

Module Manual

Master of Science

Civil Engineering

Cohort: Winter Term 2017

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Program description

Content

Civil engineering deals with the erection of buildings of all kind, in particular of structures like bridges and tunnels, structures in hydraulic engineering, water supply, waste and waste water disposal, harbour construction, streets, hall construction, as well as industrial and housing construction, including refurbishment. The master program civil engineering gives graduates the qualification to process difficult projects in the construction practice, including the necessary competences in business and management. Buildings arise by the cooperation of owners, planning offices, contractors, environment, politicians and society. Civil engineering is located in the field between technical and economic constraint, political will and legal conditions. The master program prepares for that. The master program also opens the way to doctoral studies and successful research activities, assuming a sufficient diploma.

The master program civil engineering is associated with the bachelor program civil engineering and environmental engineering of the University of Technology Hamburg-Harburg in the sense of a consecutive course of studies. Possible entries from other bachelor programs are based on a catalog of requirements, described in the document "Specific Requirements for the Master Program Civil Engineering".

Career prospects

The graduates of the master program civil engineering are prepared for a leading professional activity in planning offices, at building contractors, building authorities, owners of major immovables and infrastructure, producers of building products, material testing institutions and in research facilities. It aims at activities in extensive and difficult projects, or in research and development. In Germany a great demand exists at this time for civil engineers in particular with good knowledge in structural engineering. The master program is based on this demand.

Learning target

The graduates of the master program civil engineering gain the specialist knowledge and the methods, to plan and erect new buildings, in particular concrete structures, steel structures, structures in water engineering, in foundation engineering, in water supply, waste and waste water disposal, including refurbishment of existing structures. This incorporates the realization of necessary preliminary investigations, the design of structural elements, the development of all necessary proofs and the project management.

The graduates of the master program are able to transfer the acquired knowledge in engineering, mathematics and natural sciences to practical applications and to analyze and solve problems on a scientific basis, even if these are unusual or incompletely defined and comprise complex specifications. The graduates are able to successfully work on research projects in the field of civil engineering. Therefore a comprehensive understanding of the underlying processes and the ability to model and calculate such processes, e.g. with Finite Elements Methods, are necessary.

The graduates for this purpose gain the skills to experimentally determine the necessary properties of soil, materials and components and to deal with construction-specific program systems to calculate mechanical behavior, the hydraulics of systems as well as other physical-chemical processes. They are enabled to work on problems of civil engineering and related disciplines on one's own. They are able to use methods needed for the solution of technical problems and planning procedures. They are able to use new findings in a critical way and to improve methods and new developments.

The graduates can communicate on advanced contents and problems of civil engineering with specialists and the laity. They are able to present their methods and the results of their work in writing and verbally in a comprehensive way. The graduates in addition learn to work on problems in a team in a purposeful way, and to document and present their methods and results understandably with up-to-date presentation methods to other persons. They learn to take the leadership for parts of a project or the whole. They are able to familiarize themselves with a topic and to select suitable methods to solve questions and problems. They are able to acquire the necessary information about a topic on one's own and to put the new information in the context of their knowledge.

The graduates are further qualified to develop concept designs for difficult projects in structural engineering, foundation engineering, bridge design and hydraulic engineering and to plan such constructions under consideration of the available information and restrictions. They can:

- · successfully cooperate with expert und inexpert partners from the public administration, the economy and science,
- autonomously define, plan and conduct scientific tasks and to theoretically or experimentally investigate constructions, ground, materials, infrastructure as well as
 management duties.
- · responsibly evaluate and consider the interests of building partners, people concerned and the society as a whole.

Program structure

The master program consists of modules which 6 ECTS except for the master thesis. It is divided into a "Core Qualification", into the three alternative specializations "Harbor Construction and Coast Protection", "Underground Engineering" and "Structures", as well as the master thesis. The core qualification covers 24 ECTS, each specialization covers 66 ECTS and the master thesis covers 30 ECTS. The program covers 120 ECTS in 2 years with 4 terms in total.

The core qualification contains a module "Finite Elements Methods" as well as a module "Sustainability and Risk Management" in the 1st term. In addition an open module during the 1st, 2nd or 3rd term from the field "Business and Management" as well as a module from the "Nontechnical Elective Complementary Courses for Master" are incorporated. The lectures of these open modules are selected from catalogs that are independent from the specific master program.

Each specialization covers 42 ECTS in the compulsory modules, that are indispensable for the specialization, and 24 ECTS in the mandatory electives. They contain also an open module and a project work with of 6 ECTS in each case. The compulsory modules are located in the 1st and 2nd term.

The 4th term covers the master thesis. In addition lectures of the open module of the specialization can still be attended in the 4th term. The students must select a specialization and they have the choice to elect different options in the field of "Business and Management", in the field of the "Nontechnical Elective Complementary Courses for Master" and in the mandatory electives of the specialization.

A term abroad is possible. In particular the 3rd semester is used by the students to go abroad, because in the 3rd term there are no compulsory modules, but only mandatory electives.



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	Students are capable of acquiring necessary knowledge independently by means of research and preparation of material.
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 M0524: Nontechnical Elective Complementary Courses for Master				
Module Responsible	Module Responsible Dagmar Richter			
Admission Requirements	Admission Requirements None			
Recommended Previous	Recommended Previous None			
Knowledge	Knowledge			
Educational Objectives	Educational Objectives After taking part successfully, students have reached the following learning results			
Professional Competence	Professional Competence			
Knowledge	Knowledge The Nontechnical Academic Programms (NTA)			

imparts skills that, in view of the TUHH's training profile, professional engineering studies require but are not able to cover fully. Self-reliance, selfmanagement, collaboration and professional and personnel management competences. The department implements these training objectives in its teaching architecture, in its teaching and learning arrangements, in teaching areas and by means of teaching offerings in which students can qualify by opting for specific competences and a competence level at the Bachelor's or Master's level. The teaching offerings are pooled in two 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 nontechnical academic programms follow the specific profiling of TUHH degree courses.

The learning architecture demands and trains independent educational planning as regards the individual development of competences. It also 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 semesters. In view of the adaptation problems that individuals commonly face in their first semesters after making the transition from school to university and in order to encourage individually planned semesters abroad, there is no obligation to study these subjects in one or two specific semesters during 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 dealing with interdisciplinarity and a variety of stages of learning in courses are part of the learning architecture and are deliberately encouraged in specific courses

Fields of Teaching

are based on research findings from the academic disciplines cultural studies, social studies, arts, historical studies, communication studies, migration studies and sustainability research, and from engineering didactics. In addition, from the winter semester 2014/15 students on all Bachelor's courses will have 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-oriented 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 differences are reflected in the practical examples used, in content topics that refer to different professional application contexts, and in the higher scientific and

This is also reflected in the different quality of soft skills, which relate to the different team positions and different group leadership functions of 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 area,
- 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 in the 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.

