of-freedom systems: undamped and damped vibration, free vibration, forced vibrations due to harmonic, periodical or arbitrary loading, natural frequency, damping vibration isolation solution in the frequency-domain (Fourier transformation), solution in the time-domain multi-degree-of-freedom systems: continuous or discrete systems, modelling with finite elements, generalisation modal analysis power iteration according to v.Mises earthquake loading: seismological basics, response spectrum method wind-induced vibrations: engineering meteorology, aerodynamic, classification of excitation mechanisms 		
Literature	Clough, R.W., Penzien, J.: Dynamics of Structures. 2. Aufl., McGraw-Hill, New York, 1993.		



Course L1203: Structural Dynamics	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Uwe Starossek
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0564: Fracture Mechanic	ourse L0564: Fracture Mechanics and Fatigue	
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Dr. Ingo Hadrych	
Language	DE	
Cycle	SoSe	
Content		
Literature		

Course L0565: Fracture Mechanic	s and Fatigue
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Ingo Hadrych
Language	DE
Cycle	SoSe
Content	 Basics of fatigue stress and fatigue resistance and determination of fatigue strength, determination and use of S-N-curves and classification of notch effects, set up of determination of fatigue strength under dynamic load using the accumulation formula by Palmgren-Miner, set up of determination of fatigue strength in different examples, basics of construction and design regarding the problem of material fatigue, basics of linear elastic fracture mechanics under static and dynamic load, determination of lifetime of steel construction based on linear elastic fracture mechanics in different examples.
Literature	 Kuhlmann, Dürr, Günther; Kranbahnen und Betriebsfestigkeit; in Stahlbau Kalender 2003; Verlag Ernst & Sohn; Berlin 2003 Deutscher Stahlbau-Verband (Hrsg.); Stahlbau Handbuch Band 1 Teil B; 3. Auflage; Stahlbau-Verlagsgesellschaft; Köln 1996 Petersen, C.; Stahlbau; 3. überarb. und erw. Auflage; Vieweg-Verlag; Braunschweig 1993 DIN V ENV 1993-1-1: Eurocode 3; Bemessung und Konstruktion von Stahlbauwerken; Teil 1-1: Allgemeine Bemessungsregeln, Bemessungsregeln für den Hochbau; 1993 DIN V ENV 1993-6: Eurocode 3; Bemessung und Konstruktion von Stahlbauwerken; Teil 6: Kranbahnen; 2001 DIN-Fachbericht 126. Richtlinie zur Anwendung von DIN V ENV 1993-6; Nationales Anwendungsdokument (NAD); Berlin 2002



ourses				
itle		Тур	Hrs/wk	CP
teel Construction Project (L1206)		Project Seminar	4	6
Module Responsible	Dr. Jürgen Priebe			
Admission Requirements	none			
Recommended Previous	Steel and Composite Structures			
Knowledge	a			
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence	•			
Knowledge	Students are able to prepare a part of the whole proj	ect and explain it to the others.		
Skills	Students can produce sketches and calculations of	their part of the project. They are able to adju	ust their work in reaction	n to changing condition
	resulting from other participants of the project.			
Personal Competence	•			
Social Competence	Students can present their results to other members	of the group.		
	They have the ability to work for a broad agreement	vith respect to intergroup dependencies.		
	They can distribute and process tasks independently			
Autonomy	Students can handle their part of the project on their	own resposibility-		
Workload in Hours	Independent Study Time 124, Study Time in Lecture	56		
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	approx. 15-20 pages (without appendix)			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ing: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engin	eering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	g: Elective Compulsory		
ourse L1206: Steel Constructio	n Project			
Typ	•			
Hrs/w	,			
CF				

Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Dr. Jürgen Priebe, Prof. Uwe Starossek
Language	DE
Cycle	SoSe
Content	Design of a big construction project (i.e skyscraper, large bridge, roof of a stadiuim) in small groups
Literature	



0					
Courses					
Title		Тур	Hrs/wk	CP	
Geo-Information-Systems in Water Management and Hydraulic Engineering (L0963) Water Protection and Wastewater Management (L0226)		Problem-based Learning Seminar	2	2 2	
Water Protection and Wastewater Mana		Recitation Section (large)	2	2	
Module Responsible		(algo)	·	ka.	
Admission Requirements	none				
Recommended Previous	none				
Knowledge	 Basic knowledge in water management; 				
Kilowiedge	 Good knowledge in urban drainage; 				
	 Good knowledge of wastewater treatment techniques; 				
	Good knowledge of pollutants (e.g. COD, BOD, TS, N, P) and their properties;			
Educational Objectives	After taking part successfully, students have reached the follow	na learnina results			
Professional Competence	File lang part bebeebbary, stadents have reached the longw				
	The students can describe the basic principles of the regula	ory framework related to the internati	onal and European	water sector They o	
i i i i i i i i i i i i i i i i i i i	explain limnological processes, substance cycles and water				
	problems. Finally, the students can demonstrate to achieve sig				
	able to judge environmental and wastewater related issues				
	interventions as well as conceptual problem solving approache				
Skills	Students can accurately assess current problems and situati	ons in a country-specific or local cor	itext. They can sugg	est concrete actions	
	contribute to the planning of tomorrow's urban water cycle. Furthermore, they can suggest appropriate technical, administrative and legislativ				
	solutions to solve these problems.				
Personal Competence					
Social Competence	The students can work together in international groups.				
Autonomy	Students are able to organize their work flow to prepare t	nemselves before presentations and	discussion. They ca	an acquire appropria	
	knowledge by making enquiries independently.				
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70				
Credit points	6				
Examination	Written exam				
Examination duration and scale	60 min				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective	ve Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: El	ective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: Elective	Compulsory			
	Environmental Engineering: Specialisation Water: Elective Con	npulsory			
	International Management and Engineering: Specialisation II. C	ivil Engineering: Elective Compulsory			
	Joint European Master in Environmental Studies - Cities and St	ustainability: Specialisation Water: Elec	tive Compulsory		
	Water and Environmental Engineering: Specialisation Water: C	ompulsory			
	Water and Environmental Engineering: Specialisation Environr	nent: Compulsory			
	Water and Environmental Engineering: Specialisation Cities: E	ective Compulsory			



Course L0963: Geo-Information-Se	Course L0963: Geo-Information-Systems in Water Management and Hydraulic Engineering	
Тур	Problem-based Learning	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Peter Fröhle	
Language	DE/EN	
Cycle	WiSe	
Content	Theoretical basics of Geo-Information-Systems	
	 Data models, geographical coordinates, geo-referencing, map-views Data mining and – analyses of geo-data Analysis techniques 	
Literature	None	

Course L0226: Water Protection a	nd Wastewater Management
Тур	Seminar
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	WiSe
	The lecture focusses on: Regulatory Framework (e.g. WFD) Main instruments for the water management and protection In depth knowledge of relevant measures of water pollution control Urban drainage, treatment options in different regions on the world Rainwater management, improved management of heavy rainfalls, downpours, rainwater harvesting, rainwater infiltration Case Studies and Field Trips
Literature	 The literature listed below is available in the library of the TUHH. Water and wastewater technology Hammer, M. J. 1., & . (2012). (7. ed., internat. ed.). Boston [u.a.]: Pearson Education International. Water and wastewater engineering : design principles and practice: Davis, M. L. 1. (2011). New York, NY: McGraw-Hill. Biological wastewater treatment: (2011). C. P. Leslie Grady, Jr. (3. ed.). London, Boca Raton, Fla. [u.a.]: IWA Publ.

Course L0227: Water Protection a	nd Wastewater Management
Тур	Recitation Section (large)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	WiSe
	 The lecture focusses on: Regulatory Framework (e.g. WFD) Main instruments for the water management and protection In depth knowledge of relevant measures of water pollution control Urban drainage, treatment options in different regions on the world Rainwater management, improved management of heavy rainfalls, downpours, rainwater harvesting, rainwater infiltration Case Studies and Field Trips
Literature	 The literature listed below is available in the library of the TUHH. Water and wastewater technology Hammer, M. J. 1., & . (2012). (7. ed., internat. ed.). Boston [u.a.]: Pearson Education International. Water and wastewater engineering : design principles and practice: Davis, M. L. 1. (2011). New York, NY: McGraw-Hill. Biological wastewater treatment: (2011). C. P. Leslie Grady, Jr. (3. ed.). London, Boca Raton, Fla. [u.a.]: IWA Publ.



Module M0595: Examinati	on of Materials, Structural Condi	tion and Damages		
Courses				
Title		Тур	Hrs/wk	СР
Examination of Materials, Structural Con	dition and Damages (L0260)	Lecture	4	4
Examination of Materials, Structural Con	dition and Damages (L0261)	Recitation Section (small)	1	2
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials o	r material science, for example by the module Building M	aterials and Building	Chemistry.
Knowledge				
Educational Objectives	After taking part successfully, students have	reached the following learning results		
Professional Competence				
Knowledge	The students are able to describe the rules for trading, use and marking of construction products in Germany. They know which methods for the testing of building material properties are usable and know the limitations and characterics of the most important testing methods.			
Skills	The students are able to responsibly discover the rules for trading and using of building products in Germany. They are able to chose suitable methods for the testing and inspection of construction products, the examination of damages and the examinat of the structural conditions of buildings. They are able to conclude from symptons to the cause of damages. They are able to describe examination in form of a test report or expert opinion.			
Personal Competence	The students can describe the different rol	es of manufacturers as well as testing, supervisory and	d certification bodies	within the framewo
		ent roles of the participants in legal proceedings.		within the namewo
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in	Lecture 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural I	Engineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnic	al Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Er	gineering: Elective Compulsory		
	International Management and Engineering	Specialisation II. Civil Engineering: Elective Compulsory	/	
	Materials Science: Specialisation Engineerin	ng Materials: Elective Compulsory		

ourse L0260: Examination of Materials, Structural Condition and Damages		
Тур	Lecture	
Hrs/wk	4	
CP	4	
Workload in Hours	Independent Study Time 64, Study Time in Lecture 56	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	WiSe	
Content	Materials testing and marking process of construction products, testing methods for building materials and structures, testing reports and expert	
	opinions, describing the condition of a structure, from symptons to the cause of damages	
Literature	Frank Schmidt-Döhl: Materialprüfung im Bauwesen. Fraunhofer irb-Verlag, Stuttgart, 2013.	

Course L0261: Examination of Mat	Course L0261: Examination of Materials, Structural Condition and Damages	
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Courses					
Title		Тур	Hrs/wk	CP	
Subsoil and Underground Engineering L	aw (L0395)	Lecture	2	2	
Project Geotechnics (L0708)		Problem-based Learning	2	4	
Module Responsible	Prof. Jürgen Grabe				
Admission Requirements	none				
Recommended Previous	Enviromental Law,				
Knowledge	Knowledge Law of building contracts				
Educational Objectives	After taking part successfully, students have r	eached the following learning results			
Professional Competence					
Knowledge	ge After successful completion of the module the student has in-depth knowledge in subsoil and underground construction law,				
	as in the VOB.				
Skills	 Assessment and design of the main contract regulations and control processes 				
	 Advanced detection of legal problems and thus ability to avoid legal construction disputes 				
		and thus ability to avoid regal construction disputes			
Personal Competence					
Social Competence	Cooperation in a project work, where they sol	ve a geotechnical problem and design and plan the sol	ution and present the	results at the end.	
Autonomy					
Workload in Hours	Independent Study Time 124, Study Time in L	ecture 56			
Credit points	6				
Examination	Colloquium				
Examination duration and scale	120 minutes				
Assignment for the Following	Civil Engineering: Specialisation Structural E	ngineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnic	al Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Eng	incoring: Elective Compulsory			

Course L0395: Subsoil and Underg	ground Engineering Law		
Тур	Lecture		
Hrs/wk	2		
CP			
Workload in Hours	ependent Study Time 32, Study Time in Lecture 28		
Lecturer	Dr. Georg-Friedger Drewsen		
Language	DE		
Cycle	WiSe		
Content	 Introduction Historical Overview Areas of civil law The Contracting Parties Authorities, Cooperatioves and other patries involved The Civil law The Public Service Obligations Land acquisition Planning of underground construction projects The construction contract according to BGB/VOB - design and implementation The civil law in the jurisdiction 		
Literature	Folienskipt (in der Vorlesung erhältlich) weitere Literatur: • Englert, Grauvogel und Maurer: Handbuch des Baugrund- und Tiefbaurechts. Werner-Verlag		

Course L0708: Project Geotechnic	S S
Тур	Problem-based Learning
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	WiSe
Content	The students solve independently a project-based geotechnical problem in groups. Additional lectures concerning the problem will be held and
	material will be distributed as study basis. Every two weeks the groups present their current project status. The final work will be presentated in a
	final presentation.
Literature	abhängig von der Fragestellung



Courses				
litle		Тур	Hrs/wk	CP
Waste and Environmental Chemistry (L03	328)	Laboratory Course	2	2
Biological Waste Treatment (L0318)		Problem-based Learning	3	4
· ·	Prof. Kerstin Kuchta			
	none			
Recommended Previous Knowledge	chemical and biological basics			
0	After taking part successfully, students have re	ached the following learning results		
Professional Competence	And taking part successionly, success have re	acted the following rearining results		
		ning the planning of biological waste treatment plants ent plants in detail, describe different techniques for w s for waste analytics.		-
Skills	The students are able to discuss the compilation of design and layout of plants. They can critically evaluate techniques and quality con measurements. The students can recherché and evaluate literature and date connected to the tasks given in der module and plan additional te They are capable of reflecting and evaluating findings in the group.			
Personal Competence				
		nd interdisciplinary discussions, develop cooperated s velopment in front of colleagues. Furthermore, they c		
	consultation with supervisors as well as in	rom literature, business or test reports and transform the interim presentation, to assess their learning I pplication-or research-oriented duties in accordance v	evel and define furth	ner steps on this ba
Workload in Hours	Independent Study Time 110, Study Time in Le	ecture 70		
Credit points	6			
Examination	Project			
Examination duration and scale	Elaboration and presentation (15-25 minutes i	n groups), successful participation at Praktikum		
Assignment for the Following	Civil Engineering: Specialisation Structural En	gineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnica	I Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engi	• • • •		
	67 6 T	ialisation Environmental Engineering: Elective Compu	Isory	
	Environmental Engineering: Core qualification			
		Specialisation II. Energy and Environmental Engineerin		ry
	John European Master in Environmental Studi	es - Cities and Sustainability: Specialisation Energy: E	lective Compulsory	
	Water and Environmental Engineering: Specia	lisation Environment: Electivo Compulsory		



Course L0328: Waste and Environ	mental Chemistry
Тур	Laboratory Course
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Kerstin Kuchta
Language	DE/EN
Cycle	WiSe
	The participants are divided into groups. Each group prepares a transcript on the experiment performed, which is then used as basis for discussing the results and to evaluate the performance of the group and the individual student. In some experiments the test procedure and the results are presented in seminar form, accompanied by discussion and results evaluation. Experiments ar e.g. Screening and particle size determination Fos/Tac AAS Chalorific value
Literature	Scripte

Course L0318: Biological Waste T	reatment
Тур	Problem-based Learning
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Kerstin Kuchta
Language	EN
Cycle	WiSe
Content	 Introduction biological basics determination process specific material characterization aerobic degradation (Composting, stabilization) anaerobic degradation (Biogas production, fermentation) Technical layout and process design Flue gas treatment Plant design practical phase
Literature	



Module M0705: Groundwa	iter				
Courses					
Title		Тур	Hrs/wk	CP	
Geohydraulic and Solute Transport (L05	,	Lecture	2	2	
Geohydraulic and Solute Transport (L05		Recitation Section (small)	1	1	
Simulation in Groundwater Hydrology (L Simulation in Groundwater Hydrology (L		Lecture Recitation Section (small)	1	1	
	Prof. Wilfried Schneider	Hecitation Section (analy	2	2	
Admission Requirements	None				
Recommended Previous	None				
Knowledge	Ground water hydrology				
Knowledge	Hydromechanics				
Educational Objectives	After taking part successfully, students have reached the following learning results				
Professional Competence					
Knowledge	The students are able to describe the fate of solutes in the subsurface along the path between soil and water body quantitatively and qualitative			atively and qualitatively.	
	They are able to do this with simulation models.				
Skills	s The students are able to describe conceptually movement and storage of water in the unsaturated zone. They are able to analyse pF- functions				
	and Ku functions. They can model transport of solutes in the unsaturated and saturated zoned. They are able to determine dispersiities, sorption				
	coefficients, decay rates and dissolution rates for organic and inorganic substances.				
Personal Competence					
Social Competence	The students can help to each other.				
Autonomy	none				
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84				
Credit points	6				
Examination	Written exam				
Examination duration and scale	60 min written exam and written papers				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Election	ve Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: E	lective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: Elective	e Compulsory			
	Process Engineering: Specialisation Environmental Process E	ngineering: Elective Compulsory			
	Process Engineering: Specialisation Process Engineering: Ele	ctive Compulsory			
	Water and Environmental Engineering: Specialisation Water: 0	Compulsory			
	Water and Environmental Engineering: Specialisation Environ	ment: Elective Compulsory			
	Water and Environmental Engineering: Specialisation Cities: E	lective Compulsory			

Course L0539: Geohydraulic and S	Solute Transport	
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Wilfried Schneider	
Language	DE	
Cycle	WiSe	
Content	ump test analysis, water content-water suction functions, unsaturated hydraulic conductivity function, Brooks-Corey relation, van Gen	
	relation, solute transport in unsaturated zone, solute transport and reactions in groundwater	
Literature	Todd; K. (2005): Groundwater Hydrology	
	Fetter, C.W. (2001): Applied Hydrogeology	
	Hölting & Coldewey (2005): Hydrogeologie	
	Charbeneau, R.J. (2000): Groundwater Hydraulics and pollutant Transport	

Course L0540: Geohydraulic and S	Course L0540: Geohydraulic and Solute Transport		
Тур	Recitation Section (small)		
Hrs/wk	1		
CP	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	Prof. Wilfried Schneider		
Language	DE		
Cycle	WiSe		
Content	See interlocking course		
Literature	See interlocking course		



Course L0541: Simulation in Group	Course L0541: Simulation in Groundwater Hydrology			
Тур	Lecture			
Hrs/wk	1			
CP	1			
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14			
Lecturer	Prof. Wilfried Schneider			
Language	DE			
Cycle	WiSe			
Content	Basics and theoretical background of simulation models frequently used in science and practise for pumping test analysis, water movement in			
	vadose zone, solute transport in vadose zone, groundwater recharge, solute transport in groundwater			
Literature	Handbücher der verwendeten Slumationsmodelle werden bereitgestellt.			

Course L0542: Simulation in Group	Course L0542: Simulation in Groundwater Hydrology		
Тур	Recitation Section (small)		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Wilfried Schneider		
Language	DE		
Cycle	WiSe		
Content	See interlocking course		
Literature	See interlocking course		



Courses					
litle		Тур	Hrs/wk	CP	
Concrete Structures (L0579)		Seminar	1	2	
Structural Concrete Members (L0577)		Lecture	2	2	
Structural Concrete Members (L0578)		Recitation Section (large)	2	2	
Module Responsible	Prof. Günter Rombach				
Admission Requirements	none				
Recommended Previous	Basics of structural analysis, conception and	dimensioning of structural concrete			
Knowledge	Modules 'Concrete Structures I and II'				
Educational Objectives	After taking part successfully, students have reached the following learning results				
Professional Competence					
Knowledge	The students broaden their skills in structura	al engineering, especially in the field of buildings (hous	es, roofs, halls). They di	spose of the knowled	
	for the conception and design of concrete buildings and structural members that are often used.				
Skills	s The students are able to apply procedures of the conception and dimensioning to to practical problems of structural engineering. They are capable				
	to draft concrete buildings and to design them for general action effects and to plan their detailing and execution. Moreover, they can make design				
	and construction sketches and draw up tech	nical descriptions.			
Personal Competence					
Social Competence	The students are able to obtain results of high	jh quality in teamwork.			
Autonomy	The students are able to carry out complex of	conception and dimensioning tasks of structures under	the guidance of tutors.		
Workload in Hours	Independent Study Time 110, Study Time in	Lecture 70			
Credit points	6				
Examination	Written exam				
Examination duration and scale	120 minutes				
Assignment for the Following	Civil Engineering: Specialisation Structural	Engineering: Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory				
	Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory				
	International Management and Engineering: Specialisation II. Civil Engineering: Elective Compulsory				

Course L0579: Concrete Structure	95	
Тур	Seminar	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	With help of a project teamwork the subjects of the course "Concrete Structures" is practiced, discussed and presented.	
Literature	- Projektbezogene Unterlagen werden abgegeben.	



Course L0577: Structural Concrete Members		
Тур	ecture	
Hrs/wk		
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	An introduction to structural concrete buildings is given and typical structural members are treated in detail. Subjects are:	
	 concrete buildings - basics buildings, roofs, halls - an overview actions on buildings bracing systems reinforced and prestressed members slab (line and point supported plates and floor slabs) membranes and deep beams shells and folded plates 	
Literature	- Vorlesungsunterlagen	

Course L0578: Structural Concrete Members	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Module M0722: Computat	ional Analysis of Concrete Structures			
Courses				
Title		Тур	Hrs/wk	СР
Computational Analysis of Concrete Structures (L0598)		Lecture	2	2
Computational Analysis of Concrete Stru		Recitation Section (large)	2	2
FE-Modeling of Concrete Structures (LC		Problem-based Learning	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	none			
Recommended Previous	Basic knowledge in structural analysis and design of	of reinforced concrete structures (beams, slabs, she	ar walls).	
Knowledge	Lectures 'Concrete Structures i und II'			
	Lectures 'Structural Analysis I and II'			
	Lecture 'Concrete Structures'			
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
Knowledge	The students know the problems of numerical modeling and design of an arbitrary concrete structure.			
Skills	The students can model and design an arbitrary concrete structure by means of a finite element software package.			
Personal Competence				
Social Competence	The students can model and design in teamwork a real concrete structure by means of a finite element software package.			
Autonomy	The students can model and design a real concrete structure based on a finite element software package and discuss the problems and results			
	with other students.			
Workload in Hours	Independent Study Time 96, Study Time in Lecture	84		
Credit points	6			
Examination	Project			
Examination duration and scale	Oral exam (15-30 minutes per student) and project	work (FE calculation)		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	ineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineeri	ng: Elective Compulsory		

Course L0598: Computational Analysis of Concrete Structures		
Тур	Lecture	
Hrs/wk	2	
CP		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	 Modeling of beam and truss structures Discontinuity regions, like frame corners, openings, shear walls with large openings Bracing of high-rise buildings Modeling of bridges Nonlinear analysis Finite-Elemente-analysis of slabs: support conditions, singularity regions Finite-Elemente-Berechnungen of shear walls and deep beams: support condition, design Coupled systems Modeling of slab supported on beams Shell structures 3D building models Nonlinear analysis of slabs and shells Documentation 	
Literature	 Vorlesungsumdruck Rombach, G.A. (2007): Anwendung der Finite-Elemente-Methode im Betonbau. 2. Auflage, Verlag Ernst & Sohn, Berlin Rombach G.A. (2011): Finite-Element Design of Concrete Structures, 2nd edition, ICE publishing Hartmann, F., Katz, C. (2002): Statik mit finiten Elementen. Springer, Berlin 	



Course L0599: Computational Analysis of Concrete Structures		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L0600: FE-Modeling of Cor	ncrete Structures		
Тур	Problem-based Learning		
Hrs/wk			
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Günter Rombach		
Language	DE		
Cycle	WiSe		
Content	Finite Element Modeling and computational design of concrete structures by 'SOFISTIK'		
Literature	 Rombach G.: Anwendung der Finite – Elemente – Methode im Betonbau. 2. Auflage. Verlag Ernst & Sohn, Berlin, 2007 Rombach G.: Finite-Element Design of Concrete Structures. 2nd edition, ICE Publishing, London, 2011, ISBN 0 7277 32749 Rombach G.: EDV-unterstützte Berechnungen im Stahlbetonbau. in: "Stahlbetonbau aktuell 2014" (ed. Gorris A., Hegger J., Mark P.), Berlin 2014 (S. C1C.36) 		



Courses Title Chemistry of Drinking Water Treatment (Li Chemistry of Drinking Water Treatment (Li Water Resource Management (L0402) Water Resource Management (L0403) Module Responsible F	L0312) Prof. Mathias Ernst	Typ Lecture Recitation Section (large) Lecture Recitation Section (small)	Hrs/wk 2 1 2 1	CP 1 2 2
Chemistry of Drinking Water Treatment (L Chemistry of Drinking Water Treatment (L Water Resource Management (L0402) Water Resource Management (L0403)	L0312) Prof. Mathias Ernst	Lecture Recitation Section (large) Lecture	2 1 2	1 2
Chemistry of Drinking Water Treatment (L Water Resource Management (L0402) Water Resource Management (L0403)	L0312) Prof. Mathias Ernst	Recitation Section (large) Lecture	1 2	2
Water Resource Management (L0402) Water Resource Management (L0403)	Prof. Mathias Ernst	Lecture	2	-
Water Resource Management (L0403)				2
		Recitation Section (small)	1	
Module Responsible				1
	None			
Admission Requirements				
Recommended Previous	Knowledge of water management and the key pro	cesses involved in water treatment.		
Knowledge				
Educational Objectives A	After taking part successfully, students have reach	ed the following learning results		
Professional Competence				
	Students will be able to outline key areas of confli	ct in water management, as well as their mutual de	ependence for sustain	able water supply. T
		I and social factors. Students will be able to expla		
		available water treatment processes and the scope	-	
·	water companies. They will be able to explain the		of alon application.	
Skills S	//s Students will be able to assess complex problems in drinking water production and establish solutions involving water management and tech		nagement and techn	
r	measures. They will be able to assess the evaluation	tion methods that can be used for this. Students wil	I be able to carry out o	chemical calculations
s	selected treatment processes and apply generally	accepted technical rules and standards to these p	rocesses.	
Personal Competence				
	Working in a diverse group of specialists, students will be able to develop and document complex solutions for the management and treatmen			
	• • • • •	priate professional position, for example representi		
	joint solutions in teams of diverse experts and pre		ng user meresis. me	y will be able to deve
J	joint solutions in teams of diverse expens and pre			
Autonomy S	Students will be in a position to work on a subject	independently and present on this subject.		
Workload in Hours	Independent Study Time 96, Study Time in Lecture	ə 84		
Credit points 6	6			
Examination V	Written exam			
Examination duration and scale 6	60 min (chemistry) + presentation			
Assignment for the Following	Civil Engineering: Specialisation Structural Engine	eering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical En	gineering: Elective Compulsory		
c	Civil Engineering: Specialisation Coastal Engineer	ring: Elective Compulsory		
F	Energy and Environmental Engineering: Specialis	ation Energy and Environmental Engineering: Elec	ctive Compulsory	
		ialisation II. Energy and Environmental Engineerin		-y
	Water and Environmental Engineering: Specialisa			-
	Water and Environmental Engineering: Specialisa			
	Water and Environmental Engineering: Specialisa			

Course L0311: Chemistry of Drink	ing Water Treatment	
Тур	Lecture	
Hrs/wk		
CP	1	
Workload in Hours	Independent Study Time 2, Study Time in Lecture 28	
Lecturer	Dr. Klaus Johannsen	
Language	DE	
Cycle	WiSe	
Content	The topic of this course is water chemistry with respect to drinking water treatment and water distribution	
	Major topics are solubility of gases, carbonic acid system and calcium carbonate, blending, softening, redox processes, materials and legal requirements on drinking water treatment. Focus is put on generally accepted rules of technology (DVGW- and DIN-standards). Special emphasis is put on calculations using realistic analysis data (e.g. calculation of pH or calcium carbonate dissolution potential) in exercises. Students can get a feedback and gain extra points for exam by solving problems for homework. Knowledge of drinking water treatment processes is vital for this lecture. Therefore the most important processes are explained coordinated with the course "Water resources management" in the beginning of the semester.	
Literature	 MHW (rev. by Crittenden, J. et al.): Water treatment principles and design. John Wiley & Sons, Hoboken, 2005. Stumm, W., Morgan, J.J.: Aquatic chemistry. John Wiley & Sons, New York, 1996. DVGW (Hrsg.): Wasseraufbereitung - Grundlagen und Verfahren. Oldenbourg Industrie Verlag, München, 2004. Jensen, J. N.: A Problem Solving Approach to Aquatic Chemistry. John Wiley & Sons, Inc., New York, 2003. 	



ourse L0312: Chemistry of Drinking Water Treatment		
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Dr. Klaus Johannsen	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L0402: Water Resource M	ourse L0402: Water Resource Management		
Тур	Lecture		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Mathias Ernst		
Language	DE		
Cycle	WiSe		
	 The lecture provides comprehensive knowledge on interaction of water ressource management and drinking water supply. Content overview: Current situation of global water resources User and Stakeholder conflicts Wasserressourcenmanagement in urbane Gebieten Rechtliche Aspekte, Organisationsformen Trinkwasserversorgungsunternehmen. Ökobilanzierung, Benchmarking in der Wasserversorgung 		
Literature	 Aktuelle UN World Water Development Reports Branchenbild der deutschen Wasserwirtschaft, VKU (2011) Aktuelle Artikel wissenschaftlicher Zeitschriften Ppt der Vorlesung 		

Course L0403: Water Resource Management	
Тур	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Mathias Ernst
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Courses			
Title	Тур	Hrs/wk	CP
Integrated Transportation Planning (L10		4	6
Module Responsible	Prof. Carsten Gertz		
Admission Requirements			
Recommended Previous		nd Traffic Engine	erin
Knowledge			
Educational Objectives	After taking part successfully, students have reached the following learning results		
Professional Competence			
Knowledge	Students are able to:		
	describe interdependencies between land-use/location choice and transportation/mobility behavio		
	explain and evaluate the social, ecological and economic effects of transport and land-use policy n	leasures.	
	 relate current issues in the area of integrated transport planning and formulate an opinion on them. 		
Quille			
Skills	Students are able to:		
	• quantify important parameters, which influence travel demand or are influenced by it.		
	• comprehensively examine a pre-defined or self-selected topic from a transportation studies per	erspective and d	locument the results
	accordance with scientific conventions.		
Personal Competence			
Social Competence	Students are able to:		
	 provide feedback on tanical contents and their teaching 		
	 provide feedback on topical contents and their teaching. constructively handle feedback on their own work. 		
	 produce results in group work and document these. 		
	• produce results in group work and document mese.		
Autonomy	/ Students are able to:		
hatohomy			
	assess potential consequences of their future professional activities		
	independently plan working on a pre-defined project topic, acquire the necessary knowledge and u	ise appropriate n	neans for its executio
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56		
Credit points	6		
Examination	Written elaboration		
Examination duration and scale			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory		
	Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Water: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Environment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities: Compulsory		



Course L1068: Integrated Transpo	ortation Planning
Тур	Problem-based Learning
Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Carsten Gertz, Dr. Philine Gaffron
Language	DE
Cycle	WiSe
	 The course will provide students with an understanding of interdependencies between land-use and transportation. Specific topics include a.o.: interactions between transport and the environment and consequent limitations characteristics of integrated planning complex planning processes interdependencies of location choice and mobility behaviour transport and land-use policies project on current issues in transportation studies
Literature	Kutter, Eckhard (2005) Entwicklung innovativer Verkehrsstrategien für die mobile Gesellschaft. Erich Schmidt Verlag. Berlin. Bracher, Tilman u. a. (Hrsg.) (68. Ergänzung 2013) Handbuch der kommunalen Verkehrsplanung. Herbert Wichmann Verlag. Berlin, Offenbach. (Loseblattsammlung mit kontinuierlichen Ergänzungen)



Module M0963: Steel and	Composite Structures			
Courses				
Title		Тур	Hrs/wk	СР
Steel and Composite Structures (L1204))	Lecture	2	2
Steel and Composite Structures (L1205))	Recitation Section (large)	2	2
Steel Bridges (L1097)		Lecture	2	2
Module Responsible	Dr. Jürgen Priebe			
Admission Requirements	none			
Recommended Previous	Basics of steel construction (i.e. Steel Structures I and II, BUBC)			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following lear	rning results		
Professional Competence				
Knowledge	After successful completition, students can			
	 describe the phenomenon of local buckling 			
	explain warping torsion			
	illustrate the behaviour of composite structures			
	specify the principles in design of composite sttructures			
	 sketch the contructions of steel and composite bridges 			
Skills	After successful participation students are able to			
	 check stiffened and unstiffened plated structures 			
	 recognize and verify warping tosion in strucures 			
	 design composite structures 			
	design bridges and o perform the detailing			
Deve and Commetence				
Personal Competence Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points				
Examination	Written exam			
Examination duration and scale	180 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective C	Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective Comp			
	International Management and Engineering: Specialisation II. Civil Eng			

Course L1204: Steel and Composite Structures	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Jürgen Priebe
Language	DE
Cycle	WiSe
Content	 Local-buckling of plated structures Warping torsion Composite-girders, -columns, -slabs, -bridges Principles in composite constructions Bridge-design and -construction
Literature	Petersen, C.: Stahlbau, 4.Auflage 2013, Springer-Vieweg Verlag Minnert, J. Wagenknecht, G.: Verbundbau-Praxis - Berechnung und Konstruktion nach Eurocode 4, 2.Auflage 2013, Bauwerk Beuth Verlag