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 sucsessful manner.
- justify their decisions on forms of organization and application in practical questions in contexts that go beyond the technical relationship to 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)
	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.



ents Methods			
	Typ	Hrs/wk	СР
			3
		2	3
Prof. Otto von Estorff			
	echanics II (Hydrostatics Kinematics Dynamics)	
		,	
valuemaise i, ii, iii (iii partieulai eineremai equatiem	5,		
After taking part successfully, students have reached	the following learning results		
	arding the derivation of the finite element met	thod and are able to g	give an overview of the
neoretical and methodical basis of the method.			
The students are capable to handle engineering pro and solving the resulting system of equations.	blems by formulating suitable finite elements, a	ssembling the corresp	onding system matrices
- The students are able to independently solve chall identified and the results are critically scrutinized.	enging computational problems and develop	own finite element rou	tines. Problems can b
Independent Study Time 124, Study Time in Lecture	56		
6			
Written exam			
120 min			
Civil Engineering: Core qualification: Compulsory			
Energy Systems: Core qualification: Elective Comput	Isory		
Aircraft Systems Engineering: Specialisation Aircraft	Systems: Elective Compulsory		
Aircraft Systems Engineering: Specialisation Air Transportation Systems: Elective Compulsory			
Computational Science and Engineering: Specialisa	tion Scientific Computing: Elective Compulsory		
International Management and Engineering: Special	isation II. Mechatronics: Elective Compulsory		
Mechatronics: Core qualification: Compulsory			
Biomedical Engineering: Specialisation Implants and Endoprostheses: Compulsory			
' '	d Endoprostheses: Compulsory		
' '	' '	lsory	
Biomedical Engineering: Specialisation Implants and	nt and Business Administration: Elective Compu		
Biomedical Engineering: Specialisation Implants and Biomedical Engineering: Specialisation Managemen	nt and Business Administration: Elective Compu hnology and Control Theory: Elective Compulso	ory	
Biomedical Engineering: Specialisation Implants and Biomedical Engineering: Specialisation Managemen Biomedical Engineering: Specialisation Medical Tecl	nt and Business Administration: Elective Compu hnology and Control Theory: Elective Compulsor ans and Regenerative Medicine: Elective Comp	ory	
Biomedical Engineering: Specialisation Implants and Biomedical Engineering: Specialisation Managemen Biomedical Engineering: Specialisation Medical Tecl Biomedical Engineering: Specialisation Artificial Org.	nt and Business Administration: Elective Compu hnology and Control Theory: Elective Compulso ans and Regenerative Medicine: Elective Comp re qualification: Compulsory	ory	
Biomedical Engineering: Specialisation Implants and Biomedical Engineering: Specialisation Managemen Biomedical Engineering: Specialisation Medical Tecl Biomedical Engineering: Specialisation Artificial Org. Product Development, Materials and Production: Con	nt and Business Administration: Elective Compu hnology and Control Theory: Elective Compulso ans and Regenerative Medicine: Elective Comp re qualification: Compulsory Science: Elective Compulsory	ory	
FINAN A THE TA	Prof. Otto von Estorff Inone Mechanics I (Statics, Mechanics of Materials) and Mathematics I, II, III (in particular differential equation After taking part successfully, students have reached The students possess an in-depth knowledge regalencertical and methodical basis of the method. The students are capable to handle engineering profine and solving the resulting system of equations. The students are able to independently solve chall dentified and the results are critically scrutinized. The students are able to independently solve chall dentified and the results are critically scrutinized. Written exam 20 min Divil Engineering: Core qualification: Compulsory Energy Systems: Core qualification: Elective Compulational Systems Engineering: Specialisation Air Transcomputational Science and Engineering: Specialisation ternational Management and Engineering: Specialisation enternational Management and Engineering: Specialisation.	Typ Lecture Recitation Section (large) Prof. Otto von Estorff frome Alechanics I (Statics, Mechanics of Materials) and Mechanics II (Hydrostatics, Kinematics, Dynamics Alathematics I, II, III (in particular differential equations) After taking part successfully, students have reached the following learning results The students possess an in-depth knowledge regarding the derivation of the finite element metheoretical and methodical basis of the method. The students are capable to handle engineering problems by formulating suitable finite elements, a land solving the resulting system of equations. The students are able to independently solve challenging computational problems and develop dentified and the results are critically scrutinized. The students are able to independently solve challenging computational problems and develop dentified and the results are critically scrutinized. The students are able to independently solve challenging computational problems and develop dentified and the results are critically scrutinized. The students are able to independently solve challenging computational problems and develop dentified and the results are critically scrutinized. The students are able to independently solve challenging computational problems and develop dentified and the results are critically scrutinized. The students are able to independently solve challenging computational Problems and develop dentified and the results are critically scrutinized. The students are able to independently solve challenging computational Science and Engineering: Specialisation Air Transportation Systems: Elective Compulsory computational Management and Engineering: Specialisation II. Mechatronics: Elective Compulsory international Management and Engineering: Specialisation II. Mechatronics: Elective Compulsory international Management and Engineering: Specialisation Scientific Computing: Elective Compulsory international Management and Engineering: Specialisation Scientific Computing: Elective Compulsory interna	Typ Hrswkk Lecture 2 Recitation Section (large) 2 Prof. Otto von Estorff Income Adhermatics I, III, III (in particular differential equations) Atter taking part successfully, students have reached the following learning results The students possess an in-depth knowledge regarding the derivation of the finite element method and are able to go neoretical and methodical basis of the method. The students are capable to handle engineering problems by formulating suitable finite elements, assembling the correspond solving the resulting system of equations. The students are able to independently solve challenging computational problems and develop own finite element roundentified and the results are critically scrutinized. The students are able to independently solve challenging computational problems and develop own finite element roundentified and the results are critically scrutinized. The students are able to independently solve challenging computational problems and develop own finite element roundentified and the results are critically scrutinized. The students are able to independently solve challenging computational problems and develop own finite element roundentified and the results are critically scrutinized. The students are able to independently solve challenging computational problems and develop own finite element roundentified and the results are critically scrutinized. The students are able to independently solve challenging computational problems and develop own finite element roundentified and the results are critically scrutinized.



Course L0291: Finite Element Methods				
Тур	Typ Lecture			
Hrs/wk				
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	Typ Recitation Section (large)			
Hrs/wk	2			
CP	CP 3			
Workload in Hours	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	e following learning results		
Professional Competence				
Knowledge	Students are able to describe single techniques and to	give an overview for the field of safety and	d risk assessment as we	II as environmental and
	sustainable engineering, in detail:			
	 basics in safety and reliability of technical faciliti 			
		es		
	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-orient		ainability reporting. They	can evaluate the effort
	and costs for processes and select economically feasib	le treatment concepts.		
Personal Competence				
Social Competence				
Autonomy	Students can gain knowledge of the subject area from	given sources and transform it to new que	estions. Furthermore, the	ey can define targets for
	new application or research-oriented duties in for risk	management and sustainability concepts	accordance with the po-	tential 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	tion II Civil Engineering: Floative Commule	on.	
Curricula	International Management and Engineering: Specialisa			
	Product Development, Materials and Production: Specia		mpulsory	
	Product Development, Materials and Production: Specia			
	Product Development, Materials and Production: Specia			
	Water and Environmental Engineering: Core qualification	on: Compulsory		

Course L1145: Safety, Reliability and Risk Assessment						
Тур	Typ 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					
	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 Sustainability				
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 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 (L04)	'	Recitation Section (large)	1	2
Module Responsible				
Admission Requirements	None			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge				
Skills	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 Enginee	ring: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engi	neering: Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	ng: Compulsory		
	International Management and Engineering: Specia	lisation II. Civil Engineering: Elective Compulsory		

Course L0499: Soil Laboratory Co	urse	
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	Lecture	
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	ourse 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 M0858: Coastal Hydraulic Engineering I				
Courses				
Title		Тур	Hrs/wk	СР
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	Basics of hydraulic engineering, hydrology and hydromechan	ics		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the follow	wing learning results		
Professional Competence				
Knowledge	The students are able to define and explain the basic concep	ts of coastal engineering and port engi	neering. They are ab	le to apply the concepts
	to selected practical problems of coastal engineering. Stud-	ents can define and determine the base	sics for design and o	dimensioning of coastal
	engineering constructions.			
Skills	The students are capable to apply basic design approaches to	selected and pre-defined design tasks	in coastal engineerir	ng.
Personal Competence				
Social Competence	The students are able to deploy their gained knowledge in ag	oplied problems such as the design of c	coastal protection stru	ctures. Additionaly, they
	will be able to work in team with engineers of other disciplines	s, for instance designing of coastal break	kwaters.	
Autonomy	The students will be able to independently extend their knowledge.	edge and applyit to new problems.		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 2 hours. The examination	includes tasks with respect to the gene	ral understanding of t	the lecture contents and
	calculations tasks.			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elec	tive Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: 0	Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Comp	ulsory		
	International Management and Engineering: Specialisation II.	Civil Engineering: Elective Compulsory	,	

Course L0807: Basics of Coastal Engineering	
	Lecture
Hrs/wk	
СР	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



Module M0964: Structures	s in Foundation and Hydraulic Engi	neering		
Courses				
Title		Тур	Hrs/wk	СР
Steel Structures in Foundation and Hydro	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 enviror	nmental engineering:		
Knowledge	a Cantachaire III			
	Geotechnics I-II Steel Structures I II			
	Steel Structures I-II			
Educational Objectives	After taking part successfully, students have read	ched the following learning results		
Professional Competence				
Knowledge				
	knowledge of steel and ground engineering a	s well as constructions knowledge concerning q	uay walls. Futhermore,	the students get all th
	neccessary knowledge to design singular const	ruction elements for sheet pile walls and they know	w how to choose the rig	ht construction elemen
	depending on the influencing conditions.			
Skills	Basic knowledge of tunnel design as well as practical skills in structural tunnel analysis. Furthermore, the students are able to dimension she			
	pile wall construction regarding all constrution e	lements, to choose the suitable construction elements	ents with respect to the i	nfluencing conditions,
	design all kinds of sheet pile walls (wave she	eet pile walls and combined sheet pile walls) ar	nd to dimension all co	nstruction elements an
	connections.			
Personal Competence				
Social Competence	Capacity for teamwork concerning project mana	gement and design of tunnels.		
Autonomy	Promotion of independent and creative work flow	w in the framework of a design exercise.		
Workload in Hours	Independent Study Time 124, Study Time in Led	ture 56		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Engi	neering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical E	Engineering: Compulsory		
	Civil Engineering: Specialisation Coastal Engine	eering: Compulsory		
	International Management and Engineering: Sp	ecialisation II. Civil Engineering: Elective Compuls	ory	

Course L1146: Steel Structures in	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	Design of a sheet pile wall, design of a combined sheet pile wall, piles, walings, connections, fatigue		
Literature	EAU 2012, EA-Pfähle, EAB		



Course L0707: Underground Constructions		
Тур	ecture	
Hrs/wk	1	
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 Cons	ourse 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 M0511: Electricity	Generation from Wind and Hydro Power			
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) Wind Energy Use - Focus Offshore (L00	112)	Lecture Lecture	2 1	3 1
Module Responsible		Lecture	1	'
Admission Requirements	none			
Recommended Previous				
Knowledge	Module: Technical Thermodynamics I,			
Knowleage	Module: Technical Thermodynamics II,			
	Module: Fundamentals of Fluid Mechanics			
Educational Objectives	After taking part successfully, students have reached the f	ollowing learning results		
Professional Competence				
Knowledge	By ending this module students can explain in detail kno	wledge of wind turbines with a particular f	ocus of wind energy us	se in offshore conditions
_	and can critical comment these aspects in consideration	of current developments. Furthermore, the	y are able to describe f	undamentally the use o
	water power to generate electricity. The students reprodu	ce and explain the basic procedure in the	e implementation of ren	ewable energy projects
	in countries outside Europe.			
	The same and the s		ale e in come de make a edito en ene	
	Through active discussions of various topics within the s		their understanding an	id the application of the
	theoretical background and are thus able to transfer what	they have learned in practice.		
Skills	Students are able to apply the acquired theoretical found	dations on exemplary water or wind powe	r systems and evaluate	and assess technically
	the resulting relationships in the context of dimensionir	ng and operation of these energy system	ns. They can in compa	are critically the special
	procedure for the implementation of renewable energy p	rojects in countries outside Europe with th	e in principle applied a	approach in Europe and
	can apply this procedure on exemplary theoretical project	s.		
Personal Competence				
Social Competence	Students can discuss scientific tasks subjet-specificly and	multidisciplinary within a seminar.		
Autonomy	Students can independently exploit sources in the contex	t of the emphasis of the lecture material to	clear the contents of th	e lecture and to acquire
	the particular knowledge about the subject area.			
Washland in Hausa	Independent Childry Time 110 Childry Time in Leature 70			
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:			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering			
	Civil Engineering: Specialisation Coastal Engineering: El			
	Energy and Environmental Engineering: Specialisation E			
	International Management and Engineering: Specialisation	= -		
	International Management and Engineering: Specialisation		-	у
	Product Development, Materials and Production: Speciali Product Development, Materials and Production: Speciali	•	iipui50i y	
	Product Development, Materials and Production: Speciali Product Development, Materials and Production: Speciali	' '		
	Renewable Energies: Core qualification: Compulsory	sanon materials. Liective Compuisory		
	Process Engineering: Specialisation Environmental Process	ess Engineering: Elective Compulsory		
	Water and Environmental Engineering: Specialisation En			
	Water and Environmental Engineering: Specialisation Cit			
		SS. 2.SOUVO COMPAISORY		