Course L1205: Steel and Composite Structures	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Jürgen Priebe
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Course L1097: Steel Bridges	
	Lecture
Hrs/wk	
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Jörg Ahlgrimm
Language	DE
Cycle	
Content	Lecture Contents ,Steel Bridge Construction' DrIng. Jörg Ahlgrimm
	- From tendering and contracting to completion - the development of a steel bridge
	- Contents of a bridge static - structural details, examples of analysis in detail:
	-> effective width in regard to the longitudinal stiffeners
	-> Bearing point, bearing stiffener
	-> Crossbeam breakthrough, crossbeam reinforcement
	-> Analysis of the Rib-to-Floorbeam (RF) connection (web-tooth of the floorbeam between trapezoidal shaped Ribs)
	- Steel grades, -designation, testing methods and approval certificates
	- Nondestructive weld inspecting
	- Corrosion protection
	- Bridge bearing - types, format, function, dimensioning, installation
	- Expansion Joints
	- Oscillation of bridge hangers and cables - oscillation damper
	- Opening bridges- Detailed reviews to different assembling procedures and - implements
	- Selective damage events
	Requirements: Basic knowledge in the calculation, dimensioning, and construction of structural elements and joints of constructional steelwork
Literature	
	Herbert Schmidt, Ulrich Schulte, Rainer Zwätz, Lothar Bär: Ausführung von Stahlbauten
	Petersen, Christian: Stahlbau, Abschnitt Brückenbau
	Ahlgrimm, J., Lohrer, I.: Erneuerung der Eisenbahnüberführung in Fulda-Horas über die Fulda, Stahlbau 74 (2005), Heft 2, S. 114

Workload in Hours

Examination Form

Lecturer

Language

Cycle

Content Literature NN

DE

WiSe

Examination duration and scale

Independent Study Time 32, Study Time in Lecture 28

Mündliche Prüfung



Nodule M0969: Selected	Topics in Civil Engineering			
Courses				
Title		Тур	Hrs/wk	CP
Design of Concrete Strucutures (L1840)	Lecture	2	2
Design of Prefabricated Concrete Struc	tures (L0596)	Lecture	1	1
Design of Prefabricated Concrete Struc	tures (L0597)	Recitation Section (large)	1	1
Forum I - Geotechnics and Constructio	n Management (L1634)	Seminar	1	1
Forum II - Geotechnics and Construction	n Management (L1635)	Seminar	1	1
Hydraulic applications of geosynthetics	(L0380)	Lecture	1	2
Timber Structures (L1151)		Seminar	2	2
Glass Structures (L1152)		Lecture	2	2
Glass Structures (L1447)		Recitation Section (large)	1	1
Module Responsible	NN			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the for	lowing learning results		
Professional Competence				
Knowledge				
0	 Students are able to find their way through selected 	special areas within civil and structural eng	ineering.	
	Students are able to explain basic models and proc	edures in selected special areas of civil and	l structural engineer	ing.
	Students are able to interrelate scientific and technic	cal knowledge.		
Skills				
	 Students are able to apply basic methods in selected 	d areas of civil and structural engineering.		
Personal Competence				
Social Competence				
Autonomy	 Students can chose independently, in which fields t 	hav want to doopon their knowledge and all	ille through the sleet	tion of courses
	 Students can chose independentity, in which lields t 	ney want to deepen their knowledge and sk	ins through the elect	lion of courses.
Workload in Hours	Depends on choice of courses			
Credit points	6			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: El	ective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	g: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elec			
Course L1840: Design of Concret	e Strucutures			
Тур				
Hrs/wk				
CP				
CP	4			



Tvp	Lecture	
Hrs/wk	1	
CP	1	
	Independent Study Time 16, Study Time in Lecture 14	
Examination Form		
Examination duration and scale		
	Prof. Günter Rombach	
Language		
Cycle	WiSe	
Content	 application and advantages and disadvantages of precast concrete structures 	
	 basics of design - precast element production - construction - tolerances 	
	elements of a warehouse	
	 design of a beam - joints 	
	design of D-regions: half joints, corbels, openings	
	 slab types - walls - facades 	
	footings: pocket and block foundations	
	joints - connections	
	shear design of the interface between concrete cast at different times	
	unreinforced concrete structures	
Literature	Bachmann H., Steinle A.; Hahn V.: Bauen mit Betonfertigteilen. Betonkalender 2009, Teil I, Verlag Ernst & Sohn, Berlin	
	 Bacimani H., Steine A., Hann V., Bauer nit betornentgienen. Betorikalender 2009, Tein, Venag Ernst & Sonn, Benni Bindseil P.: Stahlbetonfertigteile. Werner Verlag, 1998 	
	 FIP: FIP Handbuch f ür Planung und Entwerfen von Fertigteilbauten (siehe Zeitschrift: Beton- und Fertigteiltechnik ab 3/1996) 	
	 Bergmeister K.: Konstruieren von Fertigteilen. Betonkalender 2005 Teil 2, S. 163-240 	
	 Reineck KH.: Modellierung der D-Bereiche von Fertigteilen. Betonkalender 2005 Teil 2, S. 241-296 	
	Graubner CA. et. al.: Bemessung von Fertigteilen nach DIN 1045-1. Betonkalender 2005 Teil 2, S. 297-374	
	Broschüren der Fachvereinigung Deutscher Betonfertigteilbau e.V.	
	siehe: www.fdb-fertigteilbau.de	
	www.systembauweise.de	

Course L0597: Design of Prefabricated Concrete Structures	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Klausur
Examination duration and scale	Siehe korrespondierende Vorlesung
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1634: Forum I - Geotechnics and Construction Management	
Тур	Seminar
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Mündliche Prüfung
Examination duration and scale	30 min
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	WiSe
Content	Lectures about projects and issues with practical and scientific relevance.
Literature	



Course L1635: Forum II - Geotechnics and Construction Management

Тур	Seminar
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Mündliche Prüfung
Examination duration and scale	30 min
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	SoSe
Content	Lectures about projects and issues with practical and scientific relevance.
Literature	

Course L0380: Hydraulic applications of geosynthetics		
Тур	Lecture	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Examination Form	Klausur	
Examination duration and scale	30 min	
Lecturer	Dr. Michael Heibaum	
Language	DE	
Cycle	SoSe	
Content	In the earthworks many geotechnical structures have to be realized with the help of geosynthetics nowadays. In particular, they are used in areas	
	where the interaction between water and soil occur to seal. protect, separate, filter, pack or drain. Depending on the construction task	
	geosynthetics are used with specifisally chosen properties which are verified by special tests. In lecture materials, areas, construction methods	
	and testing methodes will be taught.	
Literature	Vorlesungsbegleitende Unterlagen, s. www.tuhh.de/gbt	
	Monographien:	
	• Karl Josef Witt, Hrsg. (2009): Grundbau-Taschenbuch Teil 2, 7. Auflage;: Geotechnische Verfahren; Abschnitt 2.12 Geokunststoffe in der	
	Geotechnik und im Wasserbau S.737-834, Berlin: Ernst&Sohn	
	Robert M. Koerner (2012): Designing with geosynthetics 6th Ed. Vol. 1+2; Bloomington: Xlibris	
	• Sanjay Kumar Shukla, Ed. (2005): Handbook of Geosynthetic Engineering, Geosynthetics and their appli-cations, 2nd Ed.; London: ICE	
	Publishing	
	Zeitschriften:	
	Official Journal of the INTERNATIONAL GEOSYNTHETICS SOCIETY	
	Geotextiles and Geomembranes, Elsevier, Amsterdam	
	Geosynthetics International (nur online), Thomas Telford Ltd, London	

Course L1151: Timber Structures	
Тур	Seminar
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Kolloquium
Examination duration and scale	90 min
Lecturer	Prof. Torsten Faber
Language	DE
Cycle	WiSe
Content	
Literature	



Course L1152: Glass Structures		
	Lecture	
Hrs/wk		
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Examination Form	Klausur	
Examination duration and scale	60 min	
Lecturer	Marvin Matzik	
Language	DE	
Cycle	WiSe	
Content	Glass structures	
	- Introduction of the material glass (production, refinement, material characteristic)	
	- design of facades	
	- facade types	
	- static calculation of glazing	
	- static calculation of facades	
	- load bearing behavior of glazing (plate or membrane stiffness)	
	- vertical / horizontal glazing with safety-related requirements	
	- glass structures	
	- fire safety of glass facades	
	- construction physics of facades and glazing	
Literature		

Course L1447: Glass Structures	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Klausur
Examination duration and scale	60 min
Lecturer	Marvin Matzik
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Module M0967: Study Work Harbour and Coastal Engineering Courses Title Hrs/wk CP Тур Module Responsible Prof. Peter Fröhle Admission Requirements none **Recommended Previous** Subjects of the Port and Coastal Engineering specialisation. Knowledge Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge The students are able to demonstrate their detailed knowledge in the field of port and coastal engineering. They can exemplify the state of technology and application and discuss critically in the context of actual problems and general conditions of science and society. The students can develop solving strategies and approaches for fundamental and practical problems in port and coastal engineering. They may apply theory based procedures and integrate safety-related, ecological, ethical, and economic view points of science and society. Scientific work techniques that are used can be described and critically reviewed. Skills The students are able to independently select methods for the project work and to justify this choice. They can explain how these methods relate to the field of work and how the context of application has to be adjusted. General findings and further developments may essentially be outlined. Personal Competence Social Competence The students are able to condense the relevance and the structure of the project work, the work steps and the sub-problems for the presentation and discussion in front of a bigger group. They can lead the discussion and give a feedback on the project to their colleagues. Autonomy The students are capable of independently planning and documenting the work steps and procedures while considering the given deadlines. This includes the ability to accurately procure the newest scientific information. Furthermore, they can obtain feedback from experts with regard to the progress of the work, and to accomplish results on the state of the art in science and technology. Independent Study Time 180, Study Time in Lecture 0 Workload in Hours Credit points 6 Examination Project (accord. to Subject Specific Regulations) Examination duration and scale The number of pages depends on the task Assignment for the Following Civil Engineering: Specialisation Coastal Engineering: Compulsory Curricula



Module M0997: Structural	Analysis - Selected Topics			
-				
Courses				
Title		Тур	Hrs/wk	CP
Plates and Shells (L1199)		Lecture	2	2
Nonlinear Analysis of Frame Structure (I		Lecture	2	2
Nonlinear Analysis of Frame Structure (I	.1201)	Recitation Section (large)	2	2
Module Responsible	Prof. Uwe Starossek			
Admission Requirements				
Recommended Previous	Mechanics I/II, Mathematics I/II, Differential Equat	tions I		
Knowledge				
Educational Objectives	After taking part successfully, students have reac	ched the following learning results		
Professional Competence				
Knowledge	After successful completion of this module, stude	ents can explain selected elements of higher structura	l analysis.	
Skills		e students are able to assess the premises and th se these methods for performing structural analyses.	e applicability of the	presented methods of
Personal Competence				
Social Competence				
Autonomy	The students have the opportunity to voluntarily a	and independently work homework problems.		
Workload in Hours	Independent Study Time 96, Study Time in Lectu	ire 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	neering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical E			



Course L1199: Plates and Shells			
Тур	2		
Hrs/wk			
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Dr. Marco Schürg		
Language	DE		
Cycle	WiSe		
Content	Theory of plates loaded in-plane		
	Governing equations (equilibrium, kinematics, constitutive law)		
	Differential equation		
	Airy stress function		
	Plane stress / plane strain		
	Structural behaviour of plates loaded in-plane		
	Theory of plates in bending		
	Governing equations (equilibrium, kinematics, constitutive law)		
	Differential equation		
	Navier solution / Fourier series expansion		
	Approximation procedures		
	Structural behaviour of plates in bending		
	Shell theory		
	Phenomenona of the structural behaviour of shells		
	Membrane and bending theory		
	Equilibrium equations of shells of revolution		
	Stress resultants and deformations of the spherical shell, the half spherical shell, and the cylindrical shell		
	Stability problems (overview)		
	Plate buckling		
	Shell buckling		
Literature			
Literature	Basar, Y.: Krätzig, W.B. (1985): Mechanik der Flächentragwerke. Vieweg-Verlag, Braunschweig, Wiesbaden		
	Girkmann, K. (1963): Flächentragwerke, Springer Verlag, Wien, 1963, unveränderter Nachdruck 1986		
	Zienkiewicz, O.C. (1977): The Finite Element Method in Enginieering Science. McGraw-Hill, London		

Course L1200: Nonlinear Analysis	s of Frame Structure
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Uwe Starossek
Language	DE
Cycle	WiSe
Content	-Types of nonlinearity
	-relevance of nonlinear effects on structural analysis
	-comparison and classification of 1 st order theory, 2 nd order theory and 3 rd order theory with regard to the coverage of geometric nonlinearity
	-fundamentals of 2 nd order elasticity theory for frame structures
	-application of 2 nd order elasticity theory using finite elements: common displacement method
	-fundamentals of analytical application of 2 nd order elasticity theory: derivation and solution of differential equation
	-structurally applied methods of analytical application of 2 nd order elasticity theory: common displacement method using analytical stiffness matrix, slope-deflection method for sway and non-sway frame structures, consideration of imperfections
	1 st order plastic hinge theory
Literature	Rothert, H.; Gensichen, V. (1987): Nichtlineare Stabstatik. Springer Verlag, Berlin



ourse L1201: Nonlinear Analysis of Frame Structure		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Uwe Starossek	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Specialization Geotechnical Engineering

Module M0699: Advanced Foundation Engineering and Soil Laboratory Course

Courses				
Title		Тур	Hrs/wk	CP
Soil Laboratory Course (L0499)		Laboratory Course	1	2
Advanced Foundation Engineering (L049		Lecture	2	2
Advanced Foundation Engineering (L049	98)	Recitation Section (large)	1	2
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements				
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reached the foll	lowing learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Written exam			
Examination duration and scale	60 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Co	ompulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	: Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Com	pulsory		
	International Management and Engineering: Specialisation	II. Civil Engineering: Elective Compulsory		

Course L0499: Soil Laboratory Co	ourse L0499: Soil Laboratory Course		
Тур	aboratory Course		
Hrs/wk	1		
CP	2		
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14		
Lecturer	Prof. Jürgen Grabe		
Language	DE		
Cycle	WiSe		
Content	 Field experiments Short lecture on laboratory tests soil analysis laboratory test soil clasification Creating a ground and foundation report 		
Literature	DIN-Taschenbuch 113, Erkundung und Untersuchung des Baugrundes		



Course L0497: Advanced Foundat	ion Engineering	
Тур	ecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	WiSe	
Content	 Vertical drains Piles Ground improvement (Deep Compaction, Soil mixing) Vibration driving Jet grouting Slurry wall Deep excavation 	
Literature	 EAK (2002): Empfehlungen für Küstenschutzbauwerke EAU (2004): Empfehlungen des Arbeitsausschusses Uferbauwerke EAB (1988): Empfehlungen des Arbeitskreises Baugruben Grundbau-Taschenbuch, Teil 1-3, (1997), Ernst & Sohn Verlag 	

Course L0498: Advanced Foundat	Course L0498: Advanced Foundation Engineering	
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Module M0964: Structures in Foundation and Hydraulic Engineering

Courses				
Title		Тур	Hrs/wk	CP
Design of Foundations and Retaining Wa	lls (L0601)	Lecture	2	2
Design of Foundations and Retaining Wa	lls (L0602)	Recitation Section (large)	1	1
Steel Structures in Foundation and Hydr	aulic Engineering (L1146)	Lecture	2	3
Underground Constructions (L0707)		Lecture	1	2
Underground Constructions (L1811)		Recitation Section (large)	1	1
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements				
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 82, Study Time in Lecture 98			
Credit points				
Examination	Written exam			
Examination duration and scale	120 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: C	Compulsory		
	International Management and Engineering: Specialisati			

Course L0601: Design of Foundati	ourse L0601: Design of Foundations and Retaining Walls		
Тур	Lecture		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	NN		
Language	DE		
Cycle	WiSe		
Content	Design of foutings and foundations		
Literature	Handouts		

Course L0602: Design of Foundations and Retaining Walls	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	NN
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1146: Steel Structures in Foundation and Hydraulic Engineering		
Тур	Lecture	
Hrs/wk	2	
CP	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Frank Feindt	
Language	DE	
Cycle	WiSe	
Content		
Literature		



Course L0707: Underground Constructions		
	Lecture	
Hrs/wk	1	
СР	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Marius Milatz	
Language	DE	
Cycle	WiSe	
Content	 Definitions Historical development in tunneling Geology for tunneling Hard rock tunneling (construction composite and machines) Tunnelung in temporarly stable soil with conventional construction methods Tunneling in soft soils (form of supports, shield types, compressed air application) Pipe jacking Tunnel Lining, tunnel supporting structures Calculation approaches for supporting structures in shield-driven tunnels Surveying for tunneling Safety requirements Construction Contract Literature and sources 	
Literature	Vorlesung/Übung s. www.tu-harburg.de/gbt	

Course L1811: Underground Constructions	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Marius Milatz
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Courses				
Title		Тур	Hrs/wk	CP
Basics of Coastal Engineering (L0807)		Lecture	3	4
Basics of Coastal Engineering (L1413) Module Responsible	Drof Dater Frähle	Recitation Section (large)	I	2
Admission Requirements				
Recommended Previous				
Knowledge				
0		shed the following logging require		
Educational Objectives	After taking part successfully, students have read	ched the following learning results		
Professional Competence				
Knowledge		basic concepts of coastal engineering and port engin	• •	
		neering. Students can define and determine the bas	ics for design and o	dimensioning of coas
	engineering constructions.			
Skills	The students are capable to apply basic design	approaches to selected and pre-defined design tasks i	in coastal engineerir	na.
				5
Personal Competence				
Social Competence				
Autonomy				
,	Independent Study Time 124, Study Time in Lec	ture 56		
,	Independent Study Time 124, Study Time in Lec	ture 56		
Workload in Hours Credit points	Independent Study Time 124, Study Time in Lec	ture 56		
Workload in Hours Credit points	Independent Study Time 124, Study Time in Lec 6 Written exam	ture 56 examination includes tasks with respect to the genera	al understanding of	the lecture contents a
Workload in Hours Credit points Examination	Independent Study Time 124, Study Time in Lec 6 Written exam		al understanding of	the lecture contents a
Workload in Hours Credit points Examination Examination duration and scale	Independent Study Time 124, Study Time in Lec 6 Written exam The duration of the examination is 2 hours. The	examination includes tasks with respect to the generation	al understanding of	the lecture contents a
Workload in Hours Credit points Examination Examination duration and scale	Independent Study Time 124, Study Time in Lec 6 Written exam The duration of the examination is 2 hours. The calculations tasks. Civil Engineering: Specialisation Structural Engi	examination includes tasks with respect to the genera neering: Elective Compulsory	al understanding of	the lecture contents a
Workload in Hours Credit points Examination Examination duration and scale Assignment for the Following	Independent Study Time 124, Study Time in Lec 6 Written exam The duration of the examination is 2 hours. The calculations tasks. Civil Engineering: Specialisation Structural Engi	examination includes tasks with respect to the genera neering: Elective Compulsory Engineering: Compulsory	al understanding of	the lecture contents a

Course L0807: Basics of Coastal Engineering		
Тур	Lecture	
Hrs/wk	3	
CP	4	
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42	
Lecturer	Prof. Peter Fröhle	
Language	DE	
Cycle	WiSe	
Content	 Basics of planning and design Water levels Currents Waves Ice Planning and Design in Coastal Engineering Functional and constructional design Determination of design parameters Design-approaches Filter Rubble mound constructions Piles Vertical constructions 	
Literature	Coastal Engineering Manual, CEM Vorlesungsumdruck	



Course L1413: Basics of Coastal Engineering		
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Peter Fröhle	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



0				
Courses				
Title		Тур	Hrs/wk	CP
Renewable Energy Projects in Emerged Hydro Power Use (L0013)	Markets (LUU14)	Project Seminar Lecture	1	1
Wind Turbine Plants (L0013)		Lecture	2	3
Wind Energy Use - Focus Offshore (L0	012)	Lecture	1	1
Module Responsible	Dr. Joachim Gerth			
Admission Requirements	none			
Recommended Previous	Thermodynamics, Fluid Mechanics, Fundamen	ntals of Fluid Flow Engines		
Knowledge		C C		
Educational Objectives	After taking part successfully, students have rea	ached the following learning results		
Professional Competence				
Knowledge	By onding this modulo students can explain in	detail knowledge of wind turbines with a particular	focus of wind operay u	so in offeboro conditio
Knowledge				
		sideration of current developments. Furthermore, th		
	water power to generate electricity. The studer	nts reproduce and explain the basic procedure in the	ne implementation of re	newable energy proje
	in countries outside Europe.			
Skills	Students are able to apply the acquired theory	etical foundations on exemplary water or wind pow	er systems and evaluat	e and assess technica
	the resulting relationships in the context of d	limensioning and operation of these energy syste	ms. They can in comp	are critically the spec
	procedure for the implementation of renewable	e energy projects in countries outside Europe with	the in principle applied	approach in Europe a
	can apply this procedure on exemplary theoret	tical projects.		
Personal Competence				
Social Competence	Students can discuss scientific tasks subjet-sp	ecificly and multidisciplinary within a seminar.		
Autonomy	Chudente con independently cynleit courses in	the context of the events of the least we material t	a alaay tha aantanta of t	
Autonomy		the context of the emphasis of the lecture material t	o clear the contents of th	ne recture and to acqu
	the particular knowledge about the subject area	a.		
Workload in Hours	Independent Study Time 110, Study Time in Le	ecture 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	3 hours written exam			
Assignment for the Following	Civil Engineering: Specialisation Structural Eng	gineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engin	neering: Elective Compulsory		
	Energy and Environmental Engineering: Speci	alisation Energy Engineering: Elective Compulsory		
		pecialisation II. Renewable Energy: Elective Compu	Ilsorv	
		pecialisation II. Energy and Environmental Enginee		20
			• ·	i y
		on: Specialisation Product Development: Elective Co	mpulsory	
		on: Specialisation Production: Elective Compulsory		
	Product Development, Materials and Productio	on: Specialisation Materials: Elective Compulsory		
	Renewable Energies: Core qualification: Comp	pulsory		
	Water and Environmental Engineering: Special	lisation Environment: Compulsory		



Course L0014: Renewable Energy	Projects in Emerged Markets
Тур	
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Andreas Wiese
Language	
Cycle	
Content	
	1. Introduction
	 Development of renewable energies worldwide
	 History
	Future markets
	Special challenges in new markets - Overview
	2. Sample project wind farm Korea
	• Survey
	Technical Description
	 Project phases and characteristics
	3. Funding and financing instruments for EE projects in new markets
	Overview funding opportunitie
	Overview countries with feed-in laws
	Major funding programs
	4. CDM projects - why, how , examples
	Overview CDM process
	• Examples
	• Exercise CDM
	5. Rural electrification and hybrid systems - an important future market for EE
	Rural Electrification - Introduction
	Types of Elektrizifierungsprojekten
	 The role of the EEInterpretation of hybrid systems
	 Project example: hybrid system Galapagos Islands
	6. Tendering process for EE projects - examples
	South Africa
	• Brazil
	7. Selected projects from the perspective of a development bank - Wesley Urena Vargas, KfW Development Bank
	• Geothermal
	Wind or CSP
Literature	Folien der Vorlesung

Course L0013: Hydro Power Use		
•	Lashus	
	Lecture	
Hrs/wk		
CP	1	
Workload in Hours	ndependent Study Time 16, Study Time in Lecture 14	
Lecturer	Dr. Stephan Heimerl	
Language	DE	
Cycle	SoSe	
Content	 Introduction, importance of water power in the national and global context Physical basics: Bernoulli's equation, usable height of fall, hydrological measures, loss mechanisms, efficiencies Classification of Hydropower: Flow and Storage hydropower, low and high pressure systems Construction of hydroelectric power plants: description of the individual components and their technical system interaction Structural engineering components; representation of dams, weirs, dams, power houses, computer systems, etc. Energy Technical Components: Illustration of the different types of hydraulic machinery, generators and grid connection Hydropower and the Environment Examples from practice 	
Literature	 Schröder, W.; Euler, G.; Schneider, K.: Grundlagen des Wasserbaus; Werner, Düsseldorf, 1999, 4. Auflage Quaschning, V.: Regenerative Energiesysteme: Technologie – Berechnung - Simulation; Carl Hanser, München, 2011, 7. Auflage Giesecke, J.; Heimerl, S.; Mosony, E.: Wasserkraftanlagen Planung, Bau und Betrieb; Springer, Berlin, Heidelberg, 2009, 5. Auflage von König, F.; Jehle, C.: Bau von Wasserkraftanlagen – Praxisbezogene Planungsunterlagen; C. F. Müller, Heidelberg, 2005, 4. Auflage Strobl, T.; Zunic, F.: Wasserbau: Aktuelle Grundlagen – Neue Entwicklungen; Springer, Berlin, Heidelberg, 2006 	



Course L0011: Wind Turbine Plant	S	
Тур	Lecture	
Hrs/wk		
CP		
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Dr. Rudolf Zellermann	
Language	DE	
Cycle	SoSe	
Content	 Historical development Wind: origins, geographic and temporal distribution, locations Power coefficient, rotor thrust Aerodynamics of the rotor Operating performance Power limitation, partial load, pitch and stall control Plant selection, yield prediction, economy Excursion 	
Literature	Gasch, R., Windkraftanlagen, 4. Auflage, Teubner-Verlag, 2005	

Course L0012: Wind Energy Use -	- Focus Offshore
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Martin Skiba
Language	DE
Cycle	SoSe
Content	 Introduction, importance of offshore wind power generation, Specific requirements for offshore engineering Physical fundamentals for utilization of wind energy Design and operation of offshore wind turbines, presentation of different concepts of offshore wind turbines, representation of the individual system components and their system-technical relationships Foundation engineering, offshore site investigation, presentation of different concepts of offshore foundation structures, planning and fabrication of foundation structures Electrical infrastructure of an offshore wind farm, Inner Park cabling, offshore substation, grid connection Installation of offshore wind farms, installation techniques and auxiliary devices, construction logistics Development and planning of offshore wind farms Operation and optimization of offshore wind farms Day excursion
Literature	 Gasch, R.; Twele, J.: Windkraftanlagen – Grundlagen, Entwurf, Planung und Betrieb; Vieweg + Teubner, Stuttgart, 2007, 7. Auflage Molly, J. P.: Windenergie – Theorie, Anwendung, Messung; C. F. Müller, Heidel-berg, 1997, 3. Auflage Hau, E.: Windkraftanlagen; Springer, Berlin, Heidelberg, 2008, 4.Auflage Heier, S.: Windkraftanlagen – Systemauslegung, Integration und Regelung; Vieweg + Teubner, Stuttgart, 2009, 5. Auflage Jarass, L.; Obermair, G.M.; Voigt, W.: Windenergie: Zuverlässige Integration in die Energieversorgung; Springer, Berlin, Heidelberg, 2009, 2. Auflage



Courses				
Title		Тур	Hrs/wk	CP
Anchor Technology and Design, Post Ir	stalled Rebar Connections (L0257)	Recitation Section (small)	1	1
Repair of Structures (L0255)		Lecture	1	1
Vineral Building Materials (L0253)		Lecture	2	2
Fechnology of mineral Building Materials	; (L0256)	Recitation Section (small)	1	1
Fransport Processes in Building Materia	als and Damage Processes (L0254)	Lecture	1	1
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials, buildin	g physics and building chemistry, for example by the	ne modules Principl	es of Building Mater
Knowledge	and Building Physics and Building Materials and B	uilding Chemistry.		
Educational Objectives	After taking part successfully, students have reache	ed the following learning results		
Professional Competence				
Knowledge	The students are able to describe the components	of mineral building materials and their function in d	etail and to use the	m for the manufactur
	special mineral building materials. They are abl	e to show the characteristics of mineral building	materials. They ar	re able to describe
		f special mortars and special concretes and the con		
	are able to show the principles of anchor technolog			
		,,		
Skills	Skills The students are able to perform an optimization of granulometry of a mineral building material. They are able to design a special m		a special mineral mo	
	and to manufacture this mortar. The students are a	able to manufacture post installed rebar connection	ns. They are able to	recognize damages
	assess possible causes, to use the fundamentals o	f construction preservation and to select repair and	strengthening meas	ures.
Personal Competence				
Social Competence	The students are able to develop in small grous the	e mixture of a special mortar. They present their res	ults to the lecturer a	nd the other students
	a critical discussion they defend and adjust their re	esults. The students are able to manufacture their s	pecial building mat	erial on the basis of
	feedback.			
Autonomy	The students are able to responsibly use the responsibly	ources of materials and lab equipment for their pr	oject and to investig	gate and to get miss
	components.			
Workload in Hours	Independent Study Time 96, Study Time in Lecture	84		
Credit points				
Examination				
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engine	ering: Compulsory		
Assignment for the Following				
Assignment for the Following Curricula	Civil Engineering: Specialisation Geotechnical Eng	jineering: Compulsory		
	Civil Engineering: Specialisation Geotechnical Eng Civil Engineering: Specialisation Coastal Engineer			

Course L0257: Anchor Technology and Design, Post Installed Rebar Connections		
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Dr. Gernod Deckelmann	
Language	DE	
Cycle	SoSe	
Content	 Working principles of friction, keying and bonding anchors Selection of anchors Anchor design Installation of anchors Post installed rebar connections and additional german regulations 	
Literature	Vortragsfolien der Lehrveranstaltung stehen über STUD.IP zum download zur Verfügung Beton-Kalender 2012: Infrastrukturbau, Befestigungstechnik. Eurocode 2. Herausgegeben von Konrad Bergmeister, Frank Fingerloos und Johann-Dietrich Wörner; 2012 Ernst & Sohn GmbH & Co. KG. Published by Ernst & Sohn GmbH & Co. KG. DIBt: Hinweise für die Montage von Dübelverankerungen; Oktober 2010 Ratgeber Dübeltechnik, Basiswissen - Metalldübel, chemische Dübel, Kunststoffdübel; Herausgeber Hilti AG	



Course L0255: Repair of Structures	
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Frank Schmidt-Döhl, Dr. Gernod Deckelmann
Language	DE
Cycle	SoSe
Content	Maintenance of structures, repair and strengthening, subsequent waterproofing of structures
Literature	BetonMarketing Deutschland (Hrsg.): Stahlbetonoberflächen – schützen, erhalten, instandsetzen

Course L0253: Mineral Building Ma	Course L0253: Mineral Building Materials	
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	SoSe	
Content	Components of mineral building materials and their function, binding materials, concrete and mortar, special mortars, special concretes	
Literature	Taylor, H.F.W.: Cement Chemistry	
	Springenschmid, R.: Betontechnologie für die Praxis	

Course L0256: Technology of mineral Building Materials	
Тур	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Frank Schmidt-Döhl
Language	DE
Cycle	SoSe
Content	Design and production of mineral building materials
Literature	Taylor, H.F.W.: Cement Chemistry
	Springenschmid, R.: Betontechnologie für die Praxis

ourse L0254: Transport Processes in Building Materials and Damage Processes	
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Frank Schmidt-Döhl, Dr. Gernod Deckelmann
Language	DE
Cycle	SoSe
Content	Transport Processes in Building Materials and Damage Processes
Literature	Blaich, J.: Bauschäden, Analyse und Vermeidung



Courses				
Title		Тур	Hrs/wk	CP
Design of Prestressed Structures and C	Concreet Bridges (L0603)	Lecture	3	4
Design of Prestressed Structures and C		Recitation Section (large)	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	None			
Recommended Previous	Detailed knowledge on the design of concrete stru	Detailed knowledge on the design of concrete structures.		
Knowledge				
Educational Objectives	After taking part successfully, students have reach	ed the following learning results		
Professional Competence				
Knowledge	The students know the main bridge types, their applications and the various loads. They can explain the basic design methods. They can expla			
	the design of a prestressed bridge.			
01:11-	The shull at our ship to desire as informed and a			
Skills	The students are able to design reinforced or pres	tressed concrete bridges.		
Personal Competence				
Social Competence	The students can design in teamwork a real concr	ete bridge.		
A				
Autonomy	The students are able to design a prestressed con	crete bridge and discuss the problems and results v	vith other students.	
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	180 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	eering: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Er	gineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer			



Course L0603: Design of Prestres	sed Structures and Concreet Bridges
Тур	Lecture
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	SoSe
Content	prestressed structures
	basis of prestressed structures
	differences between reinforced and prestressed concrete structures
	history of prestressing
	construction materials: concrete, tendons, ducts, anchorage systems
	construction: prestressing methods
	prestressing forces and member forces (friction, elongation)
	tendon layout
	time dependant prestressing losses
	design of prestressed structures
	design of anchorage region
	non-bonded prestressing
	prestressed flat slabs
	Concrete bridges
	history of bridges
	design of bridges
	loads on bridges
	member forces for slab, T-beam, hollow box, frame and arch bridges
	precast bridges - precast segmental bridges
	bearings
	abutments, columns
	construction methods
Literature	Vorlesungsumdruck
	Rombach, G. (2003): Spannbetonbau. Ernst & Sohn, Berlin
	• Wicke, M. (2002): Anwendung des Spannbetons. Betonkalender 2002, Teil II, S. 113-180, Verlag Ernst & Sohn, Berlin
	Leonhardt, F. (1980): Vorlesungen über Massivbau. Teil 5: Spannbeton. Berlin
	Mehlhorn, G. (2007): Handbuch Brücken, Springer Verlag
	Schäfer, H.; Kaufeld, K. (1997): Massivbrücken. Betonkalender Teil II, S. 443ff, Ernst & Sohn, Berlin
	Menn, Ch. (1986): Stahlbetonbrücken. Springer Verlag, Wien