Course L0014: Renewable Energy Project is Emerged Markets Hrswk 1 CP 1 Workload in Hours Independent Study Time 16, Study Time in Lecture 14 Lecture Dr. Andreas Miese Language DE Content 1 1. Introduction		
Morkload in Hours Lacturer Language DE Gycle Sosse Context 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 Teuring and financing instruments for EE projects in new markets Overview funding apportunitie Overview countries with feed in laws Major funding programs A. CDM projects—with, how, examples Overview CDM process Examples Future market for EE Future future future market for EE Future future market for EE Future future future future market for EE Future	3,	
Workload in Hours Independent Study Time 16, Study Time in Lecture 14	Тур	Project Seminar Project Seminar
Workload in Hours Lecture: Language DE Cycle SoSe Content 1. Introduction Development of renewable energies worldwide Future markets Special challenges in new markets - Overview 2. Sample project wind farm Korea Survey Technical Description Project phases and characteristics Special dinaring opportunitie Overview funding opportunitie Overview countries with feed in laws Major funding programs 4. CDM projects - why, how, examples Overview CDM process Examples Ex	Hrs/wk	1
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 7. Selected projects from the perspective of a development bank - Wesley Urena Vargas, KfW Development Bank Geothermal Wind or CSP 		
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Wind or CSP		
		Wind or CSP
Within the seminar, the various topics are actively discussed and applied to various cases of application.		Within the seminar, the various topics are actively discussed and applied to various cases of application.
Literature Folien der Vorlesung	Literature	Folien der Vorlesung

0 10040 11 1 B 11	
Course L0013: Hydro Power Use	
Тур	Lecture
Hrs/wk	1
СР	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 M1351: Construct	ion Processes			
Courses				
Title		Тур	Hrs/wk	СР
Building Information Modelling (L1908)		Lecture	2	2
Lean Construction (L1910)		Lecture	2	2
System Dynamics (L1909)		Lecture	2	2
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	None			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reach	ed the following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture	e 84		
Credit points	6			
Examination	Oral exam			
Examination duration and scale	15 min			
Assignment for the Following	Civil Engineering: Specialisation Coastal Engineer	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical En	gineering: Elective Compulsory		
	Civil Engineering: Specialisation Structural Engine	eering: Elective Compulsory		

Course L1908: Building Informatio	Course L1908: Building Information Modelling		
Тур	Lecture		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	NN		
Language	DE		
Cycle	SoSe		
Content			
Literature			

Course L1910: Lean Construction		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dozenten des SD B	
Language	DE	
Cycle	SoSe	
Content		
Literature		

Course L1909: System Dynamics		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dozenten des SD B, Dozenten des Studiengangs	
Language	DE	
Cycle	SoSe	
Content		
Literature		



Mandala MOSOO Dadidia a N	Astonials and Duilding Duranastics			
Module M0593: Building N	Materials and Building Preservation			
Courses				
Title		Тур	Hrs/wk	СР
Anchor Technology and Design, Post In	stalled 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		Recitation Section (small)	1	1
Transport Processes in Building Materia	Prof. Frank Schmidt-Döhl	Lecture	ı	I
Admission Requirements	None	ding physics and huilding shapping, for system but the	a a madulas Drinain	les of Building Mater
		ding physics and building chemistry, for example by the	ie modules Princip	ies of building Maler
Knowledge	and Building Physics and Building Materials and	Building Chemistry.		
Educational Objectives	After taking part successfully, students have read	ched the 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 th 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, to assess possible causes, to use the fundamentals of construction preservation and to select repair and strengthening measures.			
Personal Competence				
Social Competence				
Autonomy	The students are able to responsibly use the resources of materials and lab equipment for their project and to investigate and to get missing components.			
Workload in Hours	Independent Study Time 96, Study Time in Lectu	ire 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Geotechnical E	ingineering: Compulsory		
Curricula	Civil Engineering: Specialisation Coastal Engine	eering: Elective Compulsory		
	Civil Engineering: Specialisation Structural Engir	neering: Elective Compulsory		

Course L0257: Anchor Technolog	y and Design, Post Installed Rebar Connections
Тур	Recitation Section (small)
Hrs/wk	1
СР	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	
СР	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
СР	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	



Module M0723: Design of	Prestressed Structures and Concrete Br	ridges		
Courses				
Title		Тур	Hrs/wk	СР
Design of Prestressed Structures and C	Concreet Bridges (L0603)	Lecture	3	4
Design of Prestressed Structures and C	oncreet Bridges (L0604)	Recitation Section (large)	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	None			
Recommended Previous	Detailed knowledge on the design of concrete structure	S.		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	e 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 explain			thods. They can explain
	the design of a prestressed bridge.			
Skills	The students are able to design reinforced or prestressed concrete bridges.			
Personal Competence				
Social Competence	The students can design in teamwork a real concrete by	ridge.		
Autonomy	The students are able to design a prestressed concrete	bridge and discuss the problems and results w	ith 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	g: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineer	ering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering:	Elective Compulsory		
	International Management and Engineering: Specialisa	tion II. Civil Engineering: Elective Compulsory		