Course L0604: Design of Prestressed Structures and Concreet Bridges	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course



Module M0756: Soil Mecha	anics and -Dynamics			
Courses				
Title		Tun	Hrobuk	CP
Soil Mechanics - Selected Topics (L0374	1)	Typ Lecture	Hrs/wk 2	2
Soil Dynamics (L0452)	*)	Lecture	3	2
Experimental Researches in Geotechnic	es (L0706)	Laboratory Course	1	2
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	none			
Recommended Previous	Soil Mechanics, Vibration Theory			
Knowledge				
Educational Objectives	After taking part successfully, students have reac	hed the following learning results		
Professional Competence				
Knowledge	After the successful completion of the module the	students should be able to:		
	• to derive and to apply the basic equation	of a simple mass assillator		
	 to derive and to apply the basic equation 		le cent ne remetere	
		e soil under dynamic excitation and to detect the re-		
		tests to determine soil dynamic characteristics and	to evaluate them,	
	 to design machine foundations to dynami 			
	 to measure shocks to perform vibration fo 			
	 to evaluate shocks in term to their effect or 	n people and buildings,		
	 to evaluate possibilities of isolation, 			
	 to understand mechanisms that cause ea 	rthquakes and evaluate earthquake in term of their	r magnitude and intensi	ty,
	 to know methods to determine axial pile of 	apacity, integrity and the dynamic bedding modulu	IS,	
	 to know the mechanisms that lead to a de 	formation accumulation due to cyclic loading and	to estimate these deform	nations mathematically
	to distinguish the area of application of the method of elastodynamics and plastodynamics,			
	 to detect the undrained shear strength as 	a function of a number of state variables,		
	 to capture the visous behaviour of cohesi 	ve soils and to consider the effects of creep and ra	te-dependent shear stre	ength in calculations,
	 to consider the impact of the partly saturate 	ted of a seepage and shear strength.		
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lectu	re 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	150 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	neering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical E	ngineering: Compulsory		
	Civil Engineering: Specialisation Coastal Engine	ering: Elective Compulsory		

Course L0374: Soil Mechanics - Selected Topics	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Hans Mathäus Hügel
Language	DE
Cycle	SoSe
Content	selected topis:
	- continuum mechanis
	- constitutive modelling
	- time and rate dependend material behavior of soils
	- cyclic loading
	- undrained conditions
Literature	Kolymbas D. (2007): Geotechnik - Bodenmechanik, Grundbau und Tunnelbau. Springer Verlag



Course L0452: Soil Dynamics	
Тур	Lecture
Hrs/wk	3
CP	2
Workload in Hours	Independent Study Time 18, Study Time in Lecture 42
Lecturer	Dr. Sascha Henke
Language	DE
Cycle	SoSe
Content	• mass-spring-damper systems,
	• wave propagation in soils,
	dynamic soil parameters,
	Determination of dynamic soil parameters,
	• machine foundations,
	• in-situ measurement of ground motion, ground motion prediction, evaluation of ground motion,
	• ground motion shielding,
	 introduction into earthquake engineering,
	dynamic pile tests,
	• cyclic accumulation,
	plastodynamics
Literature	 Das B.M.: Fundamentals of Soil Dynamics, Elsevier Empfehlungen des Arbeitskreises Baugrunddynamik. Hrsg. Deutsche Gesellschaft für Geotechnik (DGGT) Haupt W.: Bodendynamik. Vieweg und Teubner Meskouris K. und Hinzen KG.: Bauwerke und Erdbeben. Vieweg Verlag Studer J.A., Koller M.G. und Laue J.: Bodendynamik, Springer Verlag

Course L0706: Experimental Rese	earches in Geotechnics
Тур	Laboratory Course
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Marius Milatz
Language	DE
Cycle	SoSe
Content	 1g-model tests ng-modfel tests high-grade laboratory tests field tests measurement technology
Literature	



Module M0807: Boundary	Element Methods			
Courses				
Title		Ture	Hwe hade	CP
Boundary Element Methods (L0523)		Typ Lecture	Hrs/wk 2	3
Boundary Element Methods (L0523)		Recitation Section (large)	2	3
Module Responsible	Prof. Otto von Estorff			-
Admission Requirements	none			
Recommended Previous	Mechanics I (Statics, Mechanics of Materials) and Mech	anics II (Hydrostatics, Kinematics, Dynamics)		
Knowledge	Mathematics I, II, III (in particular differential equations)			
Educational Objectives	After taking part successfully, students have reached the	e following learning results		
Professional Competence				
Knowledge	The students possess an in-depth knowledge regardin	ng the derivation of the boundary element me	hod and are able to	give an overview of th
	theoretical and methodical basis of the method.			
Skills Personal Competence Social Competence Autonomy	The students are capable to handle engineering prot matrices, and solving the resulting system of equations. - The students are able to independently solve challengi identified and the results are critically scrutinized.			
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Oral exam			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	g: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineer	ering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering:	Elective Compulsory		
	Energy Systems: Core qualification: Elective Compulso	ry		
	International Production Management: Specialisation P	roduction Technology: Elective Compulsory		
	Mechatronics: Specialisation System Design: Elective C			
	Product Development, Materials and Production: Core	qualification: Elective Compulsory		
	Technomathematics: Core qualification: Elective Comp	ulsory		

Course L0523: Boundary Element	Methods
-	
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Otto von Estorff
Language	EN
Cycle	SoSe
Content	- Boundary value problems
	- Integral equations
	- Fundamental Solutions
	- Element formulations
	- Numerical integration
	- Solving systems of equations (statics, dynamics)
	- Special BEM formulations
	- Coupling of FEM and BEM
	- Hands-on Sessions (programming of BE routines) - Applications
Literature	Gaul, L.; Fiedler, Ch. (1997): Methode der Randelemente in Statik und Dynamik. Vieweg, Braunschweig, Wiesbaden Bathe, KJ. (2000): Finite-Elemente-Methoden. Springer Verlag, Berlin



Course L0524: Boundary Element	Methods
Тур	Recitation Section (large)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Otto von Estorff
Language	EN
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course



-				
Courses				
Title		Тур	Hrs/wk	CP
Applied Groundwater Modeling (L0543)		Lecture	1	1
Applied Groundwater Modeling (L0544)		Recitation Section (small)	2	2
Modeling of Water Supply and Sewer Ne		Problem-based Learning	2	3
Module Responsible	Prof. Wilfried Schneider			
Admission Requirements	none			
Recommended Previous	Groundwater			
Knowledge	groundwater hydraulics and transport of subs	tances		
	Pipe Systems			
	 Knowledge on urban water infrastructures, in 	particular drinking water systemsand urban d	rainage systems includ	ing special structures
	 Hydraulics of drinking water supply systems a 		0 ,	0 1
	 Basic knowledge on water management 			
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge				
	systems analyses and can detect technical and con	nceptual weak points within the systems in	case studies. Besides f	they are able to analy
	interdependencies of hydraulic and toxic phenomena	a in soil and water.		
Skills	The students are able to construct and apply scientifi	c groundwater models indipendently. They c	an work on different sce	narios and can compa
	or assess different solutions for existing problems b	y application of selected software products.	The students are able	to use different softwa
	solutions (e.g. EPANET, EPA-SWMM).			
Personal Competence				
Social Competence				
Autonomy				
, laterierity				
Workload in Hours	Independent Study Time 110, Study Time in Lecture	70		
Credit points	6			
Examination	Written exam			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ing: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engin	eering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineerin	g: Elective Compulsory		
	Water and Environmental Engineering: Specialisatio	n Water: Compulsory		
	Water and Environmental Engineering: Specialisatio	n Environment: Elective Compulsory		

Course L0543: Applied Groundwat	ter Modeling
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Wilfried Schneider
Language	DE/EN
Cycle	SoSe
Content	Introduction and application of the groundwater model MODFLOW (PMWIN); theoretical backround of the modell, students do work with the model
	PMWIN for practical case studies.
Literature	MODFLOW-Handbuch
	Chiang, Wen Hsien: PMWIN



Course L0544: Applied Groundwat	ter Modeling
Тур	Recitation Section (small)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Wilfried Schneider
Language	DE/EN
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course
Course L0875: Modeling of Water	Supply and Sewer Network
Тур	Problem-based Learning
Hrs/wk	2

CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dr. Klaus Johannsen, NN
Language	DE
Cycle	SoSe
Content	
Literature	



Module M0828: Urban Env	vironmental Management			
Courses	Ŭ			
Title		Tura	Hrs/wk	CP
Noise Protection (L1109)		Typ Lecture	2	2
Urban Infrastructures (L0874)		Problem-based Learning	2	4
Module Responsible	NN	-		
Admission Requirements	none			
Recommended Previous Knowledge	 Urban planning Measures for climate protection and clir Basics of urban drainage 	mate change adaptation		
Educational Objectives	After taking part successfully, students have rea	ached the following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 124, Study Time in Le	ecture 56		
Credit points	6			
Examination	Written exam			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Eng	gineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engin	neering: Elective Compulsory		
		es - Cities and Sustainability: Core qualification: Comp	oulsory	
		ation Infrastructure and Mobility: Elective Compulsory		
	Water and Environmental Engineering: Specia			
	Water and Environmental Engineering: Specia	lisation Cities: Compulsory		

Course L1109: Noise Protection	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Bitte auswählen
Language	EN
Cycle	SoSe
Content	
Literature	

Course L0874: Urban Infrastructu	res
Тур	Problem-based Learning
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	SoSe
Content	 Problem/Project Based Learning Main topics are: Design of future cities, concepts and technical approaches for future-proof drinking water supply and wastewater disposal Climate Change Impacts, Adaptation and Mitigation Rainwater Management & urban flash floods New water sources: rainwater harvesting and wastewater reuse Urban greening & urban agriculture Water sensitive urban design How to better link urban planning and urban water issues
Literature	



Courses				
		Tree	Hrs/wk	CP
Title		Тур		
Coastal- and Flood Protection (L0808) Coastal- and Flood Protection (L1415)		Lecture Recitation Section (large)	2	3
Maintennance and Defence of Flood Pro	ptection Structures (L1411)	Lecture	2	2
Module Responsible				
Admission Requirements				
Recommended Previous				
Knowledge	0 0			
-	After taking part successfully, students have reached the	following learning results		
Professional Competence		······································		
	The students have the capability to define and explain	in detail the important aspects of erosion prot	ection and flood pro	tection and are able
Khowledge	apply the aspects to practical coastal protection problem			
	functional and from the constructional point of view.	is. They are able to design and dimension imp	onani coasiai proiet	cuon measures nom
	functional and from the constructional point of view.			
Skills	The students are able to select design approaches for	the functional and constructional design of e	erosion and flood pr	rotection measures a
Skills	The students are able to select design approaches for apply these approaches to practical design tasks.	the functional and constructional design of e	erosion and flood pr	rotection measures a
	apply these approaches to practical design tasks.	the functional and constructional design of e	erosion and flood pr	rotection measures a
Skills Personal Competence	apply these approaches to practical design tasks.	the functional and constructional design of e	prosion and flood pr	rotection measures a
	apply these approaches to practical design tasks.	the functional and constructional design of e	prosion and flood pr	rotection measures a
Personal Competence	apply these approaches to practical design tasks.	the functional and constructional design of e	prosion and flood pr	rotection measures a
Personal Competence Social Competence Autonomy	apply these approaches to practical design tasks.	the functional and constructional design of e	rosion and flood pr	rotection measures a
Personal Competence Social Competence Autonomy	apply these approaches to practical design tasks. Independent Study Time 110, Study Time in Lecture 70	the functional and constructional design of e	erosion and flood pr	rotection measures a
Personal Competence Social Competence Autonomy Workload in Hours	apply these approaches to practical design tasks. Independent Study Time 110, Study Time in Lecture 70 6	the functional and constructional design of e	erosion and flood pr	rotection measures a
Personal Competence Social Competence Autonomy Workload in Hours Credit points	apply these approaches to practical design tasks. Independent Study Time 110, Study Time in Lecture 70 6 Written exam			
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination	apply these approaches to practical design tasks. Independent Study Time 110, Study Time in Lecture 70 6 Written exam			
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale	apply these approaches to practical design tasks. Independent Study Time 110, Study Time in Lecture 70 6 Written exam The duration of the examination is 130 min. The examin	ation includes tasks with respect to the genera		
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale Assignment for the Following	apply these approaches to practical design tasks. Independent Study Time 110, Study Time in Lecture 70 6 Written exam The duration of the examination is 130 min. The examin calculations tasks.	ation includes tasks with respect to the genera		

Course L0808: Coastal- and Flood	Protection
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	SoSe
Content	Protection of sandy coasts
	Sediment transport
	Sediment uansport Morphology
	 Technical solution for the protection of sandy coasts
	Construction in direction of the coast
	 Constructions perpendicular to the coast
	Other Concepst
	Calculation approaches and numerical models
	Flood Protection
	Classification of constructions / measures
	• Dikes
	• Dunes
	Foreland – constructions
	Flood-Protection Walls
	Drainage of the hinterland
Literature	Vorlesungsumdruck
	Coastal Engineering Manual CEM



Course L1415: Coastal- and Flood Protection		
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Peter Fröhle	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L1411: Maintennance and	Defence of Flood Protection Structures
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Olaf Müller
Language	DE
Cycle	SoSe
Content	 Dike protection Maintennance of flood protection measures
Literature	Vorlesungsumdruck



Courses					
Title		Тур	Hrs/wk	CP	
Habour Engineering (L0809)		Lecture	2	2	
Habour Engineering (L1414)		Problem-based Learning	1	2	
Port Planning and Port Construction (LC		Lecture	2	2	
Module Responsible					
Admission Requirements	none				
Recommended Previous					
Knowledge					
Educational Objectives	After taking part successfully, students have reached the	ne following learning results			
Professional Competence					
Knowledge	The students are able to define in details and to cho	ose design approaches for the functional desig	n of a port and app	ly them to design tas	
	They can design the fundamental elements of a port.	They can design the fundamental elements of a port.			
Skilla	The students are able to select and apply appropriate	approaches for the functional design of parts			
SKIIIS	The students are able to select and apply appropriate	approaches for the functional design of ports.			
Personal Competence					
Social Competence					
Autonomy					
Workload in Hours	Independent Study Time 110, Study Time in Lecture 7	0			
Credit points	6				
Examination	Written exam				
Examination dynation and a set	The duration of the examination is 150 min. The exam	ination includes tasks with respect to the gener	al understanding of	the lecture contents a	
Examination duration and scale	calculations tasks.		-		
Examination duration and scale	ouround north addition				
	Civil Engineering: Specialisation Structural Engineering	g: Elective Compulsory			
	Civil Engineering: Specialisation Structural Engineerin	• • •			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineerin	ering: Elective Compulsory			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineerin Civil Engineering: Specialisation Geotechnical Engine	ering: Elective Compulsory : Compulsory			

ourse L0809: Habour Engineerin	g		
Тур	Lecture		
Hrs/wk	2		
CP			
Workload in Hours	dependent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Peter Fröhle		
Language	DE		
Cycle	SoSe		
Content	 Fundamentals of harbor engineering Maritime transportation and waterways engineering Ships Elements of harbors Harbor approaches and water-side harbor areas Terminal design and handling of cargo Quay-walls and piers Equipment of harbors Sluices and other special constructions Connection to inland transportation / inland waterway transportation Protection of harbors Breakwaters and Jetties Wave protection of harbors Fishery and other small harbors 		
Literature	Brinkmann, B.: Seehäfen, Springer 2005		



Course L1414: Habour Engineering	
Тур	Problem-based Learning
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0378: Port Planning and F	Port Construction		
Тур	Lecture		
Hrs/wk	2		
CP			
Workload in Hours	ndependent Study Time 32, Study Time in Lecture 28		
Lecturer	Frank Feindt		
Language	DE		
Cycle	SoSe		
Content	 Planning and implementation of major projects Market analysis and traffic relations Planning process and plan Port planning in urban neighborhood Development of the logistics center "Port of Hamburg" in the metropolis Quays and waterfront structure Special planning Law Harbor - securing of a flexible use of the port Dimensioning of quays Flood protection structures Port of Hamburg - Infrastructure and development Preparation of areas Scour formation in front of shore structures 		
Literature	Vorlesungsumdruck, s. www.tu-harburg.de/gbt		



Courses					
Title		Тур	Hrs/wk	CP	
Hydraulic Models (L0813)		Lecture	1	1	
Modelling of Waves (L0812)		Lecture	1	1	
Modelling of Flow in Rivers and Estuarie	(),	Lecture	3	4	
Module Responsible	Prof. Peter Fröhle				
Admission Requirements	none				
Recommended Previous					
Knowledge					
Educational Objectives	After taking part successfully, students have re	ached the following learning results			
Professional Competence					
Knowledge	Students are able to define in detail the basic processes that are related to the modelling of flows in hydraulic engineering. Besides, they car				
n nowledge	Students are able to deline in detail the basi	c processes that are related to the modelling of	r tiows in nydraulic enginee	ering. Besides, they ca	
Kilowieuge		c processes that are related to the modelling of ling and actual numerical models for the simulati		ering. Besides, they ca	
	describe the basic aspects of numerical mode	ling and actual numerical models for the simulati	ion of flows and waves.	ring. Besides, they ca	
	describe the basic aspects of numerical mode		ion of flows and waves.	rring. Besides, they ca	
	describe the basic aspects of numerical mode	ling and actual numerical models for the simulati	ion of flows and waves.	rring. Besides, they ca	
Skills	describe the basic aspects of numerical mode	ling and actual numerical models for the simulati	ion of flows and waves.	ring. Besides, they ca	
Skills Personal Competence	describe the basic aspects of numerical mode	ling and actual numerical models for the simulati	ion of flows and waves.	ring. Besides, they c	
Skills Personal Competence Social Competence Autonomy	describe the basic aspects of numerical mode	erical models to practical hydraulic engineering f	ion of flows and waves.	ring. Besides, they ca	
Skills Personal Competence Social Competence Autonomy	describe the basic aspects of numerical mode Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lu	erical models to practical hydraulic engineering f	ion of flows and waves.	ring. Besides, they ca	
Skills Personal Competence Social Competence Autonomy Workload in Hours	describe the basic aspects of numerical mode Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lu	erical models to practical hydraulic engineering f	ion of flows and waves.	ring. Besides, they ca	
Skills Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination	describe the basic aspects of numerical mode Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lo 6 Written exam	erical models to practical hydraulic engineering t	ion of flows and waves. tasks.		
Skills Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination	describe the basic aspects of numerical mode Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lo 6 Written exam	erical models to practical hydraulic engineering f	ion of flows and waves. tasks.		
Skills Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale	describe the basic aspects of numerical model Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lo 6 Written exam The duration of the examination is 3 hours. Th	erical models to practical hydraulic engineering t ecture 70 re examination includes tasks with respect to the	ion of flows and waves. tasks.		
Skills Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination Examination duration and scale Assignment for the Following	describe the basic aspects of numerical mode Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lo 6 Written exam The duration of the examination is 3 hours. Th calculations tasks.	erical models to practical hydraulic engineering t ecture 70 ee examination includes tasks with respect to the gineering: Elective Compulsory	ion of flows and waves. tasks.		

Course L0813: Hydraulic Models	
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Peter Fröhle
Language	DE/EN
Cycle	SoSe
Content	 Fundamentals of hydraulic models Model laws Pi theorem of Buckingham Practical examples of hydraulic models
Literature	Strobl, Zunic: Wasserbau, Kap. 11 Hydraulische Modelle, Springer



Course L0812: Modelling of Waves	3		
Тур	Lecture		
Hrs/wk	1		
CP			
Workload in Hours	dependent Study Time 16, Study Time in Lecture 14		
Lecturer	Prof. Peter Fröhle		
Language	DE/EN		
Cycle	SoSe		
Content	 Waves, interactions with shallow water and constructions Wave theories Sea state and surges Development of waves Wave spectra Modelling of Waves / phase averaged and phase resolved models Application of a phase averaged model for wave prediction (SWAN) Application of phase resolved wave models (Mike) 		
Literature	Vorlesungsumdruck		

Course L0810: Modelling of Flow in	n Rivers and Estuaries
Тур	Lecture
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Peter Fröhle
Language	DE/EN
Cycle	SoSe
Content	Basics of numerial models / application of models
	 classification of models model concept modelling 1D Working Equation Mathematical description of physical processes Equation of motions conservation of mass conservation of momentum Initial conditions and boundary conditions Numerical Methods Time step procedure
	Finite differencesFinite volumes
Literature	Vorlesungsskript



Module M0874: Wastewate	er Svstems			
Courses				
Title		Тур	Hrs/wk	CP
Wastewater Systems - Collection, Treatment and Reuse (L0934)		Lecture	2	2
Wastewater Systems - Collection, Treatment and Reuse (L0943)		Recitation Section (large)	1	1
Advanced Wastewater Treatment (L0357)		Lecture	2	2
Advanced Wastewater Treatment (L035	astewater Treatment (L0358) Recitation Section (large) 1 1			
Module Responsible				
Admission Requirements	None			
Recommended Previous	Knowledge of wastewater management and the key proc	esses involved in wastewater treatment.		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge	Students are able to outline key areas of the full range of	f treatment systems in waste water manageme	ent, as well as their	mutual dependence for
	sustainable water protection. They can describe relevant	economic, environmental and social factors.		
Skills	Students are able to pre-design and explain the available	e wastewater treatment processes and the so	one of their applicat	tion in municipal and f
entrie entries	some industrial treatment plants.			
Personal Competence				
Social Competence				
Autonomy	Students are in a position to work on a subject and to org	anize their work flow independently. They can	also present on this	s subject.
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering:	Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineer	ng: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: E	lective Compulsory		
	Bioprocess Engineering: Specialisation A - General Biop	rocess Engineering: Elective Compulsory		
	Energy and Environmental Engineering: Specialisation E	nvironmental Engineering: Elective Compulso	ry	
	International Management and Engineering: Specialisati	on II. Energy and Environmental Engineering:	Elective Compulsor	у
	International Management and Engineering: Specialisati	on II. Process Engineering and Biotechnology:	Elective Compulso	ry
	Process Engineering: Specialisation Environmental Proc	ess Engineering: Elective Compulsory		
	Process Engineering: Specialisation Process Engineering	g : Elective Compulsory		
	Water and Environmental Engineering: Specialisation W	ater: Compulsory		
	Water and Environmental Engineering: Specialisation Er	vironment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Ci	ties: Compulsory		

Course L0934: Wastewater Systems - Collection, Treatment and Reuse	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	SoSe
Content	+Understanding the global situation with water and wastewater
	•Regional planning and decentralised systems
	•Overview on innovative approaches
	+In depth knowledge on advanced wastewater treatment options for different situations, for end-of-pipe and reuse
	*Mathematical Modelling of Nitrogen Removal
	•Exercises with calculations and design
Literature	Henze, Mogens:
	Wastewater Treatment: Biological and Chemical Processes, Springer 2002, 430 pages
	George Tchobanoglous, Franklin L. Burton, H. David Stensel:
	Wastewater Engineering: Treatment and Reuse, Metcalf & Eddy
	McGraw-Hill, 2004 - 1819 pages



course L0943: Wastewater Systems - Collection, Treatment and Reuse	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0357: Advanced Wastewater Treatment	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Joachim Behrendt
Language	
Cycle	SoSe
Content	Survey on advanced wastewater treatment
	reuse of reclaimed municipal wastewater
	Precipitation
	Flocculation
	Depth filtration
	Membrane Processes
	Activated carbon adsorption
	Ozonation
	"Advanced Oxidation Processes"
	Disinfection
Literature	Metcalf & Eddy, Wastewater Engineering: Treatment and Reuse, McGraw-Hill, Boston 2003
	Wassertechnologie, H.H. Hahn, Springer-Verlag, Berlin 1987
	Membranverfahren: Grundlagen der Modul- und Anlagenauslegung, T. Melin und R. Rautenbach, Springer-Verlag, Berlin 2007
	Trinkwasserdesinfektion: Grundlagen, Verfahren, Anlagen, Geräte, Mikrobiologie, Chlorung, Ozonung, UV-Bestrahlung, Membranfiltration, Qualitätssicherung, W. Roeske, Oldenbourg-Verlag, München 2006
	Organische Problemstoffe in Abwässern, H. Gulyas, GFEU, Hamburg 2003



Course L0358: Advanced Wastewater Treatment	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Joachim Behrendt
Language	DE
Cycle	SoSe
Content	Aggregate organic compounds (sum parameters)
	Industrial wastewater
	Processes for industrial wastewater treatment
	Precipitation
	Flocculation
	Activated carbon adsorption
	Recalcitrant organic compounds
Literature	Metcalf & Eddy, Wastewater Engineering: Treatment and Reuse, McGraw-Hill, Boston 2003
	Wassertechnologie, H.H. Hahn, Springer-Verlag, Berlin 1987
	Membranverfahren: Grundlagen der Modul- und Anlagenauslegung, T. Melin und R. Rautenbach, Springer-Verlag, Berlin 2007
	Trinkwasserdesinfektion: Grundlagen, Verfahren, Anlagen, Geräte, Mikrobiologie, Chlorung, Ozonung, UV-Bestrahlung, Membranfiltration, Qualitätssicherung, W. Roeske, Oldenbourg-Verlag, München 2006
	Organische Problemstoffe in Abwässern, H. Gulyas, GFEU, Hamburg 2003



Module M0922: City Planr	ing			
Courses				
Title		Тур	Hrs/wk	CP
Prinicples of City Planning (L1066)		Problem-based Learning	2	3
Street Design (L1067)		Problem-based Learning	2	3
Module Responsible	Prof. Carsten Gertz			
Admission Requirements	None			
Recommended Previous	for "Principles of Urban Planning": none			
Knowledge	for "Designing Urban Streetscapes": some knowledge of Traffic Engineering"	transport planning, e.g. through taking the u	ndergraduate class "	Transport Planning
Educational Objectives	After taking part successfully, students have reached the	ollowing learning results		
Professional Competence				
Knowledge	Students are able to:			
	 use technical terms of urban planning. describe the main determinants of urban develop. 	nent		
	 describe the main determinants of urban develop explain and compare different possibilities of how 			
	 discuss requirements for public streetscapes. 	urban development can be inidenced.		
	 explain the importance of street design. 			
	- p			
Skills	Students are able to:			
	 read and analyze urban development concepts and analyze urban development concepts and 			
	 appraise such concepts in the context of competin design, justify and reflect their own solutions for competing 			
		niciele examples.		
Personal Competence				
Social Competence	Students are able to:			
	 discuss intermediate results with each other. constructively accept feedback on their own work 			
	 constructively accept feedback on their own work. provide constructive feedback to others. 			
Autonomy	Students are able to:			
	 independently complete a written report including access the concerning of their proposed colution 		ocess.	
	 assess the consequences of their proposed soluti independently acquire knowledge and apply this 			
	 Independently acquire knowledge and apply this 	o new issues of problem areas.		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Project			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering:	Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineeri			
	Civil Engineering: Specialisation Coastal Engineering: El	ective Compulsory		
	Logistics, Infrastructure and Mobility: Specialisation Infras	tructure and Mobility: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Wa	ater: Elective Compulsory		
	Water and Environmental Engineering: Specialisation En	vironment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cit	ies: Compulsory		



Course L1066: Prinicples of City Planning	
Тур	Problem-based Learning
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	SoSe
Content	"Principles of Urban Planning" deals with the determinants of urban development and their interactions. Topics include:
	 legal framework, instruments and methods of planning, functional requirements, stakeholders and actors basic design requirements different planning levels and historical contexts. The objective of the course is for students to acquire a basic understanding of urban development problems and approaches for solving them. They will also be able to comprehend the process of urban planning. The project work deals with a real life scenario and includes drawing up a development plan, an urban design concept as well as a building masterplan.
Literature	Albers, Gerd; Wekel, Julian (2009) Stadtplanung: Eine illustrierte Einführung. Primus Verlag. Darmstadt. Frick, Dieter (2008) Theorie des Städtebaus: Zur baulich-räumlichen Organisation von Stadt. Wasmuth-Verlag. Tübingen Jonas, Carsten (2009) Die Stadt und ihr Grundriss. Wasmuth-Verlag. Tübingen Kostof, Spiro; Castillo, Greg (1998) Die Anatomie der Stadt. Geschichte städtischer Strukturen. Campus-Verlag. Frankfurt/New York.

Course L1067: Street Design	
Тур	Problem-based Learning
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	SoSe
Content	 "Designing Urban Streetscapes" covers the various functional and aesthetic requirements for designing streetscape as the most important elements of public space. The class deals with: technical and design requirements, the effects of streetscapes on the behaviour of their users, possible measures relating to changes in traffic development. For their applied project, students will be required to redesign the streetscape of an actual case study.
Literature	Forschungsgesellschaft für Straßen- und Verkehrswesen (2011) Empfehlungen zur Straßenraumgestaltung innerhalb bebauter Gebiete - ESG. FGSV-Verlag. Köln (FGSV, 230). Forschungsgesellschaft für Straßen- und Verkehrswesen (2007) Richtlinien für die Anlage von Stadtstraßen – RASt 06. FGSV-Verlag. Köln (FGSV, 200).



Module M0961: Conceptu	al Design of Structures			
Courses				
Title		Тур	Hrs/wk	CP
Dimensioning and Detailing (L1144)		Project Seminar	3	4
Conception of Structures (L1142)		Lecture	1	2
,	Prof. Günter Rombach			
Admission Requirements				
Recommended Previous		ced and prestressed concrete structures	steel structures)	
Knowledge			, 0.001 0.1 00.1 00)	
Educational Objectives	After taking part successfully, students have reached the fo	llowing learning results		
Professional Competence		0 0		
•	The students are able to outline selected aspects of the building and technical history and to explain basic design strategies.			
Skills Personal Competence	The students are able to design engineering structures and	d have special structural engineering ski	lls.	
Social Competence	The students are able to explain and defend problems an work in plenary.	d proposals in front of a professional au	dience, by presenting a	nd discussing the grou
Autonomy	On the basis of the feedback given during the semester, th	e students develop independent solutior	ns for complex technical	problems.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	Oral exam (15-30 minutes per student) and project work (F	E calculation)		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: E	lective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineerin	g: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Ele	ctive Compulsory		
	International Management and Engineering: Specialisation	n II. Civil Engineering: Elective Compulse	ory	

Course L1144: Dimensioning and	Detailing
Тур	Project Seminar
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	SoSe
Content	With help of several (small) project works the subjects the conception and design of structures is practiced. The practical problems are elaborated in teamwork and have to be presented and discussed in the class.
Literature	- Projektbezogene Unterlagen

Course L1142: Conception of Stru	Course L1142: Conception of Structures		
Тур	Lecture		
Hrs/wk	1		
CP	2		
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14		
Lecturer	Prof. Günter Rombach		
Language	DE		
Cycle	SoSe		
Content	The students learn to design and gain competencies in shaping of structures and decision making. The following topics are addressed:		
	 elements of structural engineering importance of design, basics and conditions site analysis, service conditions, limit states, possibilities for execution, economy, durability structural design (shaping), structural detailing structural analysis, dimensioning of main elements assessment and discussion of proposals 		
Literature	- Vorlesungsunterlagen, Fachzeitschriften		



Module M0968: Subsoil er	igineering and Numerics			
Courses				
Title		Тур	Hrs/wk	CP
Numerical Methods in Geotechnics (L03	(75)	Lecture	3	3
Underground Constructions (L0707)		Problem-based Learning	2	3
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	none			
Recommended Previous	Basics in construction and design of reinforced concrete	structures, Soil Mechanics and Foundation En	gineering	
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Oral exam			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineer	ring: Compulsory		
	Water and Environmental Engineering: Specialisation W	later: Elective Compulsory		
	Water and Environmental Engineering: Specialisation E	nvironment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation C	ities: Elective Compulsory		

Course L0375: Numerical Methods	s in Geotechnics
Тур	Lecture
Hrs/wk	3
CP	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Dr. Hans Mathäus Hügel
Language	DE
Cycle	SoSe
Content	Topics:
	 numerical simulations numerical algorithms finite element method application of finite element method in geomechanics constitutive models for soils contact models for soil structure interaction selected applications
Literature	 Wriggers P. (2001): Nichtlineare Finite-Elemente-Methoden, Springer Verlag, Berlin Bathe Klaus-Jürgen (2002): Finite-Elemente-Methoden. Springer Verlag, Berlin



Course L0707: Underground Cons	tructions		
Тур	Problem-based Learning		
Hrs/wk	2		
CP			
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Jürgen Grabe		
Language	DE		
Cycle	SoSe		
Content	 Definitions Historical development in tunneling Geology for tunneling Hard rock tunneling (construction composite and machines) Tunnelung in temporarly stable soil with conventional construction methods Tunneling in soft soils (form of supports, shield types, compressed air application) Pipe jacking Tunnel Lining, tunnel supporting structures Calculation approaches for supporting structures in shield-driven tunnels Surveying for tunneling Safety requirements Construction Contract Literature and sources 		
Literature	• Vorlesung/Übung s. www.tu-harburg.de/gbt		



Courses					
Title		Тур	Hrs/wk	CP	
Construction Logistics (L1163)		Lecture	1	2	
Construction Logistics (L1164)		Recitation Section (small)	1	2	
Project Development and Management	(L1161)	Lecture	1	1	
Project Development and Management ((L1162)	Recitation Section (small)	1	1	
Module Responsible	Prof. Heike Flämig				
Admission Requirements	none				
Recommended Previous	none				
Knowledge					
Educational Objectives	After taking part successfully, students have re	ached the following learning results			
Professional Competence					
Knowledge	Students can				
	 give definitions of the main terms of con 	nstruction logistics and project development and manag	ement		
	 name advantages and disadvantages 	of internal or external construction logistics			
	 explain characteristics of products, der 	nand and production of construction objects and their co	onsequences for cor	struction specific suppl	
	chains				
	differentiate constructions logistics from other logistics systems				
Skills	Students can				
	carry out project life cycle assessments				
	apply methods and instruments of construction logistics				
	 apply methods and instruments of projection 				
	 apply methods and instruments of conf 	•			
	 design supply and waste removal cond 	epts for a construction project			
Personal Competence					
Social Competence	Students can				
	 hold presentations in and for groups 				
	 apply methods of conflict solving skills 	in group work and eace studies			
	 apply methods of connict solving skins 	in group work and case studies			
Autonomy	Students can				
		10			
	solve problems by holistic, systemic an	-			
	 Improve their creativity, negotiation skill 	Is, conflict and crises solution skills by applying methods	s of moderation in ca	se studies	
Workload in Hours	Independent Study Time 124, Study Time in Le	ecture 56			
Credit points	6				
Examination	Written elaboration				
Examination duration and scale	Two written compositions and two short preser	ntations			
Assignment for the Following	Civil Engineering: Specialisation Structural En	gineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnica				
	Civil Engineering: Specialisation Coastal Engi				
		ation Production and Logistics: Elective Compulsory			
		ation Infrastructure and Mobility: Elective Compulsory			



Тур	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	The lecture gives deeper insight how important logistics are as a competetive factor for construction projects and which issues are to be adressed
	The following toppics are covered:
	competetive factor logistics
	the concept of systems, planning and coordination of logistics
	material, equipment and reverse logistics
	IT in construction logistics
	elements of the planning model of construction logistics and their connections
	 flow oriented logistics systems for construction projects
	 logistics concepts for ready to use construction projects (especially procurement and waste removel logistics)
	best practice examples (construction logistics Potsdamer Platz, recent case study of the region)
	Contents of the lecture are deepened in special exercises.
Literature	Flämig, Heike: Produktionslogistik in Stadtregionen. In: Forschungsverbund Ökologische Mobilität (Hrsg.) Forschungsbericht Bd. 15.2. Wupperl 2000.
	Krauss, Siri: Die Baulogistik in der schlüsselfertigen Ausführung, Bauwerk Verlag GmbH Berlin 2005.
	Lipsmeier, Klaus: Abfallkennzahlen für Neubauleistungen im Hochbau : Verlag Forum für Abfallwirtschaft und Altlasten, 2004.
	Schmidt, Norbert: Wettbewerbsfaktor Baulogistik. Neue Wertschöpfungspotenziale in der Baustoffversorgung. In: Klaus, Peter: Edition Logist Band 6. Deutscher Verkehrs-Verlag. Hamburg 2003.
	Seemann, Y.F. (2007): Logistikkoordination als Organisationseinheit bei der Bauausführung Wissenschaftsverlag Mainz in Aachen, Aachen (Mitteilungen aus dem Fachgebiet Baubetrieb und Bauwirtschaft (Hrsg. Kuhne, V.): Heft 20)

Course L1164: Construction Logis	ourse L1164: Construction Logistics		
Тур	Recitation Section (small)		
Hrs/wk	1		
CP	2		
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14		
Lecturer	Prof. Heike Flämig		
Language	DE		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

Course L1161: Project Developme	ent and Management	
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Heike Flämig	
Language	DE	
Cycle	SoSe	
Content	Within the lecture, the main aspects of project development and management are tought:	
	Terms and definitions of project management	
	Advantages and disadvantages of different ways of project handling	
	organization, information, coordination and documentation	
	cost and fincance management in projects	
	time- and capacity management in projects	
	specific methods and instruments for successful team work	
	Contents of the lecture are deepened in special exercises.	
Literature	Projektmanagement-Fachmann. Band 1 und Band 2. RKW-Verlag, Eschborn, 2004.	



Course L1162: Project Development and Management		
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Heike Flämig	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	



Courses				
Title		Тур	Hrs/wk	CP
Structural Dynamics (L1202)		Lecture	2	2
Structural Dynamics (L1203)		Recitation Section (large)	2	2
Fracture Mechanics and Fatigue (L0564)	Lecture	-	- 1
Fracture Mechanics and Fatigue (L0565	*	Recitation Section (large)	1	1
Module Responsible	Prof. Uwe Starossek			
Admission Requirements				
Recommended Previous	Knowledge of linear structural analysis of statically	determinate and indeterminate structures; Mechani	cs I/II, Mathematics I	/II, Differential equatio
Knowledge	I			
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
	After successful completion of this module, the student can explain the basic aspects of dynamic effects on structures and the respective methods			
Skills	After successful completion of this module, the stuc the appropriate computational approaches and met		al and structures to	dynamics loading us
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture	84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ering: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	ineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineeri			

Course L1202: Structural Dynamic	28
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Uwe Starossek
Language	DE
Cycle	SoSe
Content	 Single-degree-of-freedom systems: undamped and damped vibration, free vibration, forced vibrations due to harmonic, periodical or arbitrary loading, natural frequency, damping vibration isolation solution in the frequency-domain (Fourier transformation), solution in the time-domain multi-degree-of-freedom systems: continuous or discrete systems, modelling with finite elements, generalisation modal analysis power iteration according to v.Mises earthquake loading: seismological basics, response spectrum method wind-induced vibrations: engineering meteorology, aerodynamic, classification of excitation mechanisms
Literature	Clough, R.W., Penzien, J.: Dynamics of Structures. 2. Aufl., McGraw-Hill, New York, 1993.



Course L1203: Structural Dynamics	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Uwe Starossek
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0564: Fracture Mechanic	ourse L0564: Fracture Mechanics and Fatigue	
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Dr. Ingo Hadrych	
Language	DE	
Cycle	SoSe	
Content		
Literature		

Course L0565: Fracture Mechanic	s and Fatigue
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Ingo Hadrych
Language	DE
Cycle	SoSe
Content	 Basics of fatigue stress and fatigue resistance and determination of fatigue strength, determination and use of S-N-curves and classification of notch effects, set up of determination of fatigue strength under dynamic load using the accumulation formula by Palmgren-Miner, set up of determination of fatigue strength in different examples, basics of construction and design regarding the problem of material fatigue, basics of linear elastic fracture mechanics under static and dynamic load, determination of lifetime of steel construction based on linear elastic fracture mechanics in different examples.
Literature	 Kuhlmann, Dürr, Günther; Kranbahnen und Betriebsfestigkeit; in Stahlbau Kalender 2003; Verlag Ernst & Sohn; Berlin 2003 Deutscher Stahlbau-Verband (Hrsg.); Stahlbau Handbuch Band 1 Teil B; 3. Auflage; Stahlbau-Verlagsgesellschaft; Köln 1996 Petersen, C.; Stahlbau; 3. überarb. und erw. Auflage; Vieweg-Verlag; Braunschweig 1993 DIN V ENV 1993-1-1: Eurocode 3; Bemessung und Konstruktion von Stahlbauwerken; Teil 1-1: Allgemeine Bemessungsregeln, Bemessungsregeln für den Hochbau; 1993 DIN V ENV 1993-6: Eurocode 3; Bemessung und Konstruktion von Stahlbauwerken; Teil 6: Kranbahnen; 2001 DIN-Fachbericht 126. Richtlinie zur Anwendung von DIN V ENV 1993-6; Nationales Anwendungsdokument (NAD); Berlin 2002

Workload in Hours

Lecturer Language

Cycle

Content

Literature

DE

SoSe

Independent Study Time 124, Study Time in Lecture 56

Dr. Jürgen Priebe, Prof. Uwe Starossek



Courses				
Title		Тур	Hrs/wk	CP
Steel Construction Project (L1206)		Project Seminar	4	6
Module Responsible	Dr. Jürgen Priebe	· · · · · · · · · · · · · · · · · · ·		
Admission Requirements	none			
Recommended Previous	Steel and Composite Structures			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	ollowing learning results		
Professional Competence				
Knowledge	Students are able to prepare a part of the whole project a	nd explain it to the others.		
Skills	Students can produce sketches and calculations of their	part of the project. They are able to adju	ust their work in reactior	n to changing condition
	resulting from other participants of the project.			
Personal Competence				
Social Competence	Students can present their results to other members of the	group.		
	They have the ability to work for a broad agreement with	respect to intergroup dependencies.		
	They can distribute and process tasks independently.			
Autonomy	Students can handle their part of the project on their own	resposibility-		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	approx. 15-20 pages (without appendix)			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering:	Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineeri	ng: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: El	ective Compulsory		
Course L1206: Steel Construction	Project			
Тур	Project Seminar			
Hrs/wk	4			
CP	6			

Design of a big construction project (i.e skyscraper, large bridge, roof of a stadiuim) in small groups



Courses				
		Tue	Hendade	CD.
Title		Typ Problem-based Learning	Hrs/wk 2	CP 2
Geo-Information-Systems in Water Management and Hydraulic Engineering (L0963) Water Protection and Wastewater Management (L0226)		Seminar	2	2
Water Protection and Wastewater Manag		Recitation Section (large)	1	2
Module Responsible				
Admission Requirements				
Recommended Previous				
Knowledge	 Basic knowledge in water management; 			
	 Good knowledge in urban drainage; 			
	 Good knowledge of wastewater treatment techniques; 			
	 Good knowledge of pollutants (e.g. COD, BOD, TS, N, I) and their properties;		
Educational Objectives	After taking part successfully, students have reached the follow	ving learning results		
Professional Competence	The taking part buccession, students have reacted are loney			
	The students can describe the basic principles of the regula	atory framework related to the interna	tional and European	water sector They o
Kilowieuge	explain limnological processes, substance cycles and wate			
	problems. Finally, the students can demonstrate to achieve si			
	able to judge environmental and wastewater related issues			
	interventions as well as conceptual problem solving approach			
Skills	Students can accurately assess current problems and situa	tions in a country specific or local co	ntoxt. Thoy can suga	act concrete actions
Skills	contribute to the planning of tomorrow's urban water cycle. F			
		uninemore, mey can suggest approp	nate technical, autim	islialive and legislat
	solutions to solve these problems.			
Personal Competence				
-	The students can work together in international groups.			
Autonomy	Students are able to organize their work flow to prepare	themselves before presentations and	d discussion. They ca	an acquire appropri
	knowledge by making enquiries independently.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Freedowstice demotion and each	00 min			
Examination duration and scale				
° °	Civil Engineering: Specialisation Structural Engineering: Elect			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: E			
	Civil Engineering: Specialisation Coastal Engineering: Electiv			
	Environmental Engineering: Specialisation Water: Elective Co			
	International Management and Engineering: Specialisation II.			
		usiainaniiity: Specialisation Water: Ele	cuve Compulsory	
	Joint European Master in Environmental Studies - Cities and S		,	
	Water and Environmental Engineering: Specialisation Water: 0 Water and Environmental Engineering: Specialisation Environ	Compulsory		



Course L0963: Geo-Information-Se	Course L0963: Geo-Information-Systems in Water Management and Hydraulic Engineering	
Тур	Problem-based Learning	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Peter Fröhle	
Language	DE/EN	
Cycle	WiSe	
Content	Theoretical basics of Geo-Information-Systems	
	 Data models, geographical coordinates, geo-referencing, map-views Data mining and – analyses of geo-data Analysis techniques 	
Literature	None	

Course L0226: Water Protection a	nd Wastewater Management
Тур	Seminar
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	WiSe
	 The lecture focusses on: Regulatory Framework (e.g. WFD) Main instruments for the water management and protection In depth knowledge of relevant measures of water pollution control Urban drainage, treatment options in different regions on the world Rainwater management, improved management of heavy rainfalls, downpours, rainwater harvesting, rainwater infiltration Case Studies and Field Trips
Literature	 The literature listed below is available in the library of the TUHH. Water and wastewater technology Hammer, M. J. 1., & . (2012). (7. ed., internat. ed.). Boston [u.a.]: Pearson Education International. Water and wastewater engineering : design principles and practice: Davis, M. L. 1. (2011). New York, NY: McGraw-Hill. Biological wastewater treatment: (2011). C. P. Leslie Grady, Jr. (3. ed.). London, Boca Raton, Fla. [u.a.]: IWA Publ.

Course L0227: Water Protection a	nd Wastewater Management
Тур	Recitation Section (large)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	WiSe
	 The lecture focusses on: Regulatory Framework (e.g. WFD) Main instruments for the water management and protection In depth knowledge of relevant measures of water pollution control Urban drainage, treatment options in different regions on the world Rainwater management, improved management of heavy rainfalls, downpours, rainwater harvesting, rainwater infiltration Case Studies and Field Trips
Literature	 The literature listed below is available in the library of the TUHH. Water and wastewater technology Hammer, M. J. 1., & . (2012). (7. ed., internat. ed.). Boston [u.a.]: Pearson Education International. Water and wastewater engineering : design principles and practice: Davis, M. L. 1. (2011). New York, NY: McGraw-Hill. Biological wastewater treatment: (2011). C. P. Leslie Grady, Jr. (3. ed.). London, Boca Raton, Fla. [u.a.]: IWA Publ.



Module M0595: Examinati	on of Materials, Structural Condit	ion and Damages		
Courses				
Title		Тур	Hrs/wk	СР
Examination of Materials, Structural Con	dition and Damages (L0260)	Lecture	4	4
Examination of Materials, Structural Cor	dition and Damages (L0261)	Recitation Section (small)	1	2
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials or	material science, for example by the module Buildin	ng Materials and Building	Chemistry.
Knowledge				
Educational Objectives	After taking part successfully, students have n	reached the following learning results		
Professional Competence				
Knowledge	The students are able to describe the rules	for trading, use and marking of construction produc	ts in Germany. They kno	w which methods for t
	testing of building material properties are usa	able and know the limitations and characterics of the	most important testing m	ethods.
Skills	The students are able to responsibly discover the rules for trading and using of building products in Germany.			
		the testing and inspection of construction products,		•
	•	ey are able to conclude from symptons to the cal	use of damages. They a	are able to describe
	examination in form of a test report or expert	opinion.		
Personal Competence				
	The students can describe the different role	es of manufacturers as well as testing, supervisory	and certification bodies	within the framework
		ent roles of the participants in legal proceedings.		
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in	Lecture 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural E	ingineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnic	al Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Eng	gineering: Elective Compulsory		
	International Management and Engineering:	Specialisation II. Civil Engineering: Elective Compu	Isory	
	Materials Science: Specialisation Engineerin	g Materials: Elective Compulsory		

Course L0260: Examination of Materials, Structural Condition and Damages		
Тур	Lecture	
Hrs/wk	4	
CP	4	
Workload in Hours	Independent Study Time 64, Study Time in Lecture 56	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	WiSe	
Content	Materials testing and marking process of construction products, testing methods for building materials and structures, testing reports and expert	
	opinions, describing the condition of a structure, from symptons to the cause of damages	
Literature	Frank Schmidt-Döhl: Materialprüfung im Bauwesen. Fraunhofer irb-Verlag, Stuttgart, 2013.	

Course L0261: Examination of Mat	Course L0261: Examination of Materials, Structural Condition and Damages	
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Courses				
Title		Тур	Hrs/wk	CP
Waste and Environmental Chemistry (L0328)		Laboratory Course	2	2
Biological Waste Treatment (L0318)		Problem-based Learning	3	4
Module Responsible	Prof. Kerstin Kuchta			
Admission Requirements	none			
Recommended Previous	chemical and biological basics			
Knowledge				
Educational Objectives	After taking part successfully, students have re	ached the following learning results		
Professional Competence				
Knowledge	The module aims possess knowledge concer	ning the planning of biological waste treatment plants	. Students are able to	explain the design a
		ent plants in detail, describe different techniques for w	vaste gas treatment pl	ants for biological wa
	treatment plants and explain different methods	for waste analytics.		
Skills	s The students are able to discuss the compilation of design and layout of plants. They can critically evaluate techniques and quality contri			
	measurements. The students can recherché and evaluate literature and date connected to the tasks given in der module and plan additional tests			
	They are capable of reflecting and evaluating t	indings in the group.		
Personal Competence				
-	Students can participate in subject-specific ar	nd interdisciplinary discussions, develop cooperated s	solutions and defend	their own work result
oodal oompetence		relopment in front of colleagues. Furthermore, they c		
	criticism.		an give and accept p	
Autonomy	Students can independently tap knowledge fr	om literature, business or test reports and transform	it to the course projed	ts. They are capable
	consultation with supervisors as well as in the interim presentation, to assess their learning level and define further steps on this basi			
	Furthermore, they can define targets for new application-or research-oriented duties in accordance with the potential social, economic and cultura			
	impact.			
		ecture 70		
	6			
Examination	Project			
		n groups), successful participation at Praktikum		
Curricula	a Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engi		leon	
	Energy and Environmental Engineering: Spec Environmental Engineering: Core gualification	ialisation Environmental Engineering: Elective Compu	1501 y	
	0 0 1	pecialisation II. Energy and Environmental Engineerir	a: Elective Compulso	rv
		es - Cities and Sustainability: Specialisation Energy: E	-	• ,
	Water and Environmental Engineering: Specia			



Course L0328: Waste and Environ	mental Chemistry
Тур	Laboratory Course
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Kerstin Kuchta
Language	DE/EN
Cycle	WiSe
	The participants are divided into groups. Each group prepares a transcript on the experiment performed, which is then used as basis for discussing the results and to evaluate the performance of the group and the individual student. In some experiments the test procedure and the results are presented in seminar form, accompanied by discussion and results evaluation. Experiments ar e.g. Screening and particle size determination Fos/Tac AAS Chalorific value
Literature	Scripte

Course L0318: Biological Waste T	reatment
Тур	Problem-based Learning
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Kerstin Kuchta
Language	EN
Cycle	WiSe
Content	 Introduction biological basics determination process specific material characterization aerobic degradation (Composting, stabilization) anaerobic degradation (Biogas production, fermentation) Technical layout and process design Flue gas treatment Plant design practical phase
Literature	



0					
Courses					
Title		Тур	Hrs/wk	CP	
Subsoil and Underground Engineering L Project Geotechnics (L0708)	aw (L0395)	Lecture Problem-based Learning	2	2	
Module Responsible	Brot lürgen Croke	ribbeni-based Learning	L	7	
Admission Requirements					
Recommended Previous	Enviromental Law,				
Knowledge	Law of building contracts				
Educational Objectives	After taking part successfully, students have reached the following learning results				
Professional Competence					
Knowledge	e After successful completion of the module the student has in-depth knowledge in subsoil and underground construction law, contract law as w				
	as in the VOB.				
Skills	 Assessment and design of the main contract regulations and control processes 				
	 Advanced detection of legal problems and thus ability to avoid legal construction disputes 				
	Advanced detection on egal problems				
Personal Competence					
Social Competence	Cooperation in a project work, where they so	lve a geotechnical problem and design and plan the so	lution and present the	results at the end.	
Autonomy					
Workload in Hours	Independent Study Time 124, Study Time in I	Lecture 56			
Credit points	6				
Examination	Colloquium				
Examination duration and scale	120 minutes				
Assignment for the Following	Civil Engineering: Specialisation Structural E	ngineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory				
	Civil Engineering: Specialisation Coastal Eng				

Course L0395: Subsoil and Underg	ground Engineering Law		
Тур	Lecture		
Hrs/wk	2		
CP			
Workload in Hours	dependent Study Time 32, Study Time in Lecture 28		
Lecturer	Dr. Georg-Friedger Drewsen		
Language	DE		
Cycle	WiSe		
Content	 Introduction Historical Overview Areas of civil law The Contracting Parties Authorities, Cooperatioves and other patries involved The Civil law The Public Service Obligations Land acquisition Planning of underground construction projects The construction contract according to BGB/VOB - design and implementation The civil law in the jurisdiction 		
Literature	Folienskipt (in der Vorlesung erhältlich) weitere Literatur: • Englert, Grauvogel und Maurer: Handbuch des Baugrund- und Tiefbaurechts. Werner-Verlag		

Course L0708: Project Geotechnic	S S
Тур	Problem-based Learning
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	WiSe
Content	The students solve independently a project-based geotechnical problem in groups. Additional lectures concerning the problem will be held and
	material will be distributed as study basis. Every two weeks the groups present their current project status. The final work will be presentated in a
	final presentation.
Literature	abhängig von der Fragestellung



Module M0705: Groundwa	iter				
Courses					
Title		Тур	Hrs/wk	CP	
Geohydraulic and Solute Transport (L05	,	Lecture	2	2	
Geohydraulic and Solute Transport (L05		Recitation Section (small)	1	1	
Simulation in Groundwater Hydrology (L Simulation in Groundwater Hydrology (L		Lecture Recitation Section (small)	2	2	
	Prof. Wilfried Schneider		L	L	
Admission Requirements	None				
Recommended Previous	None				
Knowledge	Ground water hydrology				
Knowledge	Hydromechanics				
Educational Objectives	After taking part successfully, students have reached the following learning results				
Professional Competence					
Knowledge	The students are able to describe the fate of solutes in the subsurface along the path between soil and water body quantitatively and qualita			atively and qualitatively.	
	They are able to do this with simulation models.				
Skills	The students are able to describe conceptually movement and storage of water in the unsaturated zone. They are able to analyse pF- functions				
	and Ku functions. They can model transport of solutes in the unsaturated and saturated zoned. They are able to determine dispersiities, sorption				
	coefficients, decay rates and dissolution rates for organic and inorganic substances.				
Personal Competence					
Social Competence	The students can help to each other.				
Autonomy	none				
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84				
Credit points	6				
Examination	Written exam				
Examination duration and scale	60 min written exam and written papers				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elect	ive Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: E	lective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: Elective	e Compulsory			
	Process Engineering: Specialisation Environmental Process E	ngineering: Elective Compulsory			
	Process Engineering: Specialisation Process Engineering: Ele	ective Compulsory			
	Water and Environmental Engineering: Specialisation Water: 0	Compulsory			
	Water and Environmental Engineering: Specialisation Environ	ment: Elective Compulsory			
	Water and Environmental Engineering: Specialisation Cities: E	Elective Compulsory			

Course L0539: Geohydraulic and S	Solute Transport	
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Wilfried Schneider	
Language	DE	
Cycle	íSe	
Content	ump test analysis, water content-water suction functions, unsaturated hydraulic conductivity function, Brooks-Corey relation, van Genuch	
	relation, solute transport in unsaturated zone, solute transport and reactions in groundwater	
Literature	Todd; K. (2005): Groundwater Hydrology	
	Fetter, C.W. (2001): Applied Hydrogeology	
	Hölting & Coldewey (2005): Hydrogeologie	
	Charbeneau, R.J. (2000): Groundwater Hydraulics and pollutant Transport	

Course L0540: Geohydraulic and S	Course L0540: Geohydraulic and Solute Transport		
Тур	Recitation Section (small)		
Hrs/wk	1		
CP	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	. Wilfried Schneider		
Language	DE		
Cycle	WiSe		
Content	See interlocking course		
Literature	See interlocking course		



Course L0541: Simulation in Group	Course L0541: Simulation in Groundwater Hydrology		
Тур	Lecture		
Hrs/wk	1		
CP	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	Prof. Wilfried Schneider		
Language	DE		
Cycle	WiSe		
Content	Basics and theoretical background of simulation models frequently used in science and practise for pumping test analysis, water movement in		
	vadose zone, solute transport in vadose zone, groundwater recharge, solute transport in groundwater		
Literature	Handbücher der verwendeten Slumationsmodelle werden bereitgestellt.		

Course L0542: Simulation in Group	course L0542: Simulation in Groundwater Hydrology		
Тур	Recitation Section (small)		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Wilfried Schneider		
Language	DE		
Cycle	WiSe		
Content	See interlocking course		
Literature	See interlocking course		



Courses						
litle		Тур	Hrs/wk	CP		
Concrete Structures (L0579)		Seminar	1	2		
Structural Concrete Members (L0577)		Lecture	2	2		
Structural Concrete Members (L0578)		Recitation Section (large)	2	2		
Module Responsible	Prof. Günter Rombach					
Admission Requirements	none					
Recommended Previous	Basics of structural analysis, conception and	dimensioning of structural concrete				
Knowledge	Modules 'Concrete Structures I and II'					
Educational Objectives	After taking part successfully, students have reached the following learning results					
Professional Competence						
Knowledge	Knowledge The students broaden their skills in structural engineering, especially in the field of buildings (houses, roofs, halls). They dispose of					
for the conception and design of concrete buildings and structural members that are often used						
01.77						
Skills	s The students are able to apply procedures of the conception and dimensioning to to practical problems of structural engineering. They are capable					
	to draft concrete buildings and to design them for general action effects and to plan their detailing and execution. Moreover, they can make design					
	and construction sketches and draw up technical descriptions.					
Personal Competence						
Social Competence	The students are able to obtain results of hig	h quality in teamwork.				
Autonomy	The students are able to carry out complex c	onception and dimensioning tasks of structures under	the guidance of tutors.			
Workload in Hours	Independent Study Time 110, Study Time in	Lecture 70				
Credit points	6					
Examination	Written exam					
Examination duration and scale	120 minutes					
Assignment for the Following	Civil Engineering: Specialisation Structural E	ingineering: Compulsory				
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory					
	Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory					
	International Management and Engineering: Specialisation II. Civil Engineering: Elective Compulsory					

Course L0579: Concrete Structures		
Тур	Seminar	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	With help of a project teamwork the subjects of the course "Concrete Structures" is practiced, discussed and presented.	
Literature	- Projektbezogene Unterlagen werden abgegeben.	



Course L0577: Structural Concrete Members		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	 An introduction to structural concrete buildings is given and typical structural members are treated in detail. Subjects are: concrete buildings - basics buildings, roofs, halls - an overview actions on buildings bracing systems reinforced and prestressed members slab (line and point supported plates and floor slabs) membranes and deep beams shells and folded plates 	
Literature	- Vorlesungsunterlagen	

Course L0578: Structural Concrete Members	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Module M0722: Computat	ional Analysis of Concrete Structures			
Courses				
Title		Тур	Hrs/wk	СР
Computational Analysis of Concrete Stru	uctures (L0598)	Lecture	2	2
Computational Analysis of Concrete Stru		Recitation Section (large)	2	2
FE-Modeling of Concrete Structures (LC		Problem-based Learning	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	none			
Recommended Previous	Basic knowledge in structural analysis and design of	of reinforced concrete structures (beams, slabs, she	ar walls).	
Knowledge	Lectures 'Concrete Structures i und II'			
	Lectures 'Structural Analysis I and II'			
	Lecture 'Concrete Structures'			
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
Knowledge	The students know the problems of numerical modeling and design of an arbitrary concrete structure.			
Skills	The students can model and design an arbitrary concrete structure by means of a finite element software package.			
Personal Competence				
Social Competence				
Autonomy	The students can model and design a real concrete structure based on a finite element software package and discuss the problems and results			
	with other students.			
Workload in Hours	Independent Study Time 96, Study Time in Lecture	84		
Credit points	6			
Examination	Project			
Examination duration and scale	Oral exam (15-30 minutes per student) and project	work (FE calculation)		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	ineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineeri	ng: Elective Compulsory		

Course L0598: Computational Ana		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Literature	 Modeling of beam and truss structures Discontinuity regions, like frame corners, openings, shear walls with large openings Bracing of high-rise buildings Modeling of bridges Nonlinear analysis Finite-Elemente-analysis of slabs: support conditions, singularity regions Finite-Elemente-Berechnungen of shear walls and deep beams: support condition, design Coupled systems Modeling of slab supported on beams Shell structures 3D building models Nonlinear analysis of slabs and shells Documentation 	
Literature	 Vorlesungsumdruck Rombach, G.A. (2007): Anwendung der Finite-Elemente-Methode im Betonbau. 2. Auflage, Verlag Ernst & Sohn, Berlin Rombach G.A. (2011): Finite-Element Design of Concrete Structures, 2nd edition, ICE publishing Hartmann, F., Katz, C. (2002): Statik mit finiten Elementen. Springer, Berlin 	



Course L0599: Computational Analysis of Concrete Structures		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L0600: FE-Modeling of Cor	ncrete Structures
Тур	Problem-based Learning
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	WiSe
Content	Finite Element Modeling and computational design of concrete structures by 'SOFISTIK'
Literature	 Rombach G.: Anwendung der Finite – Elemente – Methode im Betonbau. 2. Auflage. Verlag Ernst & Sohn, Berlin, 2007 Rombach G.: Finite-Element Design of Concrete Structures. 2nd edition, ICE Publishing, London, 2011, ISBN 0 7277 32749 Rombach G.: EDV-unterstützte Berechnungen im Stahlbetonbau. in: "Stahlbetonbau aktuell 2014" (ed. Gorris A., Hegger J., Mark P.), Berlin 2014 (S. C1C.36)



Module M0801: Water Res	ources and -Supply			
Courses				
Title		Тур	Hrs/wk	СР
Chemistry of Drinking Water Treatment	(L0311)	Lecture	2	1
Chemistry of Drinking Water Treatment	(L0312)	Recitation Section (large)	1	2
Water Resource Management (L0402)		Lecture	2	2
Water Resource Management (L0403)		Recitation Section (small)	1	1
Module Responsible	Prof. Mathias Ernst			
Admission Requirements	None			
Recommended Previous	Knowledge of water management and the key processes	s involved in water treatment.		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge	Students will be able to outline key areas of conflict in w	rater management, as well as their mutual de	ependence for sustain	able water supply. T
-	will understand relevant economic, environmental and			
	water companies. They will be able to explain the availa		-	
Skills	Students will be able to assess complex problems in driv		-	-
	measures. They will be able to assess the evaluation me		-	chemical calculations
	selected treatment processes and apply generally accept	oted technical rules and standards to these p	rocesses.	
Personal Competence				
Social Competence	Working in a diverse group of specialists, students will b	be able to develop and document complex s	olutions for the manag	gement and treatmer
	drinking water. They will be able to take an appropriate	professional position, for example representi	ng user interests. The	y will be able to deve
	joint solutions in teams of diverse experts and present th	ese solutions to others.	-	
Autonomy	Students will be in a position to work on a subject independently and present on this subject.			
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Examination	Written exam			
Examination duration and scale	60 min (chemistry) + presentation			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineer	ring: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: E	Elective Compulsory		
	Energy and Environmental Engineering: Specialisation I	Energy and Environmental Engineering: Elec	ctive Compulsory	
	International Management and Engineering: Specialisat	ion II. Energy and Environmental Engineerin	g: Elective Compulso	ry
	Water and Environmental Engineering: Specialisation W			-
	Water and Environmental Engineering: Specialisation E			
	Water and Environmental Engineering: Specialisation C			

Course L0311: Chemistry of Drink	ing Water Treatment
Тур	Lecture
Hrs/wk	2
CP	1
Workload in Hours	Independent Study Time 2, Study Time in Lecture 28
Lecturer	Dr. Klaus Johannsen
Language	DE
Cycle	WiSe
Content	The topic of this course is water chemistry with respect to drinking water treatment and water distribution
	Major topics are solubility of gases, carbonic acid system and calcium carbonate, blending, softening, redox processes, materials and legal requirements on drinking water treatment. Focus is put on generally accepted rules of technology (DVGW- and DIN-standards). Special emphasis is put on calculations using realistic analysis data (e.g. calculation of pH or calcium carbonate dissolution potential) in exercises. Students can get a feedback and gain extra points for exam by solving problems for homework. Knowledge of drinking water treatment processes is vital for this lecture. Therefore the most important processes are explained coordinated with the course "Water resources management" in the beginning of the semester.
Literature	 MHW (rev. by Crittenden, J. et al.): Water treatment principles and design. John Wiley & Sons, Hoboken, 2005. Stumm, W., Morgan, J.J.: Aquatic chemistry. John Wiley & Sons, New York, 1996. DVGW (Hrsg.): Wasseraufbereitung - Grundlagen und Verfahren. Oldenbourg Industrie Verlag, München, 2004. Jensen, J. N.: A Problem Solving Approach to Aquatic Chemistry. John Wiley & Sons, Inc., New York, 2003.