Course L0603: Design of Prestres	sed Structures and Concreet Bridges
Тур	Lecture
Hrs/wk	3
СР	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 • 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 Mech	anics and -Dynamics			
Courses				
Γitle		Тур	Hrs/wk	СР
Soil Mechanics - Selected Topics (L037	4)	Lecture	2	2
Soil Dynamics (L0452)		Lecture	3	2
experimental Researches in Geotechnic	cs (L0706)	Laboratory Course	1	2
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	none			
Recommended Previous	modules: Mathematics I-III, Mechanics I-II, Geo	etechnics I		
Knowledge	accuracy Cail laboratow accuracy (Applied atmos	truel due encice)		
	courses: Soil laboratory course, (Applied struct	tural dynamics)		
Educational Objectives	After taking part successfully, students have re	ached the following learning results		
Professional Competence				
Knowledge	After the successful completion of the module t	the students should be able to:		
	to derive and to apply the basic equation			
	 to understand the wave propagation in the soil under dynamic excitation and to detect the relevant parameters, to know the essential laboratory and field tests to determine soil dynamic characteristics and to evaluate them, 			
	to design machine foundations to dynamic load, to measure shocks to perform vibration forecast, to evaluate shocks in term to their effect on people and buildings,			
	to evaluate possibilities of isolation,	a authorization and arrativate anotherization to the state of	magnitude and intensi	
		earthquakes and evaluate earthquake in term of their	-	ıy,
	· ·	e capacity, integrity and the dynamic bedding modulu		actions mathematics
		deformation accumulation due to cyclic loading and to the method of elastodynamics and plastodynamics,	o estimate these deform	ialions malhemalica
	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,		
		esive soils and to consider the effects of creep and rat	e-denendent shear stre	enoth in calculations
	to consider the impact of the partly satu	·	o dopondom onodi odo	gar iir carcaraa ono,
	lo concider the impact of the party sala	nator of a coopage and officer of origin		
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Led	cture 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	150 min			
Assignment for the Following	Civil Engineering: Specialisation Structural En	gineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical			
	Civil Engineering: Specialisation Coastal Engi			

Course L0374: Soil Mechanics - Selected Topics		
Тур	Lecture	
Hrs/wk	2	
СР	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
СР	2
Workload in Hours	Independent Study Time 18, Study Time in Lecture 42
	Dr. Sascha Henke
Language	
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,
	eyclic 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

earches in Geotechnics
Laboratory Course
1
2
Independent Study Time 46, Study Time in Lecture 14
Marius Milatz
DE
SoSe
The students are supposed to:
 become acquainted with geotechnical model tests, field tests and laboratory tests as well as corresponding measurement techniques. These compromise amongst others inclinometer measurements and geophone measurements as well as high-grade laboratory tests on the stress-strain relationship of soil specimens, e. g. triaxial tests, simple shear tests and resonant column tests. gain insight into current soil mechanical research. plan, coordinate, perform and evaluate soil mechanical tests in a team. discuss, reflect, review and present the obtained results in a group. An important learning target is the introduction to scientific work for students who plan a scientific career, and for those who will work in practice with the responsibility to order corresponding tests and evaluate the results. The practical laboratory work is based on annualy changing problems, which are however related to the experience and results of the preceding year's course group.



Module M0807: Boundary	Element Methods			
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 Mechanics	s II (Hydrostatics, Kinematics, Dynamics)		
Knowledge	Mathematics I, II, III (in particular differential equations)			
Educational Objectives	After taking part successfully, students have reached the follo	owing learning results		
Professional Competence	· · · · · · · · · · · · · · · · · · ·			
Knowledge		e derivation of the boundary element meth	nod and are able to	give an overview of th
	theoretical and methodical basis of the method.	•		
Skills	The students are capable to handle engineering problems	by formulating suitable boundary element	ents, assembling the	corresponding syste
	matrices, and solving the resulting system of equations.	,		
Personal Competence				
Social Competence	-			
Autonomy		emputational problems and develop own b	oundary element ro	utines. Problems can I
·	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	90 min	·		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Ele	ctive Compulsory		
Curricula				
	Civil Engineering: Specialisation Coastal Engineering: Elect	ive Compulsory		
	Energy Systems: Core qualification: Elective Compulsory			
	Computational Science and Engineering: Specialisation Sci			
	Mechanical Engineering and Management: Specialisation P		tive Compulsory	
	Mechatronics: Specialisation System Design: Elective Comp	•		
	Product Development, Materials and Production: Core quality Technomathematics: Specialisation III. Engineering Science			
	Technomathematics: Specialisation iii. Engineering Science Technomathematics: Core qualification: Elective Compulsor			
	Theoretical Mechanical Engineering: Core qualification: Elec			
	Theoretical Mechanical Engineering: Technical Complemen			
		,		



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	1	Problem-based Learning	2	3	
Module Responsible					
Admission Requirements	none				
Recommended Previous	Groundwater				
Knowledge	 groundwater hydraulics and transport o 	feuhetaneoe			
	groundwater nydraulics and transport of	substances			
	Pipe Systems				
	Knowledge on urban water infrastructure	es, in particular drinking water systemsand urban dra	inaga ayatama inaludi	ng anacial atrusturas	
	· ·		illage systems includi	ng special structures	
	Hydraulics of drinking water supply systBasic knowledge on water managemer				
	Basic knowledge on water managemen	t			
Educational Objectives	After taking part successfully, students have rea	ached the following learning results			
Professional Competence					
Knowledge	The students are able to describe the modelling of groundwater flow and transport as well as urban water infrastructures. They can carry				
	systems analyses and can detect technical and conceptual weak points within the systems in case studies. Besides they are able to analy				
	interdependencies of hydraulic and toxic pheno	interdependencies of hydraulic and toxic phenomena in soil and water.			
Skille	The students are able to construct and apply s	cientific groundwater models indipendently. They car	work on different sce	narios and can compa	
OKIIIS		ems by application of selected software products. T			
	solutions (e.g. EPANET, EPA-SWMM).	enis by application of selected software products. T	ne students are able	to use unierent sollw	
	Solutions (e.g. EFAINET, EFA-SWIMIN).				
Personal Competence					
Social Competence	Wird nicht vermittelt.				
Autonomy	Wird nicht vermittelt.				
Wanta adia Harra	ladar and at Otala Time 440 Otala Time in La	-t 70			
Workload in Hours	Independent Study Time 110, Study Time in Le	cture 70			
Credit points	6				
Examination	Oral exam				
Examination duration and scale	20 min				
Assignment for the Following	Civil Engineering: Specialisation Structural Eng	, ,			
Curricula	Civil Engineering: Specialisation Geotechnical				
	Civil Engineering: Specialisation Coastal Engir				
	Water and Environmental Engineering: Special				
	Water and Environmental Engineering: Special				
	Water and Environmental Engineering: Special	isation Cities: Elective Compulsory			

Course L0543: Applied Groundwat	Course L0543: Applied Groundwater 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	ourse L0544: Applied Groundwater 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	Cycle SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L0875: Modeling of Water	ourse 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, Weitere Mitarbeiter		
Language	DE		
Cycle	SoSe		
Content			
Literature	Mutschmann/Stimmelmayr: Taschenbuch der Wasserversorgung, 16. Auflage. Springer Vieweg - Verlag. Wiesbaden 2014.		