Course L0312: Chemistry of Drink	ourse L0312: Chemistry of Drinking Water Treatment		
Тур	Recitation Section (large)		
Hrs/wk	1		
CP	2		
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14		
Lecturer	Dr. Klaus Johannsen		
Language	DE		
Cycle	WiSe		
Content	See interlocking course		
Literature	See interlocking course		

Course L0402: Water Resource M	anagement
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Mathias Ernst
Language	DE
Cycle	WiSe
Content	The lecture provides comprehensive knowledge on interaction of water ressource management and drinking water supply. Content overview: Current situation of global water resources
	 User and Stakeholder conflicts Wasserressourcenmanagement in urbane Gebieten Rechtliche Aspekte, Organisationsformen Trinkwasserversorgungsunternehmen. Ökobilanzierung, Benchmarking in der Wasserversorgung
Literature	 Aktuelle UN World Water Development Reports Branchenbild der deutschen Wasserwirtschaft, VKU (2011) Aktuelle Artikel wissenschaftlicher Zeitschriften Ppt der Vorlesung

Course L0403: Water Resource Management	
Тур	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Mathias Ernst
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



	Τνρ	Hrs/wk	СР
3)	Problem-based Learning	4	6
Prof. Carsten Gertz			
some knowledge of transport planning, e.g. through taking th	e undergraduate class "Transport Plannin	g and Traffic Engine	erin
After taking part successfully, students have reached the follo	wing learning results		
Students are able to:			
 relate current issues in the area of integrated transport 	t planning and formulate an opinion on th	em.	
Chudente ere oble te:			
• quantify important parameters, which influence travel	demand or are influenced by it.		
 comprehensively examine a pre-defined or self-sel 	ected topic from a transportation studies	s perspective and o	locument the results
accordance with scientific conventions.			
Students are able to:			
 provide feedback on topical contents and their teaching 	19		
	.9.		
h			
Students are able to:			
 independently plan working on a pre-defined project 	opic, acquire the necessary knowledge a	nd use appropriate i	neans for its executio
Written elaboration			
	1 ,		
Water and Environmental Engineering: Specialisation Enviro	nment: Elective Compulsory		
	After taking part successfully, students have reached the follo Students are able to: • describe interdependencies between land-use/location • explain and evaluate the social, ecological and econon • relate current issues in the area of integrated transport Students are able to: • quantify important parameters, which influence travel • comprehensively examine a pre-defined or self-self- accordance with scientific conventions. Students are able to: • provide feedback on topical contents and their teaching • constructively handle feedback on their own work. • produce results in group work and document these. Students are able to: • assess potential consequences of their future profess • independently plan working on a pre-defined project to Independent Study Time 124, Study Time in Lecture 56 6 Written elaboration Civil Engineering: Specialisation Structural Engineering: Election Civil Engineering: Specialisation Coastal Engineering: Election Civil Engineering: Specialisat	Prof. Carsten Gertz None some knowledge of transport planning, e.g. through taking the undergraduate class "Transport Plannin Alter taking part successfully, students have reached the following learning results Students are able to: describe interdependencies between land-use/location choice and transportation/mobility beha explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological and economic effects of transport and land-use phate explain and evaluate the social, ecological end transport planning and formulate an opinion on th Students are able to: Export carse of the scientific conventions. Students are able to: assess potential consequences of their future professional activities bited feedback on topical contents and their traching. bited feedback on topical contents and their traching. bited fieldback on their own work. bited fieldback on a pre-defined project topic, acquire the necessary knowledge a bited phate to: bited fieldback on their own explained field f	B) Problem-based Learning 4 Prof. Carsten Gertz None Some knowledge of transport planning, e.g. through taking the undergraduate class "Transport Planning and Traffic Engine After taking part successfully, students have reached the following learning results Students are able to: • • • describe interdependencies between land-use/location choice and transportation/mobility behaviour • • explain and evaluate the social, ecological and economic effects of transport and land-use policy measures. • • relate current issues in the area of integrated transport planning and formulate an opinion on them. Students are able to: • quantify important parameters, which influence travel demand or are influenced by it. • • comprehensively examine a pre-defined or self-selected topic from a transportation studies perspective and or accordance with scientific conventions. Students are able to: • provide feedback on topical contents and their teaching. • constructively handle feedback on their own work. • produce results in group work and document these. Students are able to: • • assess potential consequences of their future professional activities • independent study Time 124, Study Time in Lecture 56 •



Course L1068: Integrated Transpo	ortation Planning
Тур	Problem-based Learning
Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Carsten Gertz, Dr. Philine Gaffron
Language	DE
Cycle	WiSe
Content	 interactions between transport and the environment and consequent limitations characteristics of integrated planning complex planning processes interdependencies of location choice and mobility behaviour transport and land-use policies project on current issues in transportation studies
Literature	Kutter, Eckhard (2005) Entwicklung innovativer Verkehrsstrategien für die mobile Gesellschaft. Erich Schmidt Verlag. Berlin. Bracher, Tilman u. a. (Hrsg.) (68. Ergänzung 2013) Handbuch der kommunalen Verkehrsplanung. Herbert Wichmann Verlag. Berlin, Offenbach. (Loseblattsammlung mit kontinuierlichen Ergänzungen)



Module M0963: Steel and	Composite Structures			
Courses				
Title		Тур	Hrs/wk	CP
Steel and Composite Structures (L1204))	Lecture	2	2
Steel and Composite Structures (L1205))	Recitation Section (large)	2	2
Steel Bridges (L1097)		Lecture	2	2
Module Responsible	Dr. Jürgen Priebe			
Admission Requirements	none			
Recommended Previous	Basics of steel construction (i.e. Steel Structures I and II, BUBC)			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following lear	ning results		
Professional Competence				
Knowledge	After successful completition, students can			
	 describe the phenomenon of local buckling 			
	explain warping torsion			
	illustrate the behaviour of composite structures			
	specify the principles in design of composite sttructures			
	 sketch the contructions of steel and composite bridges 			
Skills	After successful participation students are able to			
	 check stiffened and unstiffened plated structures 			
	 recognize and verify warping tosion in strucures 			
	design composite structures			
	 design bridges and o perform the detailing 			
Baraanal Competence				
Personal Competence Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points				
Examination	Written exam			
Examination duration and scale	180 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective C	Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective Compu			
	International Management and Engineering: Specialisation II. Civil Eng			

Course L1204: Steel and Composi	te Structures
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Jürgen Priebe
Language	DE
Cycle	WiSe
Content	 Local-buckling of plated structures Warping torsion Composite-girders, -columns, -slabs, -bridges Principles in composite constructions Bridge-design and -construction
Literature	Petersen, C.: Stahlbau, 4.Auflage 2013, Springer-Vieweg Verlag Minnert, J. Wagenknecht, G.: Verbundbau-Praxis - Berechnung und Konstruktion nach Eurocode 4, 2.Auflage 2013, Bauwerk Beuth Verlag

Course L1205: Steel and Composite Structures	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Jürgen Priebe
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Course L1097: Steel Bridges	
Тур	Lecture
Hrs/wk	
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Jörg Ahlgrimm
Language	DE
Cycle	
Content	Lecture Contents ,Steel Bridge Construction' DrIng. Jörg Ahlgrimm
	- From tendering and contracting to completion - the development of a steel bridge
	- Contents of a bridge static - structural details, examples of analysis in detail:
	-> effective width in regard to the longitudinal stiffeners
	-> Bearing point, bearing stiffener
	-> Crossbeam breakthrough, crossbeam reinforcement
	-> Analysis of the Rib-to-Floorbeam (RF) connection (web-tooth of the floorbeam between trapezoidal shaped Ribs)
	- Steel grades, -designation, testing methods and approval certificates
	- Nondestructive weld inspecting
	- Corrosion protection
	- Bridge bearing - types, format, function, dimensioning, installation
	- Expansion Joints
	- Oscillation of bridge hangers and cables - oscillation damper
	- Opening bridges- Detailed reviews to different assembling procedures and - implements
	- Selective damage events
	Requirements: Basic knowledge in the calculation, dimensioning, and construction of structural elements and joints of constructional steelwork
Literature	
	 Herbert Schmidt, Ulrich Schulte, Rainer Zwätz, Lothar Bär: Ausführung von Stahlbauten Petersen, Christian: Stahlbau, Abschnitt Brückenbau
	Ahlgrimm, J., Lohrer, I.: Erneuerung der Eisenbahnüberführung in Fulda-Horas über die Fulda, Stahlbau 74 (2005), Heft 2, S. 114



Courses				
ïtle		Тур	Hrs/wk	CP
Module Responsibl	e Dozenten des SD B			
Admission Requirement	s none			
Recommended Previou	s Subjects of the Foundation Engineering specialisation.			
Knowledg	e			
Educational Objective	s After taking part successfully, students have reached the following learning	g results		
Professional Competenc	e			
Knowledg	The students are able to demonstrate their detailed knowledge in the field	eld of geotechnical and founda	tion engineering. T	hey can exemplify th
	state of technology and application and discuss critically in the context of	actual problems and general co	nditions of science	and society.
	The students can develop solving strategies and approaches for fundame	ental and practical problems in a	neotechnical and fo	undation engineerin
	They may apply theory based procedures and integrate safety-related, ec			Ū.
		ological, ethical, and economic	fiew points of soler	loc and society.
	Scientific work techniques that are used can be described and critically re	viewed.		
Skil	Is The students are able to independently select methods for the project work and to justify this choice. They can explain how these method		nese methods relate	
	the field of work and how the context of application has to be adjusted. Get	neral findings and further devel	opments may esse	ntially be outlined.
Personal Competenc	e			
Social Competenc		e project work, the work steps a	and the sub-probler	ns for the presentation
,	and discussion in front of a bigger group. They can lead the discussion ar			
Autonom	y The students are capable of independently planning and documenting the work steps and procedures while considering the given deadlines. The			
	includes the ability to accurately procure the newest scientific information		feedback from exp	erts with regard to tr
	progress of the work, and to accomplish results on the state of the art in so	ence and technology.		
Workload in Hour	s Independent Study Time 180, Study Time in Lecture 0			
Credit point	s 6			
Examinatio	n Project (accord. to Subject Specific Regulations)			
Examination duration and scal	e see FSPO			
Assignment for the Followin	g Civil Engineering: Specialisation Geotechnical Engineering: Compulsory			
Curricul				

Workload in Hours

Examination Form

Lecturer Language

Cycle

Content Literature

Examination duration and scale

Independent Study Time 32, Study Time in Lecture 28

Mündliche Prüfung

NN

DE

WiSe



Courses				
Title		Тур	Hrs/wk	CP
Design of Concrete Strucutures (L1840)		Lecture	2	2
Design of Prefabricated Concrete Struct		Lecture	1	1
Design of Prefabricated Concrete Struct		Recitation Section (large)	1	1
Forum I - Geotechnics and Construction	,	Seminar Seminar	1	1
Forum II - Geotechnics and Constructio Hydraulic applications of geosynthetics		Lecture	1	2
Timber Structures (L1151)	20380)	Seminar	2	2
Glass Structures (L1152)		Lecture	2	2
Glass Structures (L1447)		Recitation Section (large)	1	1
Module Responsible	NN			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
Knowledge				
	Students are able to find their way through selected special areas within civil and structural engineering.			
	• Students are able to explain basic models and procedures in selected special areas of civil and structural engineering.			ing.
	Students are able to interrelate scientific and technical knowledge.			
Skills	Students are able to apply basic methods in selected areas of civil and structural angingaring			
	 Students are able to apply basic methods in selected areas of civil and structural engineering. 			
Personal Competence				
Social Competence				
Autonomy				
hatohomy	Students can chose independently, in which fields they want to deepen their knowledge and skills through the election of courses.			
Wentless die Useens	Describer a desire of assures			
Workload in Hours	Depends on choice of courses			
Credit points	6			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: E			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering			
	Civil Engineering: Specialisation Coastal Engineering: Ele	ctive Compulsory		
Course L1840: Design of Concrete	Strucutures			
Тур	Lecture			
Hrs/wk	2			
CP	2			



Тур	Lecture
Hrs/wk	
CP	1
	Independent Study Time 16, Study Time in Lecture 14
Examination Form	
Examination duration and scale	
	Prof. Günter Rombach
Language	
Cycle	WiSe
Content	 application and advantages and disadvantages of precast concrete structures
	 basics of design - precast element production - construction - tolerances
	elements of a warehouse
	 design of a beam - joints
	design of D-regions: half joints, corbels, openings
	 slab types - walls - facades
	footings: pocket and block foundations
	joints - connections
	shear design of the interface between concrete cast at different times
	unreinforced concrete structures
Literature	Bachmann H., Steinle A.; Hahn V.: Bauen mit Betonfertigteilen. Betonkalender 2009, Teil I, Verlag Ernst & Sohn, Berlin
	 Bacimannin, Steine A., Hannin, Baternini betornentgienen. Betorikalender 2009, Hein, Verlag Ernst & Sonn, Bennin Bindseil P.: Stahlbetonfertigteile. Werner Verlag, 1998
	 FIP: FIP Handbuch f ür Planung und Entwerfen von Fertigteilbauten (siehe Zeitschrift: Beton- und Fertigteiltechnik ab 3/1996)
	 Bergmeister K.: Konstruieren von Fertigteilen. Betonkalender 2005 Teil 2, S. 163-240
	 Reineck KH.: Modellierung der D-Bereiche von Fertigteilen. Betonkalender 2005 Teil 2, S. 241-296
	 Graubner CA. et. al.: Bemessung von Fertigteilen nach DIN 1045-1. Betonkalender 2005 Teil 2, S. 297-374
	Broschüren der Fachvereinigung Deutscher Betonfertigteilbau e.V.
	siehe: www.fdb-fertigteilbau.de
	www.systembauweise.de

Course L0597: Design of Prefabrie	cated Concrete Structures
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Klausur
Examination duration and scale	Siehe korrespondierende Vorlesung
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1634: Forum I - Geotechr	Course L1634: Forum I - Geotechnics and Construction Management	
Тур	Seminar	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Examination Form	Mündliche Prüfung	
Examination duration and scale	30 min	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	WiSe	
Content	Lectures about projects and issues with practical and scientific relevance.	
Literature		



Course L1635: Forum II - Geotechnics and Construction Management

Тур	Seminar
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Mündliche Prüfung
Examination duration and scale	30 min
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	SoSe
Content	Lectures about projects and issues with practical and scientific relevance.
Literature	

Course L0380: Hydraulic applications of geosynthetics		
Тур	Lecture	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Examination Form	Klausur	
Examination duration and scale	30 min	
Lecturer	Dr. Michael Heibaum	
Language	DE	
Cycle	SoSe	
Content	In the earthworks many geotechnical structures have to be realized with the help of geosynthetics nowadays. In particular, they are used in areas where the interaction between water and soil occur to seal. protect, separate, filter, pack or drain. Depending on the construction task geosynthetics are used with specifically chosen properties which are verified by special tests. In lecture materials, areas, construction methods and testing methodes will be taught.	
Literature	 Vorlesungsbegleitende Unterlagen, s. www.tuhh.de/gbt Monographien: Karl Josef Witt, Hrsg. (2009): Grundbau-Taschenbuch Teil 2, 7. Auflage;: Geotechnische Verfahren; Abschnitt 2.12 Geokunststoffe in der Geotechnik und im Wasserbau S.737-834, Berlin: Ernst&Sohn Robert M. Koerner (2012): Designing with geosynthetics 6th Ed. Vol. 1+2; Bloomington: Xlibris Sanjay Kumar Shukla, Ed. (2005): Handbook of Geosynthetic Engineering, Geosynthetics and their appli-cations, 2nd Ed.; London: ICE Publishing Zeitschriften: Official Journal of the INTERNATIONAL GEOSYNTHETICS SOCIETY Geotextiles and Geomembranes, Elsevier, Amsterdam Geosynthetics International (nur online), Thomas Telford Ltd, London 	

Course L1151: Timber Structures	
Тур	Seminar
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Kolloquium
Examination duration and scale	90 min
Lecturer	Prof. Torsten Faber
Language	DE
Cycle	WiSe
Content	
Literature	



Course L1152: Glass Structures	
Hrs/wk	
CP	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Klausur
Examination duration and scale	60 min
Lecturer	Marvin Matzik
Language	DE
Cycle	WiSe
Content	Glass structures
	- Introduction of the material glass (production, refinement, material characteristic)
	- design of facades
	- facade types
	- static calculation of glazing
	- static calculation of facades
	- load bearing behavior of glazing (plate or membrane stiffness)
	- vertical / horizontal glazing with safety-related requirements
	- glass structures
	- fire safety of glass facades
	- construction physics of facades and glazing
Literature	

Course L1447: Glass Structures	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Klausur
Examination duration and scale	60 min
Lecturer	Marvin Matzik
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Module M0997: Structural	Analysis - Selected Topics			
•				
Courses				
Title		Тур	Hrs/wk	CP
Plates and Shells (L1199)		Lecture	2	2
Nonlinear Analysis of Frame Structure (Lecture	2	2
Nonlinear Analysis of Frame Structure (Recitation Section (large)	2	2
Module Responsible	Prof. Uwe Starossek			
Admission Requirements				
	Mechanics I/II, Mathematics I/II, Differential Equ	ations I		
Knowledge				
		ale al the following loopsing you ute		
-	After taking part successfully, students have reached the following learning results			
Professional Competence Knowledge		lents can explain selected elements of higher structura		
Skills		ne students are able to assess the premises and th use these methods for performing structural analyses.	e applicability of the	e presented methods of
Personal Competence				
Social Competence				
Autonomy	The students have the opportunity to voluntarily	v and independently work homework problems.		
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Eng	jineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engir	neering: Elective Compulsory		



Course L1199: Plates and Shells			
Тур	Lecture		
Hrs/wk	2		
	2		
Workload in Hours	dependent Study Time 32, Study Time in Lecture 28		
Lecturer	Dr. Marco Schürg		
Language	DE		
Cycle	WiSe		
Content	Theory of plates loaded in-plane		
	Governing equations (equilibrium, kinematics, constitutive law)		
	Differential equation		
	Airy stress function		
	Plane stress / plane strain		
	Structural behaviour of plates loaded in-plane		
	Theory of plates in bending		
	Governing equations (equilibrium, kinematics, constitutive law)		
	Differential equation		
	Navier solution / Fourier series expansion		
	Approximation procedures		
	Structural behaviour of plates in bending		
	Shell theory		
	Phenomenona of the structural behaviour of shells		
	Membrane and bending theory		
	Equilibrium equations of shells of revolution		
	Stress resultants and deformations of the spherical shell, the half spherical shell, and the cylindrical shell		
	Stability problems (overview)		
	Plate buckling		
	Shell buckling		
	g		
Literature			
	Basar, Y.: Krätzig, W.B. (1985): Mechanik der Flächentragwerke. Vieweg-Verlag, Braunschweig, Wiesbaden		
	Girkmann, K. (1963): Flächentragwerke, Springer Verlag, Wien, 1963, unveränderter Nachdruck 1986		
	Zienkiewicz, O.C. (1977): The Finite Element Method in Enginieering Science. McGraw-Hill, London		

Course L1200: Nonlinear Analysis	of Frame Structure
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Uwe Starossek
Language	DE
Cycle	WiSe
Content	-Types of nonlinearity
	-relevance of nonlinear effects on structural analysis
	-comparison and classification of 1 st order theory, 2 nd order theory and 3 rd order theory with regard to the coverage of geometric nonlinearity
	-fundamentals of 2 nd order elasticity theory for frame structures
	-application of 2 nd order elasticity theory using finite elements: common displacement method
	-fundamentals of analytical application of 2 nd order elasticity theory: derivation and solution of differential equation
	-structurally applied methods of analytical application of 2 nd order elasticity theory: common displacement method using analytical stiffness matrix, slope-deflection method for sway and non-sway frame structures, consideration of imperfections
	1 st order plastic hinge theory
Literature	Rothert, H.; Gensichen, V. (1987): Nichtlineare Stabstatik. Springer Verlag, Berlin



Course L1201: Nonlinear Analysis of Frame Structure		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Uwe Starossek	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Specialization Structural Engineering

Module M0699: Advanced Foundation Engineering and Soil Laboratory Course

Courses				
Title		Тур	Hrs/wk	CP
Soil Laboratory Course (L0499)		Laboratory Course	1	2
Advanced Foundation Engineering (L04	,	Lecture	2	2
Advanced Foundation Engineering (L04	98)	Recitation Section (large)	1	2
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements				
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reached the fol	lowing learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Written exam			
Examination duration and scale	60 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Co	ompulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	: Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Con	npulsory		
	International Management and Engineering: Specialisation	II. Civil Engineering: Elective Compulsory		

Course L0499: Soil Laboratory Course		
Тур	Laboratory Course	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	WiSe	
Content	 Field experiments Short lecture on laboratory tests soil analysis laboratory test soil clasification Creating a ground and foundation report 	
Literature	DIN-Taschenbuch 113, Erkundung und Untersuchung des Baugrundes	



Course L0497: Advanced Foundat	Course L0497: Advanced Foundation Engineering		
Тур	cture		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Jürgen Grabe		
Language	DE		
Cycle	WiSe		
Content	 Vertical drains Piles Ground improvement (Deep Compaction, Soil mixing) Vibration driving Jet grouting Slurry wall Deep excavation 		
Literature	 EAK (2002): Empfehlungen für Küstenschutzbauwerke EAU (2004): Empfehlungen des Arbeitsausschusses Uferbauwerke EAB (1988): Empfehlungen des Arbeitskreises Baugruben Grundbau-Taschenbuch, Teil 1-3, (1997), Ernst & Sohn Verlag 		

Course L0498: Advanced Foundat	Course L0498: Advanced Foundation Engineering	
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Module M0713: Concrete	Structures			
Courses				
Title		Тур	Hrs/wk	CP
Concrete Structures (L0579)		Seminar	1	2
Structural Concrete Members (L0577)		Lecture	2	2
Structural Concrete Members (L0578)		Recitation Section (large)	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	none			
Recommended Previous	Basics of structural analysis, conception and dir	nensioning of structural concrete		
Knowledge				
Educational Objectives	After taking part successfully, students have rea	ched the following learning results		
Professional Competence				
Knowledge	The students broaden their skills in structural engineering, especially in the field of buildings (houses, roofs, halls). They dispose of the knowledge			
	for the conception and design of concrete buildings and structural members that are often used.			
Skills		e conception and dimensioning to to practical proble		• • •
	to draft concrete buildings and to design them for general action effects and to plan their detailing and execution. Moreover, they can make de			er, they can make desi
	and construction sketches and draw up technica	al descriptions.		
Personal Competence				
Social Competence	The students are able to obtain results of high q	uality in teamwork.		
	0			
Autonomy	The students are able to carry out complex cond	ception and dimensioning tasks of structures under the	ne guidance of tutors.	
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical I	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engin	eering: Elective Compulsory		
	International Management and Engineering: Sp	ecialisation II. Civil Engineering: Elective Compulso	rv	

Course L0579: Concrete Structures		
Тур	Seminar	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	With help of a project teamwork the subjects of the course "Concrete Structures" is practiced, discussed and presented.	
Literature	- Projektbezogene Unterlagen werden abgegeben.	

Course L0577: Structural Concret	Course L0577: Structural Concrete Members		
Тур	cture		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Günter Rombach		
Language	DE		
Cycle	WiSe		
Content	 An introduction to structural concrete buildings is given and typical structural members are treated in detail. Subjects are: concrete buildings - basics buildings, roofs, halls - an overview actions on buildings bracing systems reinforced and prestressed members slab (line and point supported plates and floor slabs) membranes and deep beams shells and folded plates 		
Literature	- Vorlesungsunterlagen		



course L0578: Structural Concrete Members	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Module M0963: Steel and	Composite Structures			
Courses				
Title		Тур	Hrs/wk	СР
Steel and Composite Structures (L1204)		Lecture	2	2
Steel and Composite Structures (L1205)		Recitation Section (large)	2	2
Steel Bridges (L1097)		Lecture	2	2
Module Responsible	Dr. Jürgen Priebe			
Admission Requirements	none			
Recommended Previous	Basics of steel construction (i.e. Steel Structures I and II, BUBC)			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following learn	ing results		
Professional Competence				
Knowledge	After successful completition, students can			
	describe the phenomenon of local buckling			
	explain warping torsion			
	illustrate the behaviour of composite structures			
	specify the principles in design of composite structures			
	 sketch the contructions of steel and composite bridges 			
Skills	After successful participation students are able to			
	 check stiffened and unstiffened plated structures 			
	 recognize and verify warping tosion in strucures 			
	 design composite structures 			
	design bridges and o perform the detailing			
Demonstration of the second second				
Personal Competence				
Social Competence Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
	6			
Examination	Written exam			
Examination duration and scale	180 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective Co	ompulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective Comput			
	International Management and Engineering: Specialisation II. Civil Engi			
	international Management and Englieening. Specialisation II. CIVII Engl	neering. Liective Compulsory		

Course L1204: Steel and Composite Structures		
Тур	ecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dr. Jürgen Priebe	
Language	DE	
Cycle	WiSe	
Content	 Local-buckling of plated structures Warping torsion Composite-girders, -columns, -slabs, -bridges Principles in composite constructions Bridge-design and -construction 	
Literature	Petersen, C.: Stahlbau, 4.Auflage 2013, Springer-Vieweg Verlag Minnert, J. Wagenknecht, G.: Verbundbau-Praxis - Berechnung und Konstruktion nach Eurocode 4, 2.Auflage 2013, Bauwerk Beuth Verlag	

ourse L1205: Steel and Composite Structures	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Jürgen Priebe
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Course L1097: Steel Bridges		
Тур	Lecture	
Hrs/wk		
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dr. Jörg Ahlgrimm	
Language	DE	
Cycle		
Content	Lecture Contents ,Steel Bridge Construction' DrIng. Jörg Ahlgrimm	
	- From tendering and contracting to completion - the development of a steel bridge	
	- Contents of a bridge static - structural details, examples of analysis in detail:	
	-> effective width in regard to the longitudinal stiffeners	
	-> Bearing point, bearing stiffener	
	-> Crossbeam breakthrough, crossbeam reinforcement	
	-> Analysis of the Rib-to-Floorbeam (RF) connection (web-tooth of the floorbeam between trapezoidal shaped Ribs)	
	- Steel grades, -designation, testing methods and approval certificates	
	- Nondestructive weld inspecting	
	- Corrosion protection	
	- Bridge bearing - types, format, function, dimensioning, installation	
	- Expansion Joints	
	- Oscillation of bridge hangers and cables - oscillation damper	
	- Opening bridges- Detailed reviews to different assembling procedures and - implements	
	- Selective damage events	
	Requirements: Basic knowledge in the calculation, dimensioning, and construction of structural elements and joints of constructional steelwork	
Literature		
	 Herbert Schmidt, Ulrich Schulte, Rainer Zwätz, Lothar Bär: Ausführung von Stahlbauten Petersen, Christian: Stahlbau, Abschnitt Brückenbau 	
	• Ahlgrimm, J., Lohrer, I.: Erneuerung der Eisenbahnüberführung in Fulda-Horas über die Fulda, Stahlbau 74 (2005), Heft 2, S. 114	



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Courses				
Title		Тур	Hrs/wk	CP
Renewable Energy Projects in Emerged Hydro Power Use (L0013)	Markets (LUU14)	Project Seminar Lecture	1	1
Wind Turbine Plants (L0013)		Lecture	2	3
Wind Energy Use - Focus Offshore (L0	012)	Lecture	1	1
Module Responsible	Dr. Joachim Gerth			
Admission Requirements	none			
Recommended Previous	Thermodynamics, Fluid Mechanics, Fundamen	ntals of Fluid Flow Engines		
Knowledge		C C		
Educational Objectives	After taking part successfully, students have rea	ached the following learning results		
Professional Competence				
Knowledge	By onding this modulo students can explain in	detail knowledge of wind turbines with a particular	focus of wind operay u	so in offeboro conditio
Knowledge				
		sideration of current developments. Furthermore, th		
	water power to generate electricity. The studer	nts reproduce and explain the basic procedure in the	ne implementation of re	newable energy proje
	in countries outside Europe.			
Skills	Students are able to apply the acquired theory	etical foundations on exemplary water or wind pow	er systems and evaluat	e and assess technica
	the resulting relationships in the context of d	limensioning and operation of these energy syste	ms. They can in comp	are critically the spec
	procedure for the implementation of renewable	e energy projects in countries outside Europe with	the in principle applied	approach in Europe a
	can apply this procedure on exemplary theoret	tical projects.		
Personal Competence				
Social Competence	Students can discuss scientific tasks subjet-sp	ecificly and multidisciplinary within a seminar.		
Autonomy	Chudente con independently cynleit courses in	the context of the events of the least we material t	a alaay tha aantanta of t	
Autonomy		the context of the emphasis of the lecture material t	o clear the contents of th	ne recture and to acqu
	the particular knowledge about the subject area	a.		
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	3 hours written exam			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engin	neering: Elective Compulsory		
	Energy and Environmental Engineering: Speci	alisation Energy Engineering: Elective Compulsory		
		pecialisation II. Renewable Energy: Elective Compu	Ilsorv	
		pecialisation II. Energy and Environmental Enginee	•	20
			•	i y
		on: Specialisation Product Development: Elective Co	mpulsory	
		on: Specialisation Production: Elective Compulsory		
	Product Development, Materials and Productio	on: Specialisation Materials: Elective Compulsory		
	Renewable Energies: Core qualification: Comp	pulsory		
	Water and Environmental Engineering: Special	lisation Environment: Compulsory		



Course L0014: Renewable Energy	Projects in Emerged Markets
Тур	
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Andreas Wiese
Language	
Cycle	
Content	
Content	1. Introduction
	 Development of renewable energies worldwide
	 History
	Future markets
	Special challenges in new markets - Overview
	2. Sample project wind farm Korea
	• Survey
	Technical Description
	Project phases and characteristics
	3. Funding and financing instruments for EE projects in new markets
	Overview funding opportunitie
	Overview countries with feed-in laws
	Major funding programs
	4. CDM projects - why, how , examples
	Overview CDM process
	• Examples
	• Exercise CDM
	5. Rural electrification and hybrid systems - an important future market for EE
	Rural Electrification - Introduction
	 Types of Elektrizifierungsprojekten
	 The role of the EEInterpretation of hybrid systems
	 Project example: hybrid system Galapagos Islands
	6. Tendering process for EE projects - examples
	 South Africa
	• Brazil
	7. Selected projects from the perspective of a development bank - Wesley Urena Vargas, KfW Development Bank
	• Geothermal
	• Wind or CSP
1 (A	Felian day Valanuar
Literature	Folien der Vorlesung

Course L0013: Hydro Power Use			
Тур	Lecture		
Hrs/wk	1		
CP	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	Dr. Stephan Heimerl		
Language	DE		
Cycle	SoSe		
Content	 Introduction, importance of water power in the national and global context Physical basics: Bernoulli's equation, usable height of fall, hydrological measures, loss mechanisms, efficiencies Classification of Hydropower: Flow and Storage hydropower, low and high pressure systems Construction of hydroelectric power plants: description of the individual components and their technical system interaction Structural engineering components; representation of dams, weirs, dams, power houses, computer systems, etc. Energy Technical Components: Illustration of the different types of hydraulic machinery, generators and grid connection Hydropower and the Environment Examples from practice 		
Literature	 Schröder, W.; Euler, G.; Schneider, K.: Grundlagen des Wasserbaus; Werner, Düsseldorf, 1999, 4. Auflage Quaschning, V.: Regenerative Energiesysteme: Technologie – Berechnung - Simulation; Carl Hanser, München, 2011, 7. Auflage Giesecke, J.; Heimerl, S.; Mosony, E.: Wasserkraftanlagen Planung, Bau und Betrieb; Springer, Berlin, Heidelberg, 2009, 5. Auflage von König, F.; Jehle, C.: Bau von Wasserkraftanlagen – Praxisbezogene Planungsunterlagen; C. F. Müller, Heidelberg, 2005, 4. Auflage Strobl, T.; Zunic, F.: Wasserbau: Aktuelle Grundlagen – Neue Entwicklungen; Springer, Berlin, Heidelberg, 2006 		



Course L0011: Wind Turbine Plant	S
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dr. Rudolf Zellermann
Language	DE
Cycle	SoSe
Content	 Historical development Wind: origins, geographic and temporal distribution, locations Power coefficient, rotor thrust Aerodynamics of the rotor Operating performance Power limitation, partial load, pitch and stall control Plant selection, yield prediction, economy Excursion
Literature	Gasch, R., Windkraftanlagen, 4. Auflage, Teubner-Verlag, 2005

Course L0012: Wind Energy Use -	Focus Offshore
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Martin Skiba
Language	DE
Cycle	SoSe
Content	 Introduction, importance of offshore wind power generation, Specific requirements for offshore engineering Physical fundamentals for utilization of wind energy Design and operation of offshore wind turbines, presentation of different concepts of offshore wind turbines, representation of the individual system components and their system-technical relationships Foundation engineering, offshore site investigation, presentation of different concepts of offshore foundation structures, planning and fabrication of foundation structures Electrical infrastructure of an offshore wind farm, Inner Park cabling, offshore substation, grid connection Installation of offshore wind farms, installation techniques and auxiliary devices, construction logistics Development and planning of offshore wind farms Operation and optimization of offshore wind farms Day excursion
Literature	 Gasch, R.; Twele, J.: Windkraftanlagen – Grundlagen, Entwurf, Planung und Betrieb; Vieweg + Teubner, Stuttgart, 2007, 7. Auflage Molly, J. P.: Windenergie – Theorie, Anwendung, Messung; C. F. Müller, Heidel-berg, 1997, 3. Auflage Hau, E.: Windkraftanlagen; Springer, Berlin, Heidelberg, 2008, 4.Auflage Heier, S.: Windkraftanlagen – Systemauslegung, Integration und Regelung; Vieweg + Teubner, Stuttgart, 2009, 5. Auflage Jarass, L.; Obermair, G.M.; Voigt, W.: Windenergie: Zuverlässige Integration in die Energieversorgung; Springer, Berlin, Heidelberg, 2009, 2. Auflage