Module M0828: Urban En	vironmental Management			
Courses				
Title		Тур	Hrs/wk	СР
Noise Protection (L1109)		Lecture	2	2
Urban Infrastructures (L0874)	Do Doughton Doubtonback	Problem-based Learning	2	4
Module Responsible Admission Requirements	Dr. Dorothea Rechtenbach			
Recommended Previous	none			
Knowledge	Knowledge on Urban planning			
Knowleage	 Knowledge on measures for climate protection and 	climate change adaptation		
	Basics knowledge in urban drainage and stormwat	er management		
Educational Objectives	After taking part successfully, students have reached the fo	llowing learning results		
Professional Competence	· · · · · · · · · · · · · · · · · · ·	-		
Knowledge	Students can describe urban development corridors as w	vell as current and future urban environme	ntal problems. They	are able to explain the
Ü	causes of environmental problems (like noise).		,	·
	Students can specify applications for various technical inno	ovations and explain why these contribute to	the improvement of	urban life. They can, for
	example, derive and discuss measures for effective noise a			
Skills	Students are able to develop specific solutions for correct	cting existing or future environment-related	problems of urban	development. They car
	define a range of conceptual and technical solutions for		•	
	environmental problems they can select technical innovation	'		
Personal Competence		•		
Social Competence	The students can work together in international groups.			
Autonomy	Students are able to organize their work flow to prepare	themselves for presentations and contribu	utions to the discuss	ions They can acquire
ridionomy	appropriate knowledge by making enquiries independent	· ·		iono. They barr abquire
	appropriate knowledge by making enquines independent	,.		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Project			
Examination duration and scale	Written Report plus oral Presentation			
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		
	Environmental Engineering: Core qualification: Elective Co	ompulsory		
	Joint European Master in Environmental Studies - Cities at	nd Sustainability: Core qualification: Compu	lsory	
	Logistics, Infrastructure and Mobility: Specialisation Infrastr	ructure and Mobility: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Env	ironment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities	es: 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	Prof. Martin Jäschke
Language	EN
Cycle	SoSe
Content	
Literature	1) Müller & Möser (2013): Handbook of Engineering Acoustics (also available in German)
	2) WHO (1999): Guidelines for Community Noise
	3) Environmental Noise Directive 2002/49/EG
	4) ISO 9613-2 (1996): Acoustics, Attenuation of sound during propagation outdoors, Part 2: General method of calculation



Course L0874: Urban Infrastructures	
Тур	Problem-based Learning
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Dr. Dorothea Rechtenbach
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	Depends on chosen topic.



Module M0859: Coastal H	ydraulic Engineering II			
Courses				
Title		Тур	Hrs/wk	СР
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 follow	owing learning results		
Professional Competence				
Knowledge	The students have the capability to define and explain in de	etail the important aspects of erosion pro-	tection and flood pr	otection and are able to
	apply the aspects to practical coastal protection problems. The	hey are able to design and dimension imp	ortant coastal prote	ction measures from the
	functional and from the constructional point of view.			
Ckilla	The students are able to select design approaches for the	functional and asset stievel decise of a	resion and flood n	vataatian maaayyaa and
SKIIIS	apply these approaches to practical design tasks.	functional and constructional design of e	erosion and flood p	rotection measures and
	apply these approaches to practical design tasks.			
Personal Competence				
Social Competence	The students are able to deploy their gained knowledge in	applied problems such as the functional a	and constructive des	sign of coastal and flood
	protection structures. Additionaly, they will be able to work in	team with engineers of other disciplines.		
Autonomy	The students will be able to independently extend their know	rledge and apply it to new problems.		
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 130 min. The examination	n includes tasks with respect to the genera	al understanding of	the lecture contents and
	calculations tasks.			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Ele-	ctive Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering:	Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Comp	pulsory		

Course L0808: Coastal- and Flood	Protection
Тур	Lecture
Hrs/wk	2
СР	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 Constructions perpendicular to the coast 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	ourse 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	Cycle SoSe	
Content	See interlocking course	
Literature	See interlocking course	

Course L1411: Maintennance and	ourse 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	



Module M0860: Harbour E	Engineering and Harbour Planning	l de la companya de		
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	, 	Lecture	2	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous	Basics of coastal engineering			
Knowledge				
Educational Objectives	After taking part successfully, students have re	ached the following learning results		
Professional Competence				
Knowledge	The students are able to define in details and	d to choose design approaches for the functional des	sign of a port and app	ly them to design tasks.
	They can design the fundamental elements of	a port.		
Skills	The students are able to select and apply appropriate approaches for the functional design of ports.			
Personal Competence				
Social Competence	The students are able to deploy their gained k	nowledge in applied problems such as the functional	design of ports. Addition	naly, they will be able to
	work in team with engineers of other discipline	es.		
Autonomy	The students will be able to independently ext	end their knowledge and apply it to new problems.		
Workload in Hours	Independent Study Time 110, Study Time in Le	ecture 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 150 min. The	he examination includes tasks with respect to the gen	eral understanding of	the lecture contents and
	calculations tasks.			
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	neering: Compulsory		
	International Management and Engineering: S	Specialisation II. Civil Engineering: Elective Compulsor	ry	
	Theoretical Mechanical Engineering: Specialis	sation Maritime Technology: Elective Compulsory		
	Theoretical Mechanical Engineering: Technical	al Complementary Course: 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	
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	ecture		
Hrs/wk	2		
СР	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		



Module M0861: Modelling	of Hydraulic Engineering				
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	s (L0810)	Lecture	3	4	
Module Responsible	Prof. Peter Fröhle				
Admission Requirements	none				
Recommended Previous	Coastal Hydraulic Engineering I				
Knowledge					
Educational Objectives	After taking part successfully, students have reached the fo	ollowing 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 can				
	describe the basic aspects of numerical modelling and act	describe the basic aspects of numerical modelling and actual numerical models for the simulation of flows and waves.			
01.71	0				
SKIIIS	Students are able to apply hydrodynamic-numerical mode	els to practical hydraulic engineering t	asks.		
Personal Competence					
Social Competence	The students are able to deploy their gained knowledge in simple applied problems. Additionally, they will be able to work in team with others.				
Autonomy	The students will be able to independently extend their kn	owledge and apply it to new problems	S.		
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70				
Credit points	6				
Examination	Written exam				
Examination duration and scale	The duration of the examination is 3 hours. The examination includes tasks with respect to the general understanding of the lecture contents and				
	calculations tasks.				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: E	Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	ng: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: Ele	ective Compulsory			