Module M0593: Building M	laterials and Building Preservation			
Courses				
Title		Тур	Hrs/wk	CP
Anchor Technology and Design, Post Installed Rebar Connections (L0257)		Recitation Section (small)	1	1
Repair of Structures (L0255)		Lecture	1	1
Mineral Building Materials (L0253)		Lecture	2	2
Technology of mineral Building Materials	; (L0256)	Recitation Section (small)	1	1
Transport Processes in Building Materia	Is and Damage Processes (L0254)	Lecture	1	1
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials, building phy	ysics and building chemistry, for example by th	ne modules Princip	les of Building Materi
Knowledge	and Building Physics and Building Materials and Building Chemistry.			
Educational Objectives	After taking part successfully, students have reached the	e following learning results		
Professional Competence				
Skills	special mineral building materials. They are able to show the characteristics of mineral building materials. They are able to describe the manufacture, properties and fields of application of special mortars and special concretes and the correlations of their material parameters. The are able to show the principles of anchor technology and design. The students are able to perform an optimization of granulometry of a mineral building material. They are able to design a special mineral mortar and to manufacture this mortar. The students are able to manufacture post installed rebar connections. They are able to recognize damages, assess possible causes, to use the fundamentals of construction preservation and to select repair and strengthening measures.			
Personal Competence Social Competence				
	a critical discussion they defend and adjust their results. The students are able to manufacture their special building material on the basis of the feedback.			
Autonomy	The students are able to responsibly use the resources of materials and lab equipment for their project and to investigate and to get missin components.			
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Enginee	ring: Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: I	Elective Compulsory		

Course L0257: Anchor Technology and Design, Post Installed Rebar Connections		
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Dr. Gernod Deckelmann	
Language	DE	
Cycle	SoSe	
Content	 Working principles of friction, keying and bonding anchors Selection of anchors Anchor design Installation of anchors Post installed rebar connections and additional german regulations 	
Literature	Vortragsfolien der Lehrveranstaltung stehen über STUD.IP zum download zur Verfügung Beton-Kalender 2012: Infrastrukturbau, Befestigungstechnik. Eurocode 2. Herausgegeben von Konrad Bergmeister, Frank Fingerloos und Johann-Dietrich Wörner; 2012 Ernst & Sohn GmbH & Co. KG. Published by Ernst & Sohn GmbH & Co. KG. DIBt: Hinweise für die Montage von Dübelverankerungen; Oktober 2010 Ratgeber Dübeltechnik, Basiswissen - Metalldübel, chemische Dübel, Kunststoffdübel; Herausgeber Hilti AG	



Course L0255: Repair of Structures		
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Frank Schmidt-Döhl, Dr. Gernod Deckelmann	
Language	DE	
Cycle	SoSe	
Content	Maintenance of structures, repair and strengthening, subsequent waterproofing of structures	
Literature	BetonMarketing Deutschland (Hrsg.): Stahlbetonoberflächen – schützen, erhalten, instandsetzen	

Course L0253: Mineral Building Materials		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	SoSe	
Content	Components of mineral building materials and their function, binding materials, concrete and mortar, special mortars, special concretes	
Literature	Taylor, H.F.W.: Cement Chemistry	
	Springenschmid, R.: Betontechnologie für die Praxis	

Course L0256: Technology of mineral Building Materials	
Тур	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Frank Schmidt-Döhl
Language	DE
Cycle	SoSe
Content	Design and production of mineral building materials
Literature	Taylor, H.F.W.: Cement Chemistry
	Springenschmid, R.: Betontechnologie für die Praxis

course L0254: Transport Processes in Building Materials and Damage Processes		
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Frank Schmidt-Döhl, Dr. Gernod Deckelmann	
Language	DE	
Cycle	SoSe	
Content	Transport Processes in Building Materials and Damage Processes	
Literature	Blaich, J.: Bauschäden, Analyse und Vermeidung	



Courses				
Title		Тур	Hrs/wk	CP
Design of Prestressed Structures and C	Concreet Bridges (L0603)	Lecture	3	4
Design of Prestressed Structures and C		Recitation Section (large)	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	None			
Recommended Previous	Detailed knowledge on the design of concrete stru	uctures.		
Knowledge				
Educational Objectives	After taking part successfully, students have reach	ned the following learning results		
Professional Competence				
Knowledge	The students know the main bridge types, their a	pplications and the various loads. They can explain	the basic design me	thods. They can exp
	the design of a prestressed bridge.			
01:11-	The shull at our ship to desire as informed and a			
Skills	The students are able to design reinforced or pres	stressed concrete bridges.		
Personal Competence				
Social Competence	The students can design in teamwork a real concr	rete bridge.		
A				
Autonomy	The students are able to design a prestressed con	ncrete bridge and discuss the problems and results	vith other students.	
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	180 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	eering: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Er	ngineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer			



-	sed Structures and Concreet Bridges
Тур	Lecture
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	SoSe
Content	prestressed structures
	basis of prestressed structures
	 differences between reinforced and prestressed concrete structures
	 history of prestressing
	 construction materials: concrete, tendons, ducts, anchorage systems
	construction: prestressing methods
	 prestressing forces and member forces (friction, elongation)
	tendon layout
	time dependant prestressing losses
	design of prestressed structures
	design of anchorage region
	non-bonded prestressing
	prestressed flat slabs
	Concrete bridges
	history of bridges
	design of bridges
	loads on bridges
	 member forces for slab, T-beam, hollow box, frame and arch bridges
	 precast bridges - precast segmental bridges
	bearings
	abutments, columns
	construction methods
Literature	
Literature	Vorlesungsumdruck
	Rombach, G. (2003): Spannbetonbau. Ernst & Sohn, Berlin
	• Wicke, M. (2002): Anwendung des Spannbetons. Betonkalender 2002, Teil II, S. 113-180, Verlag Ernst & Sohn, Berlin
	Leonhardt, F. (1980): Vorlesungen über Massivbau. Teil 5: Spannbeton. Berlin
	Mehlhorn, G. (2007): Handbuch Brücken, Springer Verlag
	Schäfer, H.; Kaufeld, K. (1997): Massivbrücken. Betonkalender Teil II, S. 443ff, Ernst & Sohn, Berlin
	Menn, Ch. (1986): Stahlbetonbrücken. Springer Verlag, Wien

Course L0604: Design of Prestressed Structures and Concreet Bridges	
Тур	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course



Module M0756: Soil Mech					
Courses					
litle		Тур	Hrs/wk	CP	
Soil Mechanics - Selected Topics (L037	4)	Lecture	2	2	
Soil Dynamics (L0452)		Lecture	3	2	
Experimental Researches in Geotechni	cs (L0706)	Laboratory Course	1	2	
Module Responsible	Prof. Jürgen Grabe				
Admission Requirements	none				
Recommended Previous	Soil Mechanics, Vibration Theory				
Knowledge					
Educational Objectives	After taking part successfully, students have re	eached the following learning results			
Professional Competence					
Knowledge	After the successful completion of the module	e the students should be able to:			
0					
	 to derive and to apply the basic equation 	tion of a simple mass oscillator,			
	 to understand the wave propagation in 	n the soil under dynamic excitation and to detect the	relevant parameters,		
	 to know the essential laboratory and fi 	ield tests to determine soil dynamic characteristics a	nd to evaluate them,		
	to design machine foundations to dyna	amic load,			
	 to measure shocks to perform vibration forecast, 				
	• to evaluate shocks in term to their effe	ect on people and buildings,			
	 to evaluate possibilities of isolation, 				
	 to understand mechanisms that cause earthquakes and evaluate earthquake in term of their magnitude and intensity, to know methods to determine axial pile capacity, integrity and the dynamic bedding modulus, to know the mechanisms that lead to a deformation accumulation due to cyclic loading and to estimate these deformations mathematication due to cyclic loading and to estimate these deformations mathematication due to cyclic loading and to estimate these deformations mathematication due to cyclic loading and to estimate these deformations mathematications accumulation due to cyclic loading and to estimate these deformations mathematications accumulation due to cyclic loading and to estimate these deformations mathematications accumulation due to cyclic loading and to estimate these deformations mathematications accumulation due to cyclic loading and to estimate these deformations mathematications accumulation due to cyclic loading accumulations accumulations accumulations accumulation due to cyclic loading accumulations ac				
	 to distinguish the area of application of 	of the method of elastodynamics and plastodynamics	5,		
	• to detect the undrained shear strength	n as a function of a number of state variables,			
	• to capture the visous behaviour of coh	nesive soils and to consider the effects of creep and	rate-dependent shear stre	ength in calculations	
	• to consider the impact of the partly sat	turated of a seepage and shear strength.			
Skills					
Personal Competence					
Social Competence					
Autonomy					
Workload in Hours	Independent Study Time 96, Study Time in Le	ecture 84			
Credit points	6				
Examination	Written exam				
Examination duration and scale	150 min				
Assignment for the Following	Civil Engineering: Specialisation Structural E	ngineering: Elective Compulsory			
Curricula					
	Civil Engineering: Specialisation Coastal Eng				

Course L0374: Soil Mechanics - Selected Topics		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dr. Hans Mathäus Hügel	
Language	DE	
Cycle	SoSe	
Content	selected topis:	
	- continuum mechanis	
	- constitutive modelling	
	- time and rate dependend material behavior of soils	
	- cyclic loading	
	- undrained conditions	
Literature	Kolymbas D. (2007): Geotechnik - Bodenmechanik, Grundbau und Tunnelbau. Springer Verlag	



Course L0452: Soil Dynamics		
Тур	Lecture	
Hrs/wk	3	
CP	2	
Workload in Hours	Independent Study Time 18, Study Time in Lecture 42	
Lecturer	Dr. Sascha Henke	
Language	DE	
Cycle	SoSe	
Content	• mass-spring-damper systems,	
	• wave propagation in soils,	
	dynamic soil parameters,	
	Determination of dynamic soil parameters,	
	• machine foundations,	
	in-situ measurement of ground motion, ground motion prediction, evaluation of ground motion,	
	ground motion shielding,	
	introduction into earthquake engineering,	
	• dynamic pile tests,	
	• cyclic accumulation,	
	plastodynamics	
Literature	 Das B.M.: Fundamentals of Soil Dynamics, Elsevier Empfehlungen des Arbeitskreises Baugrunddynamik. Hrsg. Deutsche Gesellschaft für Geotechnik (DGGT) Haupt W.: Bodendynamik. Vieweg und Teubner Meskouris K. und Hinzen KG.: Bauwerke und Erdbeben. Vieweg Verlag Studer J.A., Koller M.G. und Laue J.: Bodendynamik, Springer Verlag 	

Course L0706: Experimental Rese	course L0706: Experimental Researches in Geotechnics		
Тур	Laboratory Course		
Hrs/wk	1		
CP	2		
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14		
Lecturer	Marius Milatz		
Language	DE		
Cycle	SoSe		
Content	 1g-model tests ng-modfel tests high-grade laboratory tests field tests measurement technology 		
Literature			



Courses				
Title		Тур	Hrs/wk	CP
Boundary Element Methods (L0523)		Lecture	2	3
Boundary Element Methods (L0524)		Recitation Section (large)	2	3
Module Responsible	Prof. Otto von Estorff			
Admission Requirements	none			
Recommended Previous	Mechanics I (Statics, Mechanics of Materials) and M	lechanics II (Hydrostatics, Kinematics, Dynamics)		
Knowledge	Mathematics I, II, III (in particular differential equatio	ns)		
Educational Objectives	After taking part successfully, students have reache	d the following learning results		
Professional Competence	Alter taking part successionly, students have reache			
Knowledge	The students possess an in-depth knowledge rega	rding the derivation of the boundary element meth	and and are able to	aive an eveniew of t
Knowledge	theoretical and methodical basis of the method.	inding the derivation of the boundary element met		give all overview of th
Personal Competence Social Competence Autonomy	matrices, and solving the resulting system of equati - The students are able to independently solve challe identified and the results are critically scrutinized.		oundary element ro	utines. Problems can
Workload in Hours	Independent Study Time 124, Study Time in Lecture	9 56		
Credit points	6			
Examination	Oral exam			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	ineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer	ng: Elective Compulsory		
	Energy Systems: Core qualification: Elective Comp	ulsory		
	International Production Management: Specialisation	on Production Technology: Elective Compulsory		
	Mechatronics: Specialisation System Design: Electi	ve Compulsory		
	Product Development, Materials and Production: Co	ore qualification: Elective Compulsory		
	Technomathematics: Core qualification: Elective Co			
	Theoretical Mechanical Engineering: Core qualifica	tion: Elective Compulsory		

Course L0523: Boundary Element	Methods
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Otto von Estorff
Language	EN
Cycle	SoSe
Content	- Boundary value problems
	- Integral equations
	- Fundamental Solutions
	- Element formulations
	- Numerical integration
- Solving systems of equations (statics, dynamics)	
- Special BEM formulations	
	- Coupling of FEM and BEM
	- Hands-on Sessions (programming of BE routines)
	- Applications
Literature	Gaul, L.; Fiedler, Ch. (1997): Methode der Randelemente in Statik und Dynamik. Vieweg, Braunschweig, Wiesbaden
Literature	Bathe, KJ. (2000): Finite-Elemente-Methoden. Springer Verlag, Berlin



course L0524: Boundary Element Methods		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Otto von Estorff	
Language	EN	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	



Courses					
Title		Тур	Hrs/wk	CP	
Applied Groundwater Modeling (L0543)		Lecture	1	1	
Applied Groundwater Modeling (L0544)		Recitation Section (small)	2	2	
Modeling of Water Supply and Sewer Network		Problem-based Learning	2	3	
Module Responsible	Prof. Wilfried Schneider				
Admission Requirements	none				
Recommended Previous	Groundwater				
Knowledge	• groundwater hydraulics and transport of sub	ostances			
I	Pipe Systems				
	 Knowledge on urban water infrastructures, i 	in particular drinking water systemsand urban dr	ainage systems includi	ng special structures	
	 Hydraulics of drinking water supply systems 	s and sewer systems			
	 Basic knowledge on water management 				
Educational Objectives	After taking part successfully, students have reache	ed the following learning results			
Professional Competence					
	The students are able to describe the modelling of	of aroundwater flow and transport as well as i	urban water infrastruct	ires. They can carry	
	systems analyses and can detect technical and c				
	interdependencies of hydraulic and toxic phenomer		ase sludies. Desides i	ney are able to allaig	
	interdependencies of hydraulic and toxic phenomer				
	The students are able to construct and apply scient				
	or assess different solutions for existing problems	by application of selected software products.	The students are able	to use different softwa	
5	solutions (e.g. EPANET, EPA-SWMM).				
Bergenel Competence					
Personal Competence					
Social Competence					
Autonomy					
Westless die 11	Independent Ottalu Time 110, Ottalu Time 11, 1	o 70			
	Independent Study Time 110, Study Time in Lecture	e / u			
	Written exam				
Examination duration and scale					
	Civil Engineering: Specialization Structural Engine				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer				
Our sector of the sector of th	Civil Engineering: Specialisation Geotechnical Eng	ineering. Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engineeri	ing: Elective Compulsory			
1		ing: Elective Compulsory ion Water: Compulsory			

Course L0543: Applied Groundwat	ter Modeling
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Wilfried Schneider
Language	DE/EN
Cycle	SoSe
Content	Introduction and application of the groundwater model MODFLOW (PMWIN); theoretical backround of the modell, students do work with the model
	PMWIN for practical case studies.
Literature	MODFLOW-Handbuch
	Chiang, Wen Hsien: PMWIN



Course L0544: Applied Groundwat	ter Modeling	
Тур	Recitation Section (small)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Wilfried Schneider	
Language	DE/EN	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	
Course L0875: Modeling of Water	Course L0875: Modeling of Water Supply and Sewer Network	
Тур	Problem-based Learning	
Hrs/wk	2	

CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dr. Klaus Johannsen, NN
Language	DE
Cycle	SoSe
Content	
Literature	



Module M0828: Urban Env	/ironmental Management			
Courses				
Title	-	Тур	Hrs/wk	CP
Noise Protection (L1109)		Lecture	2	2
Urban Infrastructures (L0874)		Problem-based Learning	2	4
Module Responsible	NN			
Admission Requirements	none			
Recommended Previous	 Urban planning 			
Knowledge	 Orban planning Measures for climate protection and climate of 	change adaptation		
	Basics of urban drainage			
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 124, Study Time in Lecture	56		
Credit points	6			
Examination	Written exam			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Enginee	ring: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engi	neering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	ng: Elective Compulsory		
	Joint European Master in Environmental Studies - C		sory	
	Logistics, Infrastructure and Mobility: Specialisation			
	Water and Environmental Engineering: Specialisation			
	Water and Environmental Engineering: Specialisation	on Cities: Compulsory		

Course L1109: Noise Protection	ourse L1109: Noise Protection		
Тур	Lecture		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Bitte auswählen		
Language	EN		
Cycle	SoSe		
Content			
Literature			

Course L0874: Urban Infrastructu	res
Тур	Problem-based Learning
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	SoSe
Content	 Problem/Project Based Learning Main topics are: Design of future cities, concepts and technical approaches for future-proof drinking water supply and wastewater disposal Climate Change Impacts, Adaptation and Mitigation Rainwater Management & urban flash floods New water sources: rainwater harvesting and wastewater reuse Urban greening & urban agriculture Water sensitive urban design How to better link urban planning and urban water issues
Literature	



Courses				
Title		Тур	Hrs/wk	CP
Coastal- and Flood Protection (L0808)		Lecture	2	3
Coastal- and Flood Protection (L1415)		Recitation Section (large)	1	1
Maintennance and Defence of Flood Pro	otection Structures (L1411)	Lecture	2	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous	Coastal Engineering I			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the for	ollowing learning results		
Professional Competence				
Knowledge	The students have the capability to define and explain in	detail the important aspects of erosion prot	ection and flood pro	ptection and are able
	apply the aspects to practical coastal protection problems.			
	functional and from the constructional point of view.			
Skills	The students are able to select design approaches for the	ne functional and constructional design of e	erosion and flood p	
Skills		ne functional and constructional design of e	erosion and flood p	
	The students are able to select design approaches for the	ne functional and constructional design of e	erosion and flood p	
Personal Competence	The students are able to select design approaches for the	ne functional and constructional design of e	erosion and flood p	
	The students are able to select design approaches for the	ne functional and constructional design of e	erosion and flood p	
Personal Competence Social Competence	The students are able to select design approaches for th apply these approaches to practical design tasks.	ne functional and constructional design of e	erosion and flood p	
Personal Competence Social Competence Autonomy	The students are able to select design approaches for the apply these approaches to practical design tasks.	ne functional and constructional design of e	erosion and flood p	
Personal Competence Social Competence Autonomy Workload in Hours	The students are able to select design approaches for the apply these approaches to practical design tasks.	ne functional and constructional design of e	erosion and flood p	
Personal Competence Social Competence Autonomy Workload in Hours Credit points	The students are able to select design approaches for the apply these approaches to practical design tasks.			rotection measures a
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination	The students are able to select design approaches for the apply these approaches to practical design tasks.			rotection measures a
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale	The students are able to select design approaches for the apply these approaches to practical design tasks. Independent Study Time 110, Study Time in Lecture 70 6 Written exam The duration of the examination is 130 min. The examination	ion includes tasks with respect to the genera		rotection measures a
Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale	The students are able to select design approaches for the apply these approaches to practical design tasks. Independent Study Time 110, Study Time in Lecture 70 6 Written exam The duration of the examination is 130 min. The examinational calculations tasks. Civil Engineering: Specialisation Structural Engineering: E	tion includes tasks with respect to the genera		rotection measures a

Course L0808: Coastal- and Flood	Protection	
Тур	Lecture	
Hrs/wk	2	
CP	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Peter Fröhle	
Language		
Cycle	SoSe	
Content	Protection of sandy coasts	
	Sediment transport	
	Morphology Tachaiad a this factor start for a factor due and the	
	Technical solution for the protection of sandy coasts Onstruction in direction of the coast	
	 Construction in direction of the coast Constructions perpendicular to the coast 	
	 Other Concepst 	
	Calculation approaches and numerical models	
	Flood Protection	
	Classification of constructions / measures	
	• Dikes	
	• Dunes	
	Foreland – constructions	
	Flood-Protection Walls	
	Drainage of the hinterland	
Literature	Vorlesungsumdruck	
	Coastal Engineering Manual CEM	



Course L1415: Coastal- and Flood	Course L1415: Coastal- and Flood Protection		
Тур	Recitation Section (large)		
Hrs/wk	1		
CP	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	Prof. Peter Fröhle		
Language	DE		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		

Course L1411: Maintennance and	Defence of Flood Protection Structures
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Olaf Müller
Language	DE
Cycle	SoSe
Content	 Dike protection Maintennance of flood protection measures
Literature	Vorlesungsumdruck



	Тур	Hrs/wk	CP
	Lecture	2	2
Habour Engineering (L1414) Problem-based		1	2
78)	Lecture	2	2
Prof. Peter Fröhle			
none			
After taking part successfully, students have read	hed the following learning results		
The students are able to define in details and to choose design approaches for the functional design of a port and apply them to design tasks			
They can design the fundamental elements of a	port.		
The students are able to select and apply approp	priate approaches for the functional design of ports.		
Independent Study Time 110, Study Time in Lect	ture 70		
	examination includes tasks with respect to the gener	al understanding of	the lecture contents ar
	examination includes tasks with respect to the genera	ai understanding of	ine lecture contents at
	accrime: Elective Compulsory		
	The students are able to define in details and t They can design the fundamental elements of a The students are able to select and apply approp Independent Study Time 110, Study Time in Lect 6 Written exam The duration of the examination is 150 min. The calculations tasks. Civil Engineering: Specialisation Structural Engine Civil Engineering: Specialisation Coastal Engine International Management and Engineering: Specialisation	Lecture Problem-based Learning 78) Lecture Prof. Peter Fröhle none After taking part successfully, students have reached the following learning results The students are able to define in details and to choose design approaches for the functional desig They can design the fundamental elements of a port. The students are able to select and apply appropriate approaches for the functional design of ports. Independent Study Time 110, Study Time in Lecture 70 6 Written exam The duration of the examination is 150 min. The examination includes tasks with respect to the genericalculations tasks. Civil Engineering: Specialisation Structural Engineering: Elective Compulsory Civil Engineering: Specialisation Coastal Engineering: Compulsory International Management and Engineering: Specialisation II. Civil Engineering: Elective Compulsory	Lecture 2 Problem-based Learning 1 78) Lecture 2 Prof. Peter Fröhle

course L0809: Habour Engineering		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	ndependent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Peter Fröhle	
Language	DE	
Cycle	SoSe	
Content	 Fundamentals of harbor engineering Maritime transportation and waterways engineering Ships Elements of harbors Harbor approaches and water-side harbor areas Terminal design and handling of cargo Quay-walls and piers Equipment of harbors Sluices and other special constructions Connection to inland transportation / inland waterway transportation Protection of harbors Breakwaters and Jetties Wave protection of harbors Fishery and other small harbors 	
Literature	Brinkmann, B.: Seehäfen, Springer 2005	



Course L1414: Habour Engineering	
Тур	Problem-based Learning
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0378: Port Planning and F	Port Construction	
Тур	Lecture	
Hrs/wk	2	
CP		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Frank Feindt	
Language	DE	
Cycle	SoSe	
Content	 Planning and implementation of major projects Market analysis and traffic relations Planning process and plan Port planning in urban neighborhood Development of the logistics center "Port of Hamburg" in the metropolis Quays and waterfront structure Special planning Law Harbor - securing of a flexible use of the port Dimensioning of quays Flood protection structures Port of Hamburg - Infrastructure and development Preparation of areas Scour formation in front of shore structures 	
Literature	Vorlesungsumdruck, s. www.tu-harburg.de/gbt	



Courses				
Title		Тур	Hrs/wk	CP
Hydraulic Models (L0813)		Lecture	1	1
Modelling of Waves (L0812)		Lecture	1	1
Modelling of Flow in Rivers and Estuarie	· · · ·	Lecture	3	4
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have re	ached the following learning results		
Professional Competence				
Knowledge	Orudante ava able te define in datail the basi			
n nowledge	Students are able to deline in detail the basi	c processes that are related to the modelling of	r tiows in nydraulic enginee	ering. Besides, they ca
Kilowieuge		c processes that are related to the modelling of ling and actual numerical models for the simulati		ering. Besides, they ca
	describe the basic aspects of numerical mode	ling and actual numerical models for the simulati	ion of flows and waves.	ring. Besides, they ca
	describe the basic aspects of numerical mode		ion of flows and waves.	rring. Besides, they ca
	describe the basic aspects of numerical mode	ling and actual numerical models for the simulati	ion of flows and waves.	rring. Besides, they ca
Skills	describe the basic aspects of numerical mode	ling and actual numerical models for the simulati	ion of flows and waves.	ring. Besides, they ca
Skills Personal Competence	describe the basic aspects of numerical mode	ling and actual numerical models for the simulati	ion of flows and waves.	ring. Besides, they c
Skills Personal Competence Social Competence Autonomy	describe the basic aspects of numerical mode	erical models to practical hydraulic engineering f	ion of flows and waves.	ring. Besides, they ca
Skills Personal Competence Social Competence Autonomy	describe the basic aspects of numerical mode Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lu	erical models to practical hydraulic engineering f	ion of flows and waves.	ring. Besides, they ca
Skills Personal Competence Social Competence Autonomy Workload in Hours	describe the basic aspects of numerical mode Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lu	erical models to practical hydraulic engineering f	ion of flows and waves.	ring. Besides, they ca
Skills Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination	describe the basic aspects of numerical mode Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lo 6 Written exam	erical models to practical hydraulic engineering t	ion of flows and waves. tasks.	
Skills Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination	describe the basic aspects of numerical mode Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lo 6 Written exam	erical models to practical hydraulic engineering f	ion of flows and waves. tasks.	
Skills Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination duration and scale	describe the basic aspects of numerical model Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lo 6 Written exam The duration of the examination is 3 hours. Th	erical models to practical hydraulic engineering t ecture 70 re examination includes tasks with respect to the	ion of flows and waves. tasks.	
Skills Personal Competence Social Competence Autonomy Workload in Hours Credit points Examination Examination Examination duration and scale Assignment for the Following	describe the basic aspects of numerical mode Students are able to apply hydrodynamic-num Independent Study Time 110, Study Time in Lo 6 Written exam The duration of the examination is 3 hours. Th calculations tasks.	erical models to practical hydraulic engineering t ecture 70 ee examination includes tasks with respect to the gineering: Elective Compulsory	ion of flows and waves. tasks.	

Course L0813: Hydraulic Models		
Тур	Lecture	
Hrs/wk	1	
CP		
Workload in Hours	ndependent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Peter Fröhle	
Language	DE/EN	
Cycle	SoSe	
Content	 Fundamentals of hydraulic models Model laws Pi theorem of Buckingham Practical examples of hydraulic models 	
Literature	Strobl, Zunic: Wasserbau, Kap. 11 Hydraulische Modelle, Springer	



Course L0812: Modelling of Waves		
Тур	lure	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Peter Fröhle	
Language	DE/EN	
Cycle	SoSe	
Content	 Waves, interactions with shallow water and constructions Wave theories Sea state and surges Development of waves Wave spectra Modelling of Waves / phase averaged and phase resolved models Application of a phase averaged model for wave prediction (SWAN) Application of phase resolved wave models (Mike) 	
Literature	Vorlesungsumdruck	

Course L0810: Modelling of Flow in Rivers and Estuaries	
Тур	Lecture
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Peter Fröhle
Language	DE/EN
Cycle	SoSe
Content	Basics of numerial models / application of models
	 classification of models model concept modelling 1D Working Equation Mathematical description of physical processes Equation of motions conservation of mass conservation of momentum Initial conditions and boundary conditions Numerical Methods Time step procedure
	Finite differencesFinite volumes
Literature	Vorlesungsskript



Module M0874: Wastewate	er Svstems			
Courses				
Title		Тур	Hrs/wk	CP
Wastewater Systems - Collection, Treat	ment and Reuse (L0934)	Lecture	2	2
Wastewater Systems - Collection, Treat	ment and Reuse (L0943)	Recitation Section (large)	1	1
Advanced Wastewater Treatment (L035	,	Lecture	2	2
Advanced Wastewater Treatment (L035		Recitation Section (large)	1	1
Module Responsible				
Admission Requirements	None			
Recommended Previous	Knowledge of wastewater management and the key proc	esses involved in wastewater treatment.		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge	Students are able to outline key areas of the full range of	f treatment systems in waste water manageme	ent, as well as their	mutual dependence for
	sustainable water protection. They can describe relevant	economic, environmental and social factors.		
Skills	Students are able to pre-design and explain the available	e wastewater treatment processes and the so	one of their applicat	tion in municipal and f
Chino -	some industrial treatment plants.			
Personal Competence				
Social Competence				
Autonomy	Students are in a position to work on a subject and to org	anize their work flow independently. They can	also present on this	s subject.
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering:	Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineer	ng: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: E	lective Compulsory		
	Bioprocess Engineering: Specialisation A - General Biop	rocess Engineering: Elective Compulsory		
	Energy and Environmental Engineering: Specialisation E	nvironmental Engineering: Elective Compulso	ry	
	International Management and Engineering: Specialisati	on II. Energy and Environmental Engineering:	Elective Compulsor	у
	International Management and Engineering: Specialisati	on II. Process Engineering and Biotechnology:	Elective Compulso	ry
	Process Engineering: Specialisation Environmental Proc	ess Engineering: Elective Compulsory		
	Process Engineering: Specialisation Process Engineering	g : Elective Compulsory		
	Water and Environmental Engineering: Specialisation W	ater: Compulsory		
	Water and Environmental Engineering: Specialisation Er	vironment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Ci	ties: Compulsory		

Course L0934: Wastewater Systems - Collection, Treatment and Reuse		
Тур	ecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Ralf Otterpohl	
Language	EN	
Cycle	SoSe	
Content	+Understanding the global situation with water and wastewater	
	*Regional planning and decentralised systems	
	+Overview on innovative approaches	
	+In depth knowledge on advanced wastewater treatment options for different situations, for end-of-pipe and reuse	
	*Mathematical Modelling of Nitrogen Removal	
	•Exercises with calculations and design	
Literature	Henze, Mogens:	
	Wastewater Treatment: Biological and Chemical Processes, Springer 2002, 430 pages	
	George Tchobanoglous, Franklin L. Burton, H. David Stensel:	
	Wastewater Engineering: Treatment and Reuse, Metcalf & Eddy	
	McGraw-Hill, 2004 - 1819 pages	



Course L0943: Wastewater System	ourse L0943: Wastewater Systems - Collection, Treatment and Reuse	
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Ralf Otterpohl	
Language	EN	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L0357: Advanced Wastewater Treatment		
	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dr. Joachim Behrendt	
Language	DE	
Cycle	SoSe	
Content	Survey on advanced wastewater treatment	
	reuse of reclaimed municipal wastewater	
	Precipitation	
	Flocculation	
	Depth filtration	
	Membrane Processes	
	Activated carbon adsorption	
	Ozonation	
	"Advanced Oxidation Processes"	
	Disinfection	
Literature	Metcalf & Eddy, Wastewater Engineering: Treatment and Reuse, McGraw-Hill, Boston 2003	
	Wassertechnologie, H.H. Hahn, Springer-Verlag, Berlin 1987	
	Membranverfahren: Grundlagen der Modul- und Anlagenauslegung, T. Melin und R. Rautenbach, Springer-Verlag, Berlin 2007	
	Trinkwasserdesinfektion: Grundlagen, Verfahren, Anlagen, Geräte, Mikrobiologie, Chlorung, Ozonung, UV-Bestrahlung, Membranfiltration, Qualitätssicherung, W. Roeske, Oldenbourg-Verlag, München 2006	
	Organische Problemstoffe in Abwässern, H. Gulyas, GFEU, Hamburg 2003	



Course L0358: Advanced Wastewater Treatment		
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Dr. Joachim Behrendt	
Language	DE	
Cycle	SoSe	
Content	Aggregate organic compounds (sum parameters)	
	Industrial wastewater	
	Processes for industrial wastewater treatment	
	Precipitation	
	Flocculation	
	Activated carbon adsorption	
	Recalcitrant organic compounds	
Literature	Metcalf & Eddy, Wastewater Engineering: Treatment and Reuse, McGraw-Hill, Boston 2003	
	Wassertechnologie, H.H. Hahn, Springer-Verlag, Berlin 1987	
	Membranverfahren: Grundlagen der Modul- und Anlagenauslegung, T. Melin und R. Rautenbach, Springer-Verlag, Berlin 2007	
	Trinkwasserdesinfektion: Grundlagen, Verfahren, Anlagen, Geräte, Mikrobiologie, Chlorung, Ozonung, UV-Bestrahlung, Membranfiltration, Qualitätssicherung, W. Roeske, Oldenbourg-Verlag, München 2006	
	Organische Problemstoffe in Abwässern, H. Gulyas, GFEU, Hamburg 2003	



Module M0922: City Plann				
Courses				
Title		Тур	Hrs/wk	CP
Prinicples of City Planning (L1066)		Problem-based Learning	2	3
Street Design (L1067)		Problem-based Learning	2	3
Module Responsible	Prof. Carsten Gertz			
Admission Requirements	None			
Recommended Previous	for "Principles of Urban Planning": none			
Knowledge	for "Designing Urban Streetscapes": some knowledge of	transport planning e.g. through taking the u	nderaraduate class	Transport Planning
	Traffic Engineering"		aorgradado orado "	
Educational Objectives	After taking part successfully, students have reached the for	ollowing learning results		
Professional Competence				
Knowledge	Students are able to:			
	 use technical terms of urban planning. 			
	 describe the main determinants of urban developm 	nent.		
	explain and compare different possibilities of how	urban development can be influenced.		
	 discuss requirements for public streetscapes. 			
	explain the importance of street design.			
Skills	Students are able to:			
	 read and analyze urban development concepts an 	d designs for streetscapes		
	appraise such concepts in the context of competing			
	 design, justify and reflect their own solutions for co 			
Personal Competence				
Social Competence	Students are able to:			
	 discuss intermediate results with each other. 			
	 constructively accept feedback on their own work. 			
	 provide constructive feedback to others. 			
Autonomy	Students are able to:			
	 independently complete a written report including 		cess.	
	 assess the consequences of their proposed solution 			
	 independently acquire knowledge and apply this to 	o new issues or problem areas.		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points				
Examination	Project			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: B	Elective Compulsory		
Curricula	Civil Engineering: Specialisation Structural Engineering: Provide Structural Engineering: Specialisation Geotechnical Engineering			
Guiricula	Civil Engineering: Specialisation Coastal Engineering: Ele	•		
	Logistics, Infrastructure and Mobility: Specialisation Infrast			
	Water and Environmental Engineering: Specialisation Wa			
	Water and Environmental Engineering: Specialisation Env			
	Water and Environmental Engineering: Specialisation Citi			



Course L1066: Prinicples of City F	Planning
Тур	Problem-based Learning
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	SoSe
Content	"Principles of Urban Planning" deals with the determinants of urban development and their interactions. Topics include:
	 legal framework, instruments and methods of planning, functional requirements, stakeholders and actors basic design requirements different planning levels and historical contexts. The objective of the course is for students to acquire a basic understanding of urban development problems and approaches for solving them. They will also be able to comprehend the process of urban planning. The project work deals with a real life scenario and includes drawing up a development plan, an urban design concept as well as a building masterplan.
Literature	Albers, Gerd; Wekel, Julian (2009) Stadtplanung: Eine illustrierte Einführung. Primus Verlag. Darmstadt. Frick, Dieter (2008) Theorie des Städtebaus: Zur baulich-räumlichen Organisation von Stadt. Wasmuth-Verlag. Tübingen Jonas, Carsten (2009) Die Stadt und ihr Grundriss. Wasmuth-Verlag. Tübingen Kostof, Spiro; Castillo, Greg (1998) Die Anatomie der Stadt. Geschichte städtischer Strukturen. Campus-Verlag. Frankfurt/New York.

Course L1067: Street Design	
Тур	Problem-based Learning
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	SoSe
Content	"Designing Urban Streetscapes" covers the various functional and aesthetic requirements for designing streetscape as the most important
	elements of public space. The class deals with:
	technical and design requirements,
	 the effects of streetscapes on the behaviour of their users,
	possible measures relating to changes in traffic development.
	For their applied project, students will be required to redesign the streetscape of an actual case study.
	For men applied project, students win be required to redesign the streetscape of an actual case study.
Literature	Forschungsgesellschaft für Straßen- und Verkehrswesen (2011) Empfehlungen zur Straßenraumgestaltung innerhalb bebauter Gebiete - ESG.
	FGSV-Verlag. Köln (FGSV, 230).
	Forschungsgesellschaft für Straßen- und Verkehrswesen (2007) Richtlinien für die Anlage von Stadtstraßen – RASt 06. FGSV-Verlag. Köln
	(FGSV, 200).



Module M0961: Conceptu	al Design of Structures			
Courses				
Title		Тур	Hrs/wk	CP
Dimensioning and Detailing (L1144)		Project Seminar	3	4
Conception of Structures (L1142)		Lecture	1	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	none			
Recommended Previous	Basics in structural engineering (structural analysis, reinf	orced and prestressed concrete structures	s, steel structures)	
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge	The students are able to outline selected aspects of the b	uilding and technical history and to explai	n basic design strategie	S.
Personal Competence Social Competence	s The students are able to design engineering structures and have special structural engineering skills. The students are able to explain and defend problems and proposals in front of a professional audience, by presenting and discussing the group work in plenary.			
Autonomy	On the basis of the feedback given during the semester, t	he students develop independent solution	is for complex technical	problems.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	Oral exam (15-30 minutes per student) and project work	(FE calculation)		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering:	Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineeri	ng: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: E	lective Compulsory		
	International Management and Engineering: Specialisati	on II. Civil Engineering: Elective Compulse	ory	

Course L1144: Dimensioning and	urse L1144: Dimensioning and Detailing		
Тур	Project Seminar		
Hrs/wk	3		
CP	4		
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42		
Lecturer	Prof. Günter Rombach		
Language	DE		
Cycle	SoSe		
Content	With help of several (small) project works the subjects the conception and design of structures is practiced. The practical problems are elaborated		
	in teamwork and have to be presented and discussed in the class.		
Literature	- Projektbezogene Unterlagen		

Course L1142: Conception of Structures		
Тур	Lecture	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	SoSe	
Content	The students learn to design and gain competencies in shaping of structures and decision making. The following topics are addressed:	
	 elements of structural engineering importance of design, basics and conditions site analysis, service conditions, limit states, possibilities for execution, economy, durability structural design (shaping), structural detailing structural analysis, dimensioning of main elements assessment and discussion of proposals 	
Literature	- Vorlesungsunterlagen, Fachzeitschriften	



Module M0968: Subsoil er	igineering and Numerics			
Courses				
Courses				
Title		Тур	Hrs/wk	CP
Numerical Methods in Geotechnics (L03	.75)	Lecture	3	3
Underground Constructions (L0707)		Problem-based Learning	2	3
Module Responsible				
Admission Requirements	none			
Recommended Previous	Basics in construction and design of reinforced concrete	e structures, Soil Mechanics and Foundation En	igineering	
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	e following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Oral exam			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	g: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Enginee	ering: Compulsory		
	Water and Environmental Engineering: Specialisation V	Nater: Elective Compulsory		
	Water and Environmental Engineering: Specialisation E	Environment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation C	Cities: Elective Compulsory		

Course L0375: Numerical Methods in Geotechnics		
Тур	Lecture	
Hrs/wk	3	
CP	3	
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42	
Lecturer	Dr. Hans Mathäus Hügel	
Language	DE	
Cycle	SoSe	
Content	Topics:	
	 numerical simulations numerical algorithms finite element method application of finite element method in geomechanics constitutive models for soils contact models for soil structure interaction selected applications 	
Literature	 Wriggers P. (2001): Nichtlineare Finite-Elemente-Methoden, Springer Verlag, Berlin Bathe Klaus-Jürgen (2002): Finite-Elemente-Methoden. Springer Verlag, Berlin 	



Course L0707: Underground Constructions		
Тур	Problem-based Learning	
Hrs/wk	2	
CP	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	SoSe	
Content	 Definitions Historical development in tunneling Geology for tunneling Hard rock tunneling (construction composite and machines) Tunnelung in temporarly stable soil with conventional construction methods Tunneling in soft soils (form of supports, shield types, compressed air application) Pipe jacking Tunnel Lining, tunnel supporting structures Calculation approaches for supporting structures in shield-driven tunnels Surveying for tunneling Safety requirements Construction Contract Literature and sources 	
Literature	Vorlesung/Übung s. www.tu-harburg.de/gbt	



Courses				
Title		Тур	Hrs/wk	CP
Construction Logistics (L1163)		Lecture	1	2
Construction Logistics (L1164)		Recitation Section (small)	1	2
Project Development and Management	(L1161)	Lecture	1	1
Project Development and Management ((L1162)	Recitation Section (small)	1	1
Module Responsible	Prof. Heike Flämig			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have rea	ched the following learning results		
Professional Competence				
Knowledge	Students can			
	e sive definitions of the main terms of each	atruction logistics and project development and manage	amant	
	-	struction logistics and project development and manag	ement	
	• •	f internal or external construction logistics		
		and and production of construction objects and their co	onsequences for cor	istruction specific suppl
	chains			
	 differentiate constructions logistics from 	other logistics systems		
Skills	Students can			
	 carry out project life cycle assessments 			
		ruction logistics		
	apply methods and instruments of const			
	apply methods and instruments of proje			
	 apply methods and instruments of confli 	-		
	 design supply and waste removal concerning 	pts for a construction project		
Personal Competence				
Social Competence	Students can			
	 hold presentations in and for groups 			
	 apply methods of conflict solving skills in 	aroup work and case studies		
		group work and babe statios		
Autonomy	Students can			
	e polya problema by balistia systemia and	flow avianted this line		
	solve problems by holistic, systemic and	·		
	 Improve their creativity, negotiation skills 	s, conflict and crises solution skills by applying methods	s of moderation in ca	ise studies
Workload in Hours	Independent Study Time 124, Study Time in Le	cture 56		
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	Two written compositions and two short present	tations		
Assignment for the Following	Civil Engineering: Specialisation Structural Eng	ineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engin	• • • •		
		tion Production and Logistics: Elective Compulsory		
		tion Infrastructure and Mobility: Elective Compulsory		



Тур	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	The lecture gives deeper insight how important logistics are as a competetive factor for construction projects and which issues are to be adresse
	The following toppics are covered:
	competetive factor logistics
	the concept of systems, planning and coordination of logistics
	material, equipment and reverse logistics
	IT in construction logistics
	elements of the planning model of construction logistics and their connections
	 flow oriented logistics systems for construction projects
	 logistics concepts for ready to use construction projects (especially procurement and waste removel logistics)
	best practice examples (construction logistics Potsdamer Platz, recent case study of the region)
	Contents of the lecture are deepened in special exercises.
Literature	Flämig, Heike: Produktionslogistik in Stadtregionen. In: Forschungsverbund Ökologische Mobilität (Hrsg.) Forschungsbericht Bd. 15.2. Wuppe 2000.
	Krauss, Siri: Die Baulogistik in der schlüsselfertigen Ausführung, Bauwerk Verlag GmbH Berlin 2005.
	Lipsmeier, Klaus: Abfallkennzahlen für Neubauleistungen im Hochbau : Verlag Forum für Abfallwirtschaft und Altlasten, 2004.
	Schmidt, Norbert: Wettbewerbsfaktor Baulogistik. Neue Wertschöpfungspotenziale in der Baustoffversorgung. In: Klaus, Peter: Edition Logi Band 6. Deutscher Verkehrs-Verlag. Hamburg 2003.
	Seemann, Y.F. (2007): Logistikkoordination als Organisationseinheit bei der Bauausführung Wissenschaftsverlag Mainz in Aachen, Aach (Mitteilungen aus dem Fachgebiet Baubetrieb und Bauwirtschaft (Hrsg. Kuhne, V.): Heft 20)

ourse L1164: Construction Logistics	
Тур	Recitation Section (small)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L1161: Project Development and Management		
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Heike Flämig	
Language	DE	
Cycle	SoSe	
Content	Within the lecture, the main aspects of project development and management are tought:	
	Terms and definitions of project management	
	 Advantages and disadvantages of different ways of project handling 	
	organization, information, coordination and documentation	
	cost and fincance management in projects	
	time- and capacity management in projects	
	specific methods and instruments for successful team work	
	Contents of the lecture are deepened in special exercises.	
Literature	Projektmanagement-Fachmann. Band 1 und Band 2. RKW-Verlag, Eschborn, 2004.	



Course L1162: Project Development and Management	
Тур	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course



Courses				
Title		Тур	Hrs/wk	CP
Structural Dynamics (L1202)		Lecture	2	2
Structural Dynamics (L1203)		Recitation Section (large)	2	2
Fracture Mechanics and Fatigue (L0564)	Lecture	-	- 1
Fracture Mechanics and Fatigue (L0565	*	Recitation Section (large)	1	1
Module Responsible	Prof. Uwe Starossek			
Admission Requirements				
Recommended Previous	Knowledge of linear structural analysis of statically	determinate and indeterminate structures; Mechani	cs I/II, Mathematics I	/II, Differential equatio
Knowledge	I			
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
	After successful completion of this module, the student can explain the basic aspects of dynamic effects on structures and the respective methods			
Skills	After successful completion of this module, the stuc the appropriate computational approaches and met		al and structures to	dynamics loading us
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture	84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ering: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	ineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineeri			

Course L1202: Structural Dynamic	28		
Тур	Lecture		
Hrs/wk	2		
CP	2		
Workload in Hours	dependent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Uwe Starossek		
Language	DE		
Cycle	SoSe		
Content	 Single-degree-of-freedom systems: undamped and damped vibration, free vibration, forced vibrations due to harmonic, periodical or arbitrary loading, natural frequency, damping vibration isolation solution in the frequency-domain (Fourier transformation), solution in the time-domain multi-degree-of-freedom systems: continuous or discrete systems, modelling with finite elements, generalisation modal analysis power iteration according to v.Mises earthquake loading: seismological basics, response spectrum method wind-induced vibrations: engineering meteorology, aerodynamic, classification of excitation mechanisms 		
Literature	Clough, R.W., Penzien, J.: Dynamics of Structures. 2. Aufl., McGraw-Hill, New York, 1993.		



Course L1203: Structural Dynamics		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP		
Workload in Hours	ependent Study Time 32, Study Time in Lecture 28	
Lecturer	of. Uwe Starossek	
Language	DE	
Cycle	SoSe	
Content	ee interlocking course	
Literature	See interlocking course	

Course L0564: Fracture Mechanic	ourse L0564: Fracture Mechanics and Fatigue		
Тур	Lecture		
Hrs/wk			
CP			
Workload in Hours	dependent Study Time 16, Study Time in Lecture 14		
Lecturer	Ingo Hadrych		
Language	DE		
Cycle	SoSe		
Content			
Literature			

Course L0565: Fracture Mechanic	s and Fatigue
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Ingo Hadrych
Language	DE
Cycle	SoSe
Content	 Basics of fatigue stress and fatigue resistance and determination of fatigue strength, determination and use of S-N-curves and classification of notch effects, set up of determination of fatigue strength under dynamic load using the accumulation formula by Palmgren-Miner, set up of determination of fatigue strength in different examples, basics of construction and design regarding the problem of material fatigue, basics of linear elastic fracture mechanics under static and dynamic load, determination of lifetime of steel construction based on linear elastic fracture mechanics in different examples.
Literature	 Kuhlmann, Dürr, Günther; Kranbahnen und Betriebsfestigkeit; in Stahlbau Kalender 2003; Verlag Ernst & Sohn; Berlin 2003 Deutscher Stahlbau-Verband (Hrsg.); Stahlbau Handbuch Band 1 Teil B; 3. Auflage; Stahlbau-Verlagsgesellschaft; Köln 1996 Petersen, C.; Stahlbau; 3. überarb. und erw. Auflage; Vieweg-Verlag; Braunschweig 1993 DIN V ENV 1993-1-1: Eurocode 3; Bemessung und Konstruktion von Stahlbauwerken; Teil 1-1: Allgemeine Bemessungsregeln, Bemessungsregeln für den Hochbau; 1993 DIN V ENV 1993-6: Eurocode 3; Bemessung und Konstruktion von Stahlbauwerken; Teil 6: Kranbahnen; 2001 DIN-Fachbericht 126. Richtlinie zur Anwendung von DIN V ENV 1993-6; Nationales Anwendungsdokument (NAD); Berlin 2002



Courses					
Title		Тур	Hrs/wk	CP	
Steel Construction Project (L1206)		Project Seminar	4	6	
Module Responsible	Dr. Jürgen Priebe				
Admission Requirements					
Recommended Previous	Steel and Composite Structures				
Knowledge					
Educational Objectives	After taking part successfully, students have reached the f	ollowing learning results			
Professional Competence					
	Students are able to prepare a part of the whole project at	•			
Skills	Students can produce sketches and calculations of their part of the project. They are able to adjust their work in reaction to changing condition				
	resulting from other participants of the project.				
Personal Competence					
Social Competence	Students can present their results to other members of the	group.			
	They have the ability to work for a broad agreement with respect to intergroup dependencies.				
	They can distribute and process tasks independently.				
Autonomy	Students can handle their part of the project on their own	resposibility-			
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56				
Credit points	6				
Examination	Written elaboration				
Examination duration and scale	approx. 15-20 pages (without appendix)				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering:	Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	ng: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: El	ective Compulsory			
Course L1206: Steel Construction	Project				
Тур	•				
Hrs/wk	,				

Тур	Project Seminar	
Hrs/wk	4	
CP	6	
Workload in Hours	pendent Study Time 124, Study Time in Lecture 56	
Lecturer	Jürgen Priebe, Prof. Uwe Starossek	
Language		
Cycle	Se	
Content	esign of a big construction project (i.e skyscraper, large bridge, roof of a stadiuim) in small groups	
Literature		



0				
Courses				
Title	Тур	Hrs/wk	CP	
Geo-Information-Systems in Water Man Water Protection and Wastewater Mana	agement and Hydraulic Engineering (L0963)	Problem-based Learning Seminar	2	2
Water Protection and Wastewater Mana		Recitation Section (large)	2	2
Module Responsible		(algo)	·	6
Admission Requirements	none			
Recommended Previous				
Knowledge	 Basic knowledge in water management; 			
	 Good knowledge in urban drainage; 			
	 Good knowledge of wastewater treatment techniques; 			
	 Good knowledge of pollutants (e.g. COD, BOD, TS, N, F) and their properties;		
Educational Objectives	After taking part successfully, students have reached the follow	ng learning results		
Professional Competence				
	The students can describe the basic principles of the regula	ory framework related to the internati	onal and European	water sector They c
	explain limnological processes, substance cycles and water			
	problems. Finally, the students can demonstrate to achieve sig			
	able to judge environmental and wastewater related issues			
	interventions as well as conceptual problem solving approache	S.		
Skills	Students can accurately assess current problems and situat	ons in a country-specific or local cor	text. They can sugg	est concrete actions
	contribute to the planning of tomorrow's urban water cycle. Furthermore, they can suggest appropriate technical, administrative and legislative			
	solutions to solve these problems.			
.				
Personal Competence				
Social Competence	The students can work together in international groups.			
Autonomy	Students are able to organize their work flow to prepare t	nemselves before presentations and	discussion. They ca	an acquire appropria
	knowledge by making enquiries independently.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	60 min			
	Civil Engineering: Specialisation Structural Engineering: Electi	ve Compulsory		
	Civil Engineering: Specialisation Geotechnical Engineering: Electronic Electronic Civil Engineering: Specialisation Geotechnical Engineering: Electronic E			
Guilleula	Civil Engineering: Specialisation Coastal Engineering: Elective			
	Environmental Engineering: Specialisation Obastal Engineering. Elective Cor			
	International Management and Engineering: Specialisation II. (
	Joint European Master in Environmental Studies - Cities and S	• • • •	tive Compulsorv	
	Water and Environmental Engineering: Specialisation Water: C			
	Water and Environmental Engineering: Specialisation Environmental			
	J J Zittion	1 · · · · ·		



Course L0963: Geo-Information-Se	ourse L0963: Geo-Information-Systems in Water Management and Hydraulic Engineering			
Тур	Problem-based Learning			
Hrs/wk	2			
CP	2			
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28			
Lecturer	Prof. Peter Fröhle			
Language	DE/EN			
Cycle	WiSe			
Content	Theoretical basics of Geo-Information-Systems			
	 Data models, geographical coordinates, geo-referencing, map-views Data mining and – analyses of geo-data Analysis techniques 			
Literature	None			

Course L0226: Water Protection a	nd Wastewater Management		
Тур	Seminar		
Hrs/wk			
CP			
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Ralf Otterpohl		
Language	EN		
Cycle	WiSe		
	 The lecture focusses on: Regulatory Framework (e.g. WFD) Main instruments for the water management and protection In depth knowledge of relevant measures of water pollution control Urban drainage, treatment options in different regions on the world Rainwater management, improved management of heavy rainfalls, downpours, rainwater harvesting, rainwater infiltration Case Studies and Field Trips 		
Literature	 The literature listed below is available in the library of the TUHH. Water and wastewater technology Hammer, M. J. 1., & . (2012). (7. ed., internat. ed.). Boston [u.a.]: Pearson Education International. Water and wastewater engineering : design principles and practice: Davis, M. L. 1. (2011). New York, NY: McGraw-Hill. Biological wastewater treatment: (2011). C. P. Leslie Grady, Jr. (3. ed.). London, Boca Raton, Fla. [u.a.]: IWA Publ. 		

Course L0227: Water Protection a	nd Wastewater Management		
Тур	Recitation Section (large)		
Hrs/wk	1		
CP			
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14		
Lecturer	Prof. Ralf Otterpohl		
Language	EN		
Cycle	WiSe		
	 The lecture focusses on: Regulatory Framework (e.g. WFD) Main instruments for the water management and protection In depth knowledge of relevant measures of water pollution control Urban drainage, treatment options in different regions on the world Rainwater management, improved management of heavy rainfalls, downpours, rainwater harvesting, rainwater infiltration Case Studies and Field Trips 		
Literature	 The literature listed below is available in the library of the TUHH. Water and wastewater technology Hammer, M. J. 1., & . (2012). (7. ed., internat. ed.). Boston [u.a.]: Pearson Education International. Water and wastewater engineering : design principles and practice: Davis, M. L. 1. (2011). New York, NY: McGraw-Hill. Biological wastewater treatment: (2011). C. P. Leslie Grady, Jr. (3. ed.). London, Boca Raton, Fla. [u.a.]: IWA Publ. 		



Module M0595: Examinati	on of Materials, Structural Condit	ion and Damages			
Courses					
Title		Тур	Hrs/wk	CP	
Examination of Materials, Structural Cor	Examination of Materials, Structural Condition and Damages (L0260)		4	4	
Examination of Materials, Structural Cor	dition and Damages (L0261)	Recitation Section (small)	1	2	
Module Responsible	Prof. Frank Schmidt-Döhl				
Admission Requirements	None				
Recommended Previous	Basic knowledge about building materials or	material science, for example by the module Building Ma	aterials and Building	Chemistry.	
Knowledge					
Educational Objectives	After taking part successfully, students have r	eached the following learning results			
Professional Competence					
Knowledge	The students are able to describe the rules	or trading, use and marking of construction products in	Germany. They know	w which methods for	
	testing of building material properties are usa	ble and know the limitations and characterics of the mos	st important testing me	ethods.	
Skillo	The students are able to reasonably discover	r the rules for trading and using of building products in C	armany		
Skills	Its The students are able to responsibly discover the rules for trading and using of building products in Germany.			the examination	
	They are able to chose suitable methods for the testing and inspection of construction products, the examination of damages and the exa				
	of the structural conditions of buildings. They are able to conclude from symptons to the cause of damages. They are able to descrete animation in form of a test report or expert opinion.				
Personal Competence					
	The students can describe the different roles of manufacturers as well as testing, supervisory and certification bodies within the framework				
eesial eempotenee	material testing. They can describe the different roles of the participants in legal proceedings.				
	······································				
Autonomy					
,	Independent Study Time 110, Study Time in I	Lecture 70			
Credit points	6				
Examination	Written exam				
Examination duration and scale	120 min				
Assignment for the Following	Civil Engineering: Specialisation Structural E	ngineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnic	al Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Eng	gineering: Elective Compulsory			
	International Management and Engineering:	Specialisation II. Civil Engineering: Elective Compulsory	(
	Materials Science: Specialisation Engineerin	g Materials: Elective Compulsory			

Course L0260: Examination of Materials, Structural Condition and Damages			
Тур	Lecture		
Hrs/wk	4		
CP	4		
Workload in Hours	Independent Study Time 64, Study Time in Lecture 56		
Lecturer	Prof. Frank Schmidt-Döhl		
Language	DE		
Cycle	WiSe		
Content	Materials testing and marking process of construction products, testing methods for building materials and structures, testing reports and expert		
	opinions, describing the condition of a structure, from symptons to the cause of damages		
Literature	Frank Schmidt-Döhl: Materialprüfung im Bauwesen. Fraunhofer irb-Verlag, Stuttgart, 2013.		

Course L0261: Examination of Materials, Structural Condition and Damages		
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Module M0603: Nonlinear	Structural Analysis				
Courses					
Title		Тур	Hrs/wk	СР	
Nonlinear Structural Analysis (L0277)		Lecture	3	4	
Nonlinear Structural Analysis (L0279)		Recitation Section (small)	1	2	
Module Responsible	Prof. Alexander Düster				
Admission Requirements	None				
Recommended Previous	Mathematics I, II, III, Mechanics I, II, III, IV				
Knowledge	Differential Equations 2 (Partial Differential Equations)				
Educational Objectives	After taking part successfully, students have reached the	ne following learning results			
Professional Competence					
Knowledge	Students are able to				
-	+ give an overview of the different nonlinear phenome	na in structural mechanics.			
	+ explain the mechanical background of nonlinear phe				
	+ to specify problems of nonlinear structural analysi		explain their mathe	matical and mechanic	
	background.				
Skills	Students are able to				
	+ model nonlinear structural problems.				
	+ select for a given nonlinear structural problem a suitable computational procedure.				
	+ apply finite element procedures for nonlinear structural analysis.				
	+ critically verify and judge results of nonlinear finite elements.				
	+ to transfer their knowledge of nonlinear solution proc	edures to new problems.			
Personal Competence					
Social Competence	Students are able to				
	+ solve problems in heterogeneous groups and to doc	ument the corresponding results.			
	+ share new knowledge with group members.				
Autonomy	Students are able to				
	+ assess their knowledge by means of exercises and B	E-Learning.			
Workload in Hours	Independent Study Time 124, Study Time in Lecture 5	6			
Credit points	6				
Examination	Written exam				
Examination duration and scale	120 min				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	g: Elective Compulsory			
Curricula	International Management and Engineering: Specialis	ation II. Civil Engineering: Elective Compulsory			
	Materials Science: Specialisation Modelling: Elective (Compulsory			
	Mechatronics: Specialisation System Design: Elective	Compulsory			
	Product Development, Materials and Production: Core	qualification: Elective Compulsory			
	Naval Architecture and Ocean Engineering: Core qual	ification: Elective Compulsory			
	Ship and Offshore Technology: Core qualification: Ele	ctive Compulsory			
	Theoretical Mechanical Engineering: Core qualificatio	n: Elective Compulsory			
	Theoretical Mechanical Engineering: Technical Comp	ementary Course: Elective Compulsory			



Course L0277: Nonlinear Structur	al Analysis
Тур	Lecture
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Alexander Düster
Language	DE/EN
Cycle	WiSe
Content	1. Introduction
	2. Nonlinear phenomena
	3. Mathematical preliminaries
	4. Basic equations of continuum mechanics
	5. Spatial discretization with finite elements
	6. Solution of nonlinear systems of equations
	7. Solution of elastoplastic problems
	8. Stability problems
	9. Contact problems
Literature	[1] Alexander Düster, Nonlinear Structrual Analysis, Lecture Notes, Technische Universität Hamburg-Harburg, 2014.
	[2] Peter Wriggers, Nonlinear Finite Element Methods, Springer 2008.
	[3] Peter Wriggers, Nichtlineare Finite-Elemente-Methoden, Springer 2001.
	[4] Javier Bonet and Richard D. Wood, Nonlinear Continuum Mechanics for Finite Element Analysis, Cambridge University Press, 2008.

Course L0279: Nonlinear Structural Analysis		
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Alexander Düster	
Language	DE/EN	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Courses				
Title		Tue	Hrs/wk	CP
Title Waste and Environmental Chemistry (L0328) Biological Waste Treatment (L0318)		Typ Laboratory Course	2	2
		Problem-based Learning	3	4
Module Responsible	Prof. Kerstin Kuchta	-		
Admission Requirements	none			
Recommended Previous	chemical and biological basics			
Knowledge	5			
Educational Objectives	After taking part successfully, students have reache	ed the following learning results		
Professional Competence				
Knowledge	The module aims possess knowledge concerning	the planning of biological waste treatment plants.	Students are able to	explain the design a
	layout of anaerobic and aerobic waste treatment p	plants in detail, describe different techniques for wa	aste gas treatment pl	ants for biological wa
	treatment plants and explain different methods for	waste analytics.		
Skills	The students are able to discuss the compilation	n of design and layout of plants. They can critic	ally evaluate technic	ues and quality con
	measurements. The students can recherché and evaluate literature and date connected to the tasks given in der module and plan additional tests			
	They are capable of reflecting and evaluating finding	ngs in the group.		
Personal Competence				
Social Competence	Students can participate in subject-specific and in			
	front of others and promote the scientific development in front of colleagues. Furthermore, they can give and accept professional constructive			
	criticism.			
Autonomy	y Students can independently tap knowledge from literature, business or test reports and transform it to the course projects. They are capable, i			
	consultation with supervisors as well as in the interim presentation, to assess their learning level and define further steps on this basis Furthermore, they can define targets for new application-or research-oriented duties in accordance with the potential social, economic and culture			
	impact.	autorior research-onemed duties in accordance w	fuir the potential socia	al, economic and culu
	impaci.			
Workload in Hours	Independent Study Time 110, Study Time in Lectur	re 70		
Credit points	6			
Examination	Project			
Examination duration and scale	Elaboration and presentation (15-25 minutes in gro	oups), successful participation at Praktikum		
Assignment for the Following	Civil Engineering: Specialisation Structural Engine			
	Civil Engineering: Specialisation Geotechnical Eng	• • •		
	Civil Engineering: Specialisation Coastal Engineer			
	Energy and Environmental Engineering: Specialisa	ation Environmental Engineering: Elective Compul	sory	
	Environmental Engineering: Core qualification: Co	mpulsory		
	International Management and Engineering: Speci	alisation II. Energy and Environmental Engineering	g: Elective Compulso	ry
	Joint European Master in Environmental Studies -	Cities and Sustainability: Specialisation Energy: El	ective Compulsory	
	Water and Environmental Engineering: Specialisat			
	Water and Environmental Engineering: Specialisat	tion Cities: Elective Compulsory		



Course L0328: Waste and Environ	mental Chemistry
Тур	Laboratory Course
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Kerstin Kuchta
Language	DE/EN
Cycle	WiSe
	The participants are divided into groups. Each group prepares a transcript on the experiment performed, which is then used as basis for discussing the results and to evaluate the performance of the group and the individual student. In some experiments the test procedure and the results are presented in seminar form, accompanied by discussion and results evaluation. Experiments ar e.g. Screening and particle size determination Fos/Tac AAS Chalorific value
Literature	Scripte

Course L0318: Biological Waste T	reatment
Тур	Problem-based Learning
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Kerstin Kuchta
Language	EN
Cycle	WiSe
Content	 Introduction biological basics determination process specific material characterization aerobic degradation (Composting, stabilization) anaerobic degradation (Biogas production, fermentation) Technical layout and process design Flue gas treatment Plant design practical phase
Literature	



Courses					
Title		Тур	Hrs/wk	CP	
Subsoil and Underground Engineering L	aw (L0395)	Lecture	2	2	
Project Geotechnics (L0708)		Problem-based Learning	2	4	
Module Responsible	Prof. Jürgen Grabe				
Admission Requirements	none				
Recommended Previous	Enviromental Law,				
Knowledge	Law of building contracts				
	Law of building contracts				
Educational Objectives	After taking part successfully, students have	reached the following learning results			
Professional Competence					
Knowledge	After successful completion of the module the student has in-depth knowledge in subsoil and underground construction law, contract law as				
	as in the VOB.				
Skills					
	 Assessment and design of the main contract regulations and control processes Advanced detection of legal problems and thus ability to avoid legal construction disputes 				
	Advanced detection on egal problem	s and thus ability to avoid legal construction disputes			
Personal Competence					
Social Competence	Cooperation in a project work, where they solve a geotechnical problem and design and plan the solution and present the results at the end.				
Autonomy					
Workload in Hours	Independent Study Time 124, Study Time in	Lecture 56			
Credit points	6				
Examination	Colloquium				
Examination duration and scale	120 minutes				
Assignment for the Following	Civil Engineering: Specialisation Structural E	Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnic	cal Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal En				

Course L0395: Subsoil and Underg	ground Engineering Law		
Тур	Lecture		
Hrs/wk	2		
CP			
Workload in Hours	dependent Study Time 32, Study Time in Lecture 28		
Lecturer	Dr. Georg-Friedger Drewsen		
Language	DE		
Cycle	WiSe		
Content	 Introduction Historical Overview Areas of civil law The Contracting Parties Authorities, Cooperatioves and other patries involved The Civil law The Public Service Obligations Land acquisition Planning of underground construction projects The construction contract according to BGB/VOB - design and implementation The civil law in the jurisdiction 		
Literature	Folienskipt (in der Vorlesung erhältlich) weitere Literatur: • Englert, Grauvogel und Maurer: Handbuch des Baugrund- und Tiefbaurechts. Werner-Verlag		

Course L0708: Project Geotechnic	SS Contraction of the second se
Тур	Problem-based Learning
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	WiSe
Content	The students solve independently a project-based geotechnical problem in groups. Additional lectures concerning the problem will be held and
	material will be distributed as study basis. Every two weeks the groups present their current project status. The final work will be presentated in a
	final presentation.
Literature	abhängig von der Fragestellung



Module M0705: Groundwa	iter			
Courses				
Title		Тур	Hrs/wk	CP
Geohydraulic and Solute Transport (L05		Lecture	2	2
Geohydraulic and Solute Transport (L05		Recitation Section (small)	1	1
Simulation in Groundwater Hydrology (L			1	1 2
Simulation in Groundwater Hydrology (L		Recitation Section (small)	2	2
	Prof. Wilfried Schneider			
Admission Requirements	None			
Recommended Previous	 Ground water hydrology 			
Knowledge	Hydromechanics			
Educational Objectives	After taking part successfully, students have reached the follow	ving learning results		
Professional Competence		• •		
	The students are able to describe the fate of solutes in the subsurface along the path between soil and water body quantitatively and qualitatively			
C C	They are able to do this with simulation models.			
Skills	The students are able to describe conceptually movement and storage of water in the unsaturated zone. They are able to analyse pF- function of the students are able to analyse pF- func			to analyse pF- functions
	and Ku functions. They can model transport of solutes in the unsaturated and saturated zoned. They are able to determine dispersiities, so			ne dispersiities, sorption
	coefficients, decay rates and dissolution rates for organic and inorganic substances.			
Personal Competence				
Social Competence	The students can help to each other.			
Autonomy	none			
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Examination	Written exam			
Examination duration and scale	60 min written exam and written papers			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elect	ive Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: E	lective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Electiv	e Compulsory		
	Process Engineering: Specialisation Environmental Process E	ngineering: Elective Compulsory		
	Process Engineering: Specialisation Process Engineering: Ele	ective Compulsory		
	Water and Environmental Engineering: Specialisation Water:	Compulsory		
	Water and Environmental Engineering: Specialisation Environ	ment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities: B	Elective Compulsory		

Course L0539: Geohydraulic and Solute Transport		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Wilfried Schneider	
Language	DE	
Cycle	WiSe	
Content	Pump test analysis, water content-water suction functions, unsaturated hydraulic conductivity function, Brooks-Corey relation, van Genuchten	
	relation, solute transport in unsaturated zone, solute transport and reactions in groundwater	
Literature	Todd; K. (2005): Groundwater Hydrology	
	Fetter, C.W. (2001): Applied Hydrogeology	
	Hölting & Coldewey (2005): Hydrogeologie	
	Charbeneau, R.J. (2000): Groundwater Hydraulics and pollutant Transport	

Course L0540: Geohydraulic and Solute Transport		
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Wilfried Schneider	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Course L0541: Simulation in Groundwater Hydrology		
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Wilfried Schneider	
Language	DE	
Cycle	WiSe	
Content	Basics and theoretical background of simulation models frequently used in science and practise for pumping test analysis, water movement	
	vadose zone, solute transport in vadose zone, groundwater recharge, solute transport in groundwater	
Literature	Handbücher der verwendeten Slumationsmodelle werden bereitgestellt.	