Course L0813: Hydraulic Models			
Тур	ture		
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	
Тур	Lecture
Hrs/wk	1
СР	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	n Rivers and Estuaries
Тур	Lecture
Hrs/wk	3
СР	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 differences Finite volumes
Literature	Vorlesungsskript



Module M0874: Wastewate	er Systems				
Courses					
Title		Тур	Hrs/wk	СР	
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	7)	Lecture	2	2	
Advanced Wastewater Treatment (L035	8)	Recitation Section (large)	1	1	
Module Responsible	Prof. Ralf Otterpohl				
Admission Requirements	None				
Recommended Previous	Knowledge of wastewater management and the key processes	involved in wastewater treatment.			
Knowledge					
Educational Objectives	After taking part successfully, students have reached the followi	ng learning results			
Professional Competence					
Knowledge	Students are able to outline key areas of the full range of treatr	nent systems in waste water manageme	ent, as well as their	mutual dependence for	
	sustainable water protection. They can describe relevant econo	mic, environmental and social factors.			
Skills	Students are able to pre-design and explain the available wastewater treatment processes and the scope of their application in municipal and for				
	some industrial treatment plants.				
Personal Competence					
Social Competence					
Autonomy	Students are in a position to work on a subject and to organize t	heir work flow independently. They can	also 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	120 min				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective	re Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Ele	ective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: Elective	Compulsory			
	Bioprocess Engineering: Specialisation A - General Bioprocess	Engineering: Elective Compulsory			
	Energy and Environmental Engineering: Specialisation Environ	mental Engineering: Elective Compulso	ry		
	International Management and Engineering: Specialisation II. E	nergy and Environmental Engineering: I	Elective Compulsor	у	
	International Management and Engineering: Specialisation II. P	rocess Engineering and Biotechnology:	Elective Compulso	ry	
	Process Engineering: Specialisation Environmental Process En	gineering: Elective Compulsory			
	Process Engineering: Specialisation Process Engineering: Elective Compulsory				
	Water and Environmental Engineering: Specialisation Water: Co	ompulsory			
	Water and Environmental Engineering: Specialisation Environment: Elective Compulsory				
	Water and Environmental Engineering: Specialisation Cities: Co	ompulsory			

Course L0934: Wastewater System	ms - 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			
	epth filtration			
	flembrane Processes			
	ctivated 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	nina			
Module M0922. Oity Flam	illig			
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 tran	sport planning or a through taking the ur	doraraduato class	Transport Planning and
	Traffic Engineering"	sport planning, e.g. unough taking the th	idergraduate class "	Transport Flaming and
	Hallic Engineering			
Educational Objectives	After taking part successfully, students have reached the follow	wing learning results		
Professional Competence				
Knowledge	Students are able to:			
	use technical terms of urban planning.			
	describe the main determinants of urban development acceptain and acceptant different possibilities of how with			
	 explain and compare different possibilities of how urba discuss requirements for public streetscapes. 	an development can be influenced.		
	· · · · · · · · · · · · · · · · · · ·			
	explain the importance of street design.			
Skills	Students are able to:			
	read and analyze urban development concepts and development concepts.	esigns for streetscapes		
	appraise such concepts in the context of competing re			
	design, justify and reflect their own solutions for concre			
		·		
Personal 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 draw 	wings following a broadly pro-defined pro-	cass	
		wings iollowing a broadly pre-delifted pro	UU33.	
	 assess the consequences of their proposed solutions. independently acquire knowledge and apply this to ne 	nw issues or problem areas		
	- independently adquire knowledge and apply this to he	vv 133063 OF PRODICTE ALCAS.		
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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: Elec	tive Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: B	Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Electiv	ve Compulsory		
	Logistics, Infrastructure and Mobility: Specialisation Infrastructure	ture and Mobility: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Water:	Elective Compulsory		
	Water and Environmental Engineering: Specialisation Environmental	nment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities:	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. Althors Cardy Wellah, Indian (2000) Started and planning in the project work deals with a planning and planning in 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	
Ü	
	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, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of streetscapes on the behaviour of their users, the effects of the effect
	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).
	5 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
	Forschungsgesellschaft für Straßen- und Verkehrswesen (2007) Richtlinien für die Anlage von Stadtstraßen – RASt 06. FGSV-Verlag. Köln
	(FGSV, 200).



Module M0977: Construct	ion Logistics and Project Managemen	t		
Courses				
Title		Тур	Hrs/wk	СР
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)	Problem-based Learning	1	1
Module Responsible	Prof. Heike Flämig			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reached	d the following learning results		
Professional Competence				
Knowledge	Students can			
	a cive definitions of the main terms of construct	tion legistics and project development and manage		
		tion logistics and project development and manage	anient	
	 name advantages and disadvantages of inte explain characteristics of products, demand 		naaguanaaa far aan	atruation appoific auppl
	chains	and production of construction objects and their co	insequences for con	struction specific suppr
	differentiate constructions logistics from other	r logistics systems		
	unierentiate constructions logistics from othe	i logistics systems		
Skills	Students can			
	carry out project life cycle assessments			
	apply methods and instruments of construction	on logistics		
	apply methods and instruments of project de	•		
	apply methods and instruments of conflict ma			
	 design supply and waste removal concepts t 			
Personal Competence				
Social Competence	Students can			
eeda. eempetenee				
	 hold presentations in and for groups 			
	 apply methods of conflict solving skills in gro 	up work and case studies		
Autonomy	Students can			
	colve problems by beliefic eyetomic and flow	oriented thinking		
	solve problems by holistic, systemic and flow improve their creativity, population skills, columns.		of modoration in an	eo etudios
	improve their creativity, negotiation skins, con	nflict and crises solution skills by applying methods	or moderation in ca	se studies
Workload in Hours	Independent Study Time 124, Study Time in Lecture	56		
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	Two written compositions and two short presentation	ns		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engi	neering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	ng: Elective Compulsory		
	International Management and Engineering: Specia	alisation II. Civil Engineering: Elective Compulsory		
	Logistics, Infrastructure and Mobility: Specialisation	Production and Logistics: Elective Compulsory		
	Logistics, Infrastructure and Mobility: Specialisation	Infrastructure and Mobility: Elective Compulsory		



Course L1163: Construction Logis	tics
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) host and the contraction 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. Wuppertal 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 Logistik. 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)
L	

Course 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, Dr. Anton Worobei	
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	Problem-based Learning
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig, Dr. Anton Worobei
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course