Course L0542: Simulation in Groundwater Hydrology		
Тур	Recitation Section (small)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Wilfried Schneider	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Module M0722: Computat	ional Analysis of Concrete Structures	;		
Courses				
Title Typ Hrs/wk CP			CP	
Computational Analysis of Concrete Stru	uctures (L0598)	Lecture	2	2
Computational Analysis of Concrete Structures (L0599)		Recitation Section (large)	2	2
FE-Modeling of Concrete Structures (LC		Problem-based Learning	2	2
Module Responsible				
Admission Requirements	none			
Recommended Previous	Basic knowledge in structural analysis and design	of reinforced concrete structures (beams, slabs, she	ar walls).	
Knowledge	Lectures 'Concrete Structures I und II'			
	Lectures 'Structural Analysis I and II'			
	Lecture 'Concrete Structures'			
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
Knowledge	The students know the problems of numerical modeling and design of an arbitrary concrete structure.			
Skills	The students can model and design an arbitrary concrete structure by means of a finite element software package.			
Personal Competence				
Social Competence				
Autonomy	The students can model and design a real concrete structure based on a finite element software package and discuss the problems and results with other students.			
Credit points				
Examination	Project			
Examination duration and scale	Oral exam (15-30 minutes per student) and project			
Assignment for the Following		• • • •		
Curricula	Civil Engineering: Specialisation Geotechnical Eng Civil Engineering: Specialisation Coastal Engineer	• • •		

Course L0598: Computational Ana	Ilysis of Concrete Structures		
Тур	ecture		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Günter Rombach		
Language	DE		
Cycle	WiSe		
Content	 Modeling of beam and truss structures Discontinuity regions, like frame corners, openings, shear walls with large openings Bracing of high-rise buildings Modeling of bridges Nonlinear analysis Finite-Elemente-analysis of slabs: support conditions, singularity regions Finite-Elemente-Berechnungen of shear walls and deep beams: support condition, design Coupled systems Modeling of slab supported on beams Shell structures 3D building models Nonlinear analysis of slabs and shells Documentation 		
Literature	 Vorlesungsumdruck Rombach, G.A. (2007): Anwendung der Finite-Elemente-Methode im Betonbau. 2. Auflage, Verlag Ernst & Sohn, Berlin Rombach G.A. (2011): Finite-Element Design of Concrete Structures, 2nd edition, ICE publishing Hartmann, F., Katz, C. (2002): Statik mit finiten Elementen. Springer, Berlin 		



Course L0599: Computational Analysis of Concrete Structures		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L0600: FE-Modeling of Cor	ncrete Structures	
Тур	Problem-based Learning	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	Finite Element Modeling and computational design of concrete structures by 'SOFISTIK'	
Literature	 Rombach G.: Anwendung der Finite – Elemente – Methode im Betonbau. 2. Auflage. Verlag Ernst & Sohn, Berlin, 2007 Rombach G.: Finite-Element Design of Concrete Structures. 2nd edition, ICE Publishing, London, 2011, ISBN 0 7277 32749 Rombach G.: EDV-unterstützte Berechnungen im Stahlbetonbau. in: "Stahlbetonbau aktuell 2014" (ed. Gorris A., Hegger J., Mark P.), Berlin 2014 (S. C1C.36) 	



Module M0801: Water Res	sources and -Supply			
Courses				
Title		Тур	Hrs/wk	CP
Chemistry of Drinking Water Treatment (L0311)		Lecture	2	1
Chemistry of Drinking Water Treatment (L0312)		Recitation Section (large)	1	2
Water Resource Management (L0402)		Lecture	2	2
Water Resource Management (L0403)		Recitation Section (small)	1	1
Module Responsible	Prof. Mathias Ernst			
Admission Requirements	None			
Recommended Previous	Knowledge of water management and the key process	ses involved in water treatment.		
Knowledge				
Educational Objectives	After taking part successfully, students have reached t	he following learning results		
Professional Competence				
Knowledge	Students will be able to outline key areas of conflict in	water management, as well as their mutual d	ependence for sustain	able water supply. T
	will understand relevant economic, environmental an	d social factors. Students will be able to expla	in and outline the org	anisational structure
	water companies. They will be able to explain the ava	ilable water treatment processes and the scop	e of their application.	
Skills	Skills Students will be able to assess complex problems in drinking water production and establish solutions involving water management		-	
	measures. They will be able to assess the evaluation			chemical calculations
	selected treatment processes and apply generally acc	epted technical rules and standards to these p	rocesses.	
Personal Competence				
Social Competence	Working in a diverse group of specialists, students wi	II be able to develop and document complex s	olutions for the manag	gement and treatmer
	drinking water. They will be able to take an appropriat	e professional position, for example represent	ng user interests. The	y will be able to deve
	joint solutions in teams of diverse experts and present	these solutions to others.	-	
Autonomy	Students will be in a position to work on a subject independently and present on this subject.			
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Examination	Written exam			
Examination duration and scale	60 min (chemistry) + presentation			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	ng: Elective Compulsory		
Curricula				
	Civil Engineering: Specialisation Coastal Engineering	: Elective Compulsory		
	Energy and Environmental Engineering: Specialisatio	n Energy and Environmental Engineering: Ele	ctive Compulsory	
	International Management and Engineering: Specialis	ation II. Energy and Environmental Engineerir	ig: Elective Compulso	ry
	Water and Environmental Engineering: Specialisation	Water: Compulsory		
	Water and Environmental Engineering: Specialisation	Environment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	Cities: Elective Compulsory		

Course L0311: Chemistry of Drinking Water Treatment		
Тур	Lecture	
Hrs/wk	2	
CP	1	
Workload in Hours	Independent Study Time 2, Study Time in Lecture 28	
Lecturer	Dr. Klaus Johannsen	
Language	DE	
Cycle	WiSe	
Content	The topic of this course is water chemistry with respect to drinking water treatment and water distribution	
	Major topics are solubility of gases, carbonic acid system and calcium carbonate, blending, softening, redox processes, materials and legal requirements on drinking water treatment. Focus is put on generally accepted rules of technology (DVGW- and DIN-standards). Special emphasis is put on calculations using realistic analysis data (e.g. calculation of pH or calcium carbonate dissolution potential) in exercises. Students can get a feedback and gain extra points for exam by solving problems for homework. Knowledge of drinking water treatment processes is vital for this lecture. Therefore the most important processes are explained coordinated with the course "Water resources management" in the beginning of the semester.	
Literature	 MHW (rev. by Crittenden, J. et al.): Water treatment principles and design. John Wiley & Sons, Hoboken, 2005. Stumm, W., Morgan, J.J.: Aquatic chemistry. John Wiley & Sons, New York, 1996. DVGW (Hrsg.): Wasseraufbereitung - Grundlagen und Verfahren. Oldenbourg Industrie Verlag, München, 2004. Jensen, J. N.: A Problem Solving Approach to Aquatic Chemistry. John Wiley & Sons, Inc., New York, 2003. 	



Course L0312: Chemistry of Drinking Water Treatment		
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Dr. Klaus Johannsen	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L0402: Water Resource M	anagement
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Mathias Ernst
Language	DE
Cycle	WiSe
	 The lecture provides comprehensive knowledge on interaction of water ressource management and drinking water supply. Content overview: Current situation of global water resources User and Stakeholder conflicts Wasserressourcenmanagement in urbane Gebieten Rechtliche Aspekte, Organisationsformen Trinkwasserversorgungsunternehmen. Ökobilanzierung, Benchmarking in der Wasserversorgung
Literature	 Aktuelle UN World Water Development Reports Branchenbild der deutschen Wasserwirtschaft, VKU (2011) Aktuelle Artikel wissenschaftlicher Zeitschriften Ppt der Vorlesung

Course L0403: Water Resource Management	
Тур	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Mathias Ernst
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Courses				
Title		Тур	Hrs/wk	CP
Basics of Coastal Engineering (L0807) Basics of Coastal Engineering (L1413)		Lecture Recitation Section (large)	3	4
Module Responsible	Prof Peter Fröhle	ricolation oconon (harge)		L
Admission Requirements				
Recommended Previous				
Knowledge				
Educational Objectives		reached the following learning results		
Professional Competence				
		n the basic concepts of coastal engineering and port er	ngineering. They are ab	ble to apply the conce
		engineering. Students can define and determine the b		
	engineering constructions.		gg	
Skills	The students are capable to apply basic des	sign approaches to selected and pre-defined design tas	sks in coastal engineeri	ng.
Personal Competence	a			
Social Competence				
Autonomy				
	Independent Study Time 124, Study Time in			
WORKIDAU III HOURS		Lecture 56		
Credit points	0	Lecture 56		
Credit points	Written exam	Lecture 56		
Credit points	N Written exam	Lecture 56 The examination includes tasks with respect to the ger	neral understanding of	the lecture contents a
Credit points Examination	N Written exam		neral understanding of	the lecture contents a
Credit points Examination Examination duration and scale	Written exam The duration of the examination is 2 hours.	The examination includes tasks with respect to the gen	neral understanding of	the lecture contents a
Credit points Examination Examination duration and scale	 Written exam The duration of the examination is 2 hours. calculations tasks. Civil Engineering: Specialisation Structural 	The examination includes tasks with respect to the gen Engineering: Elective Compulsory	neral understanding of	the lecture contents a
Credit points Examination Examination duration and scale Assignment for the Following	 Written exam The duration of the examination is 2 hours. calculations tasks. Civil Engineering: Specialisation Structural 	The examination includes tasks with respect to the ger Engineering: Elective Compulsory cal Engineering: Compulsory	neral understanding of	the lecture contents a

Course L0807: Basics of Coastal Engineering		
Тур	Lecture	
Hrs/wk	3	
CP	4	
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42	
Lecturer	Prof. Peter Fröhle	
Language	DE	
Cycle	WiSe	
Content	 Basics of planning and design Water levels Currents Waves Ice Planning and Design in Coastal Engineering Functional and constructional design Determination of design parameters Design-approaches Filter Rubble mound constructions Piles Vertical constructions 	
Literature	Coastal Engineering Manual, CEM Vorlesungsumdruck	



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Course L1413: Basics of Coastal Engineering	
Тур	Recitation Section (large)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Courses		
Title	Typ Hrs/wk	CP
Integrated Transportation Planning (L10		6
Module Responsible	Prof. Carsten Gertz	
Admission Requirements		
Recommended Previous		eerin
Knowledge		
Educational Objectives	After taking part successfully, students have reached the following learning results	
Professional Competence		
Knowledge	Students are able to:	
	describe interdependencies between land-use/location choice and transportation/mobility behaviour	
	 explain and evaluate the social, ecological and economic effects of transport and land-use policy measures. relate current issues in the area of integrated transport planning and formulate an opinion on them. 	
Skille	s Students are able to:	
Okina		
	quantify important parameters, which influence travel demand or are influenced by it.	
	• comprehensively examine a pre-defined or self-selected topic from a transportation studies perspective and	document the results
	accordance with scientific conventions.	
Personal Competence		
Social Competence	Students are able to:	
	 provide feedback on topical contents and their teaching. 	
	constructively handle feedback on their own work.	
	produce results in group work and document these.	
Autonomy	/ Students are able to:	
	access potential concequences of their future prefereional estivities	
	 assess potential consequences of their future professional activities independently plan working on a pre-defined project topic, acquire the necessary knowledge and use appropriate 	means for its execution
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56	
Credit points		
Examination		
Examination duration and scale		
Assignment for the Following		
Curricula		
	Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory	
	Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory	
	Water and Environmental Engineering: Specialisation Water: Elective Compulsory	
	Water and Environmental Engineering: Specialisation Environment: Elective Compulsory	
	Water and Environmental Engineering: Specialisation Cities: Compulsory	



Course L1068: Integrated Transpo	rtation Planning
Тур	Problem-based Learning
Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Carsten Gertz, Dr. Philine Gaffron
Language	DE
Cycle	WiSe
Content	 interactions between transport and the environment and consequent limitations characteristics of integrated planning complex planning processes interdependencies of location choice and mobility behaviour transport and land-use policies project on current issues in transportation studies
Literature	Kutter, Eckhard (2005) Entwicklung innovativer Verkehrsstrategien für die mobile Gesellschaft. Erich Schmidt Verlag. Berlin. Bracher, Tilman u. a. (Hrsg.) (68. Ergänzung 2013) Handbuch der kommunalen Verkehrsplanung. Herbert Wichmann Verlag. Berlin, Offenbach. (Loseblattsammlung mit kontinuierlichen Ergänzungen)



Module M0964: Structures	in Foundation and Hydraulic Engineering	g		
Courses				
Title		Тур	Hrs/wk	CP
Design of Foundations and Retaining Wa	alls (L0601)	Lecture	2	2
Design of Foundations and Retaining Wa	alls (L0602)	Recitation Section (large)	1	1
Steel Structures in Foundation and Hydr	aulic Engineering (L1146)	Lecture	2	3
Underground Constructions (L0707)		Lecture	1	2
Underground Constructions (L1811)		Recitation Section (large)	1	1
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	None			
Recommended Previous	Modules from Bachelor studies Civil and environmental e	engineering:		
Knowledge	• October in the			
	Geotechnics I-II			
	Steel Structures I-II			
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge				
	knowledge of steel and ground engineering as well as constructions knowledge concerning quay walls. Futhermore, the students get all th		the students get all the	
	neccessary knowledge to design singular construction elements for sheet pile walls and they know how to choose the right construction element			
	depending on the influencing conditions.			
Skills	Basic knowledge of tunnel design as well as practical s	kills in structural tunnel analysis. Furthermore	e, the students are a	able to dimension shee
	pile wall construction regarding all construction elements, to choose the suitable construction elements with respect to the influencing conditions, to			
	design all kinds of sheet pile walls (wave sheet pile walls and combined sheet pile walls) and to dimension all construction elements			
	connections.	. ,		
Personal Competence				
Social Competence	Capacity for teamwork concerning project management a	and design of tunnels.		
Autonomy	Promotion of independent and creative work flow in the framework of a design exercise.			
Workload in Hours	Independent Study Time 82, Study Time in Lecture 98			
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering:	Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineeri	ng: Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Co	ompulsory		
	International Management and Engineering: Specialisation	on II. Civil Engineering: Elective Compulsory		

Course L0601: Design of Foundations and Retaining Walls	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	NN
Language	DE
Cycle	WiSe
Content	Design of foutings and foundations
Literature	Handouts

Course L0602: Design of Foundations and Retaining Walls	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	NN
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



ourse L1146: Steel Structures in Foundation and Hydraulic Engineering	
	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Frank Feindt
Language	DE
Cycle	WiSe
Content	
Literature	

Course L0707: Underground Cons	tructions	
Тур	Lecture	
Hrs/wk		
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Marius Milatz	
Language	DE	
Cycle	WiSe	
Content	 Definitions Historical development in tunneling Geology for tunneling Hard rock tunneling (construction composite and machines) Tunnelung in temporarly stable soil with conventional construction methods Tunneling in soft soils (form of supports, shield types, compressed air application) Pipe jacking Tunnel Lining, tunnel supporting structures Calculation approaches for supporting structures in shield-driven tunnels Surveying for tunneling Safety requirements Construction Contract Literature and sources 	
Literature	Vorlesung/Übung s. www.tu-harburg.de/gbt	

Course L1811: Underground Constructions	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Marius Milatz
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Module M0965: Study Wo	rk Structural Engineering			
Courses				
Title		Тур	Hrs/wk	СР
Module Responsible	Dozenten des SD B			
Admission Requirements	none			
Recommended Previous	Subjects of the Structural Engineering specialisation.			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following part successfully.	owing learning results		
Professional Competence				
Knowledge	The students are able to demonstrate their detailed knowled	lge in the field of structural and co	nstruction engineering. They c	an exemplify the stat
	of technology and application and discuss critically in the co	ntext of actual problems and gene	ral conditions of science and s	ociety.
	The students can develop solving strategies and approaches for fundamental and practical problems in structural and construction engineering			
	They may apply theory based procedures and approaches to fundamental and practical problems in structural and construction engineering.			
	Scientific work techniques that are used can be described an	nd critically reviewed.		
Skills	The students are able to independently select methods for the	ne project work and to justify this c	hoice. They can explain how th	ese methods relate t
	the field of work and how the context of application has to be	adjusted. General findings and fu	irther developments may esser	ntially be outlined.
Personal Competence				
Social Competence	The students are able to condense the relevance and the s	tructure of the project work, the w	ork steps and the sub-problem	ns for the presentatio
	and discussion in front of a bigger group. They can lead the	discussion and give a feedback or	n the project to their colleagues	5.
Autonomy	The students are capable of independently planning and do	cumenting the work steps and pro	cedures while considering the	given deadlines. Th
,	includes the ability to accurately procure the newest scienti	• • •	÷	•
	progress of the work, and to accomplish results on the state	of the art in science and technolog	ıy.	
Workload in Hours	Independent Study Time 180, Study Time in Lecture 0			
Credit points	6			
Examination	Project (accord. to Subject Specific Regulations)			
Examination duration and scale	see FSPO			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Co	mpulsory		
Curricula				



	Fopics in Civil Engineering			
Courses				
litle		Тур	Hrs/wk	CP
Design of Concrete Strucutures (L1840)	Lecture	2	2
Design of Prefabricated Concrete Struc	tures (L0596)	Lecture	1	1
Design of Prefabricated Concrete Struc	tures (L0597)	Recitation Section (large)	1	1
Forum I - Geotechnics and Constructio	n Management (L1634)	Seminar	1	1
Forum II - Geotechnics and Construction	n Management (L1635)	Seminar	1	1
Hydraulic applications of geosynthetics	(L0380)	Lecture	1	2
Fimber Structures (L1151)		Seminar	2	2
Glass Structures (L1152)		Lecture	2	2
Glass Structures (L1447)		Recitation Section (large)	1	1
Module Responsible	NN			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following the students have reached the following the students have reached the students h	owing learning results		
Professional Competence				
Knowledge				
	 Students are able to find their way through selected special areas within civil and structural engineering. 			
	dures in selected special areas of civil and	elected special areas of civil and structural engineering.		
	Students are able to interrelate scientific and technical knowledge.			
Skills				
on the	 Students are able to apply basic methods in selected 	areas of civil and structural engineering.		
Personal Competence				
Social Competence				
Autonomy				
	 Students can chose independently, in which fields th 	ey want to deepen their knowledge and sk	ills through the elect	ion of courses.
Workload in Hours	Depends on choice of courses			
Credit points	6			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Ele	ctive Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering:			
	Civil Engineering: Specialisation Coastal Engineering: Elect			
	5 9 -F 9			
Course L1840: Design of Concret	e Strucutures			
-	Lecture			
Hrs/wk				
111.3/ WK	-			

Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Mündliche Prüfung
Examination duration and scale	
Lecturer	NN
Language	DE
Cycle	WiSe
Content	
Literature	



Typ Lecture				
Hrs/wk	1			
CP				
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14			
Examination Form	Klausur			
Examination duration and scale	60 min			
Lecturer	Prof. Günter Rombach			
Language	DE			
Cycle	WiSe			
Content	application and advantages and disadvantages of precast concrete structures			
	 basics of design - precast element production - construction - tolerances 			
	elements of a warehouse			
	design of a beam - joints			
	design of D-regions: half joints, corbels, openings			
	 slab types - walls - facades 			
	footings: pocket and block foundations			
	joints - connections			
	shear design of the interface between concrete cast at different times			
	unreinforced concrete structures			
Literature	Bachmann H., Steinle A.; Hahn V.: Bauen mit Betonfertigteilen. Betonkalender 2009, Teil I, Verlag Ernst & Sohn, Berlin			
	 Bacimani H., Steine A., Hann V., Bateri nin betomengtenen. Betomkalender 2009, Tein, Venag Ernst & Sonn, Benn Bindseil P.: Stahlbetonfertigteile. Werner Verlag, 1998 			
	 FIP: FIP Handbuch f ür Planung und Entwerfen von Fertigteilbauten (siehe Zeitschrift: Beton- und Fertigteiltechnik ab 3/1996) 			
	 Bergmeister K.: Konstruieren von Fertigteilen. Betonkalender 2005 Teil 2, S. 163-240 			
	 Reineck KH.: Modellierung der D-Bereiche von Fertigteilen. Betonkalender 2005 Teil 2, S. 241-296 			
	 Graubner CA. et. al.: Bemessung von Fertigteilen nach DIN 1045-1. Betonkalender 2005 Teil 2, S. 297-374 			
	Broschüren der Fachvereinigung Deutscher Betonfertigteilbau e.V.			
	siehe: www.fdb-fertigteilbau.de			
	www.systembauweise.de			

Course L0597: Design of Prefabricated Concrete Structures		
Тур	Recitation Section (large)	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Examination Form	Klausur	
Examination duration and scale	Siehe korrespondierende Vorlesung	
Lecturer	Prof. Günter Rombach	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L1634: Forum I - Geotechnics and Construction Management		
Тур	Seminar	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Examination Form	Mündliche Prüfung	
Examination duration and scale	30 min	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	WiSe	
Content	Lectures about projects and issues with practical and scientific relevance.	
Literature		



Course L1635: Forum II - Geotechnics and Construction Management

Тур	Seminar
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Mündliche Prüfung
Examination duration and scale	30 min
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	SoSe
Content	Lectures about projects and issues with practical and scientific relevance.
Literature	

Course L0380: Hydraulic application	ons of geosynthetics
Тур	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Examination Form	Klausur
Examination duration and scale	30 min
Lecturer	Dr. Michael Heibaum
Language	DE
Cycle	SoSe
	In the earthworks many geotechnical structures have to be realized with the help of geosynthetics nowadays. In particular, they are used in areas where the interaction between water and soil occur to seal. protect, separate, filter, pack or drain. Depending on the construction task geosynthetics are used with specifically chosen properties which are verified by special tests. In lecture materials, areas, construction methods and testing methodes will be taught.
	 Vorlesungsbegleitende Unterlagen, s. www.tuhh.de/gbt Monographien: Karl Josef Witt, Hrsg. (2009): Grundbau-Taschenbuch Teil 2, 7. Auflage;: Geotechnische Verfahren; Abschnitt 2.12 Geokunststoffe in der Geotechnik und im Wasserbau S.737-834, Berlin: Ernst&Sohn Robert M. Koerner (2012): Designing with geosynthetics 6th Ed. Vol. 1+2; Bloomington: Xlibris Sanjay Kumar Shukla, Ed. (2005): Handbook of Geosynthetic Engineering, Geosynthetics and their appli-cations, 2nd Ed.; London: ICE Publishing Zeitschriften: Official Journal of the INTERNATIONAL GEOSYNTHETICS SOCIETY Geotextiles and Geomembranes, Elsevier, Amsterdam Geosynthetics International (nur online), Thomas Telford Ltd, London

Course L1151: Timber Structures	
Тур	Seminar
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Kolloquium
Examination duration and scale	90 min
Lecturer	Prof. Torsten Faber
Language	DE
Cycle	WiSe
Content	
Literature	



Course L1152: Glass Structures			
Тур	Lecture		
Hrs/wk			
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Examination Form	Klausur		
Examination duration and scale	60 min		
Lecturer	Marvin Matzik		
Language	DE		
Cycle	WiSe		
Content	Glass structures		
	- Introduction of the material glass (production, refinement, material characteristic)		
	design of facades		
	facade types		
	- static calculation of glazing		
	- static calculation of facades		
	- load bearing behavior of glazing (plate or membrane stiffness)		
	- vertical / horizontal glazing with safety-related requirements		
	- glass structures		
	- fire safety of glass facades		
	- construction physics of facades and glazing		
Literature			

Course L1447: Glass Structures	
Тур	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Klausur
Examination duration and scale	60 min
Lecturer	Marvin Matzik
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Module M0997: Structural	Analysis - Selected Topics			
Courses				
Title		Тур	Hrs/wk	CP
Plates and Shells (L1199)		Lecture	2	2
Nonlinear Analysis of Frame Structure (L1200)	Lecture	2	2
Nonlinear Analysis of Frame Structure (L1201)	Recitation Section (large)	2	2
Module Responsible	Prof. Uwe Starossek			
Admission Requirements				
Recommended Previous	Mechanics I/II, Mathematics I/II, Differential E	quations I		
Knowledge				
Educational Objectives	After taking part successfully, students have	reached the following learning results		
Professional Competence				
Knowledge	After successful completion of this module, students can explain selected elements of higher structural analysis.			
Skills				
	After successful completion of this module	, the students are able to assess the premises and th	e applicability of the	presented methods
	-	to use these methods for performing structural analyses.		
Personal Competence				
Social Competence				
Autonomy	The students have the opportunity to volunta	rily and independently work homework problems.		
Workload in Hours	Independent Study Time 96, Study Time in L	ecture 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural E	Engineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnic	cal Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal En	gineering: Elective Compulsory		

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Course 11100, Distance and Shelle		
Course L1199: Plates and Shells		
	Lecture	
Hrs/wk		
CP		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dr. Marco Schürg	
Language	DE	
Cycle	WiSe	
Content	Theory of plates loaded in-plane	
	Governing equations (equilibrium, kinematics, constitutive law)	
	Differential equation	
	Airy stress function	
	Plane stress / plane strain	
	Structural behaviour of plates loaded in-plane	
	Theory of plates in bending	
	Governing equations (equilibrium, kinematics, constitutive law)	
	Differential equation	
	Navier solution / Fourier series expansion	
	Approximation procedures	
	Structural behaviour of plates in bending	
	Shell theory	
	Phenomenona of the structural behaviour of shells	
	Membrane and bending theory	
	Equilibrium equations of shells of revolution	
	Stress resultants and deformations of the spherical shell, the half spherical shell, and the cylindrical shell	
	Stability problems (overview)	
	Plate buckling	
	Shell buckling	
Literature		
	Basar, Y.: Krätzig, W.B. (1985): Mechanik der Flächentragwerke. Vieweg-Verlag, Braunschweig, Wiesbaden	
	Girkmann, K. (1963): Flächentragwerke, Springer Verlag, Wien, 1963, unveränderter Nachdruck 1986	
	Zienkiewicz, O.C. (1977): The Finite Element Method in Enginieering Science. McGraw-Hill, London	

Course L1200: Nonlinear Analysis of Frame Structure		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Uwe Starossek	
Language	DE	
Cycle	WiSe	
Content	-Types of nonlinearity	
	-relevance of nonlinear effects on structural analysis	
	-comparison and classification of 1 st order theory, 2 nd order theory and 3 rd order theory with regard to the coverage of geometric nonlinearity	
	-fundamentals of 2 nd order elasticity theory for frame structures	
	-application of 2 nd order elasticity theory using finite elements: common displacement method	
	-fundamentals of analytical application of 2 nd order elasticity theory: derivation and solution of differential equation	
	-structurally applied methods of analytical application of 2 nd order elasticity theory: common displacement method using analytical stiffness matrix, slope-deflection method for sway and non-sway frame structures, consideration of imperfections	
	1 st order plastic hinge theory	
Literature	Rothert, H.; Gensichen, V. (1987): Nichtlineare Stabstatik. Springer Verlag, Berlin	



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Course L1201: Nonlinear Analysis of Frame Structure		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Uwe Starossek	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Thesis

Courses	
litle	Typ Hrs/wk CP
Module Responsible	Professoren der TUHH
Admission Requirements	
	According to General Regulations §24 (1):
	At least 126 ECTS credit points have to be achieved in study programme. The examinations board decides on exceptions.
Recommended Previous	
Knowledge	
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	• The students can use specialized knowledge (facts, theories, and methods) of their subject competently on specialized issues.
	• The students can explain in depth the relevant approaches and terminologies in one or more areas of their subject, describing curr
	developments and taking up a critical position on them.
	• The students can place a research task in their subject area in its context and describe and critically assess the state of research.
Chille	The students are able:
Skills	
	• To select, apply and, if necessary, develop further methods that are suitable for solving the specialized problem in question.
	• To apply knowledge they have acquired and methods they have learnt in the course of their studies to complex and/or incomple
	defined problems in a solution-oriented way.
	 To develop new scientific findings in their subject area and subject them to a critical assessment.
Personal Competence	
Social Competence	Students can
	 Both in writing and orally outline a scientific issue for an expert audience accurately, understandably and in a structured way.
	• Deal with issues competently in an expert discussion and answer them in a manner that is appropriate to the addressees while uphold
	their own assessments and viewpoints convincingly.
Autonomy	Students are able:
	 To structure a project of their own in work packages and to work them off accordingly.
	• To work their way in depth into a largely unknown subject and to access the information required for them to do so.
	To apply the techniques of scientific work comprehensively in research of their own.
Workload in Hours	Independent Study Time 900, Study Time in Lecture 0
Credit points	30
	according to Subject Specific Regulations
Examination duration and scale	see FSPO
Assignment for the Following	Civil Engineering: Thesis: Compulsory
Curricula	Bioprocess Engineering: Thesis: Compulsory
	Chemical and Bioprocess Engineering: Thesis: Compulsory
	Computer Science: Thesis: Compulsory
	Electrical Engineering: Thesis: Compulsory Energy and Environmental Engineering: Thesis: Compulsory
	Energy Systems: Thesis: Compulsory
	Environmental Engineering: Thesis: Compulsory
	Aircraft Systems Engineering: Thesis: Compulsory
	Global Innovation Management: Thesis: Compulsory
	Computational Science and Engineering: Thesis: Compulsory
	Information and Communication Systems: Thesis: Compulsory
	International Production Management: Thesis: Compulsory
	International Management and Engineering: Thesis: Compulsory Joint European Master in Environmental Studies - Cities and Sustainability: Thesis: Compulsory
	Logistics, Infrastructure and Mobility: Thesis: Compulsory
	Materials Science: Thesis: Compulsory
	Mechanical Engineering and Management: Thesis: Compulsory
	Mechatronics: Thesis: Compulsory
	Biomedical Engineering: Thesis: Compulsory
	Microelectronics and Microsystems: Thesis: Compulsory
	Product Development, Materials and Production: Thesis: Compulsory
	Renewable Energies: Thesis: Compulsory
	Naval Architecture and Ocean Engineering: Thesis: Compulsory



	Ship and Offshore Technology: Thesis: Compulsory
	Theoretical Mechanical Engineering: Thesis: Compulsory
	Process Engineering: Thesis: Compulsory
	Water and Environmental Engineering: Thesis: Compulsory