Module M0998: Statics an	d Dynamics of Structures			
Courses				
Title		Тур	Hrs/wk	СР
Structural Dynamics (L1202)		Lecture	2	2
Structural Dynamics (L1203)		Recitation Section (large)	2	2
Fracture mechanics and fatigue in steel	structures (L0564)	Lecture	1	1
Fracture Mechanics and Fatigue (L0565	5)	Recitation Section (large)	1	1
Module Responsible	Prof. Uwe Starossek			
Admission Requirements	None			
Recommended Previous	Knowledge of linear structural analysis of statically determinat	e and indeterminate structures; Mechanic	s I/II, Mathematics I	/II, Differential equations
Knowledge	I			
Educational Objectives	After taking part successfully, students have reached the follow	ving learning results		
Professional Competence				
Knowledge	After successful completion of this module, the student can exp	plain the basic aspects of dynamic effects	on structures and t	he respective methods.
Skills	After successful completion of this module, the students will be	e able to predict the response of materia	I and structures to	dynamics loading using
	the appropriate computational approaches and methods.			
Personal Competence				
Social Competence	Students can			
p-10				
	 participate in subject-specific and interdisciplinary disc 	ussions,		
	 defend their own work results in front of others 			
	promote the scientific development of colleagues			
	 Furthermore, they can give and accept professional co 	nstructive criticism		
Autonomy				
	Independent Study Time 06 Study Time in Lecture 94			
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: Com			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: E			
	Civil Engineering: Specialisation Coastal Engineering: Electiv	e Compulsory		
	International Management and Engineering: Specialisation II.	Civil Engineering: Elective Compulsory		

Course L1202: Structural Dynamic	cs Control of the Con
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
СР	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	es and fatigue in steel structures
Тур	Lecture
Hrs/wk	1
СР	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 anduse 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	Seeßelberg, C.; Kranbahnen - Bemessung und konstruktive Gestaltung; 3. Auflage; Bauwerk-Verlag; Berlin 2009
	- 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



Course L0565: Fracture Mechanics 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	See interlocking course
Literature	See interlocking course



Module M0999: Steel Con	struction Project			
Courses				
Title		Тур	Hrs/wk	СР
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	ne following learning results		
Professional Competence				
Knowledge	Students are able to prepare a part of the whole project	t and explain it to the others.		
Skills	Students can produce sketches and calculations of their part of the project. They are able to adjust their work in reaction to changing conditions			
	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 wi	th respect to intergroup dependencies.		
	They can distribute and process tasks independently.			
Autonomy	Students can handle their part of the project on their ov	vn resposibility-		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56	6		
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	approx. 15-20 pages (without appendix)			
Assignment for the Following	Civil Engineering: Specialisation Geotechnical Engine	ering: Elective Compulsory		<u> </u>
Curricula	Civil Engineering: Specialisation Coastal Engineering	Elective Compulsory		
	Civil Engineering: Specialisation Structural Engineering	g: Compulsory		

Course L1206: Steel Construction	ourse L1206: Steel Construction Project		
Тур	Project Seminar		
Hrs/wk	4		
CP	6		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56		
Lecturer	Dozenten des SD B		
Language	DE		
Cycle	SoSe		
Content	Design of a big construction project (i.e skyscraper, large bridge, roof of a stadiuim) in small groups		
Literature	Wird je nach Projekt individuell angegeben.		



2				
Courses				
Title		Тур	Hrs/wk	CP
Marine Geotechnics (L0548)		Lecture	1	2
Marine Geotechnics (L0549)	75)	Recitation Section (large)	3	1
Numerical Methods in Geotechnics (L03	,	Lecture	3	3
Module Responsible				
Admission Requirements				
	complete modules: Geotechnics I-II, Mathematics	s I-III		
Knowledge	courses: Soil laboratory course			
	·			
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 Lect	ure 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	90 min			
Assignment for the Following	Civil Engineering: Specialisation Geotechnical E	ngineering: Compulsory		
Curricula	Civil Engineering: Specialisation Structural Engir	neering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engine	ering: Compulsory		
	Theoretical Mechanical Engineering: Specialisat	ion Maritime Technology: Elective Compulsory		
	Theoretical Mechanical Engineering: Technical C	Complementary Course: Elective Compulsory		
	Water and Environmental Engineering: Specialis	ation Cities: Elective Compulsory		
	Water and Environmental Engineering: Specialis	ation Environment: Elective Compulsory		
	Water and Environmental Engineering: Specialis	ation Water: Elective Compulsory		

Course L0548: Marine Geotechnic	s
Тур	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Jürgen Grabe
Language	DE
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 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



Module M0595: Examinati	on of Materials, Structural Condition	n and Damages		
Courses				
Title		Тур	Hrs/wk	CP
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 or ma	aterial science, for example by the module Build	ing Materials and Building	Chemistry.
Knowledge				
Educational Objectives	After taking part successfully, students have read	ched 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.			
SAIIS	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 examination of the structural conditions of buildings. They are able to conclude from symptons to the cause of damages. They are able to describe an examination in form of a test report or expert opinion.			
Personal Competence				
Social Competence	The students can describe the different roles of	of manufacturers as well as testing, supervisor	y and certification bodies	within the framework of
,	material testing. They can describe the different	• •	,	
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in Lec	ture 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engi	neering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical E	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engine	eering: Elective Compulsory		
	International Management and Engineering: Sp	ecialisation II. Civil Engineering: Elective Comp	ulsory	
	Materials Science: Specialisation Engineering N	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 Ma	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 M1350: Excavatio	n Law			
Courses				
Title		Тур	Hrs/wk	СР
Subsoil and Underground Engineering L	aw (L0395)	Lecture	2	3
Service Contract and Procurement Law	(L1906)	Lecture	2	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 124, Study Time in Lecture	56		
Credit points	6			
Examination	Oral exam			
Examination duration and scale	15 min			
Assignment for the Following	Civil Engineering: Specialisation Coastal Engineering	ng: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engi	neering: Elective Compulsory		
	Civil Engineering: Specialisation Structural Enginee	ring: Elective Compulsory		

Course L0395: Subsoil and Underg	· · · ·
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, 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 L1906: Service Contract and Procurement Law		
Тур	Lecture	
Hrs/wk	2	
CP	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Jürgen Grabe, Dozenten des SD B	
Language	DE	
Cycle	WiSe	
Content		
Literature		



Module M0581: Water Pro	tection			
Courses				
Title		Тур	Hrs/wk	СР
	nagement and Hydraulic Engineering (L0963)	Problem-based Learning	2	2
Water Protection and Wastewater Mana		Seminar	2	2
Water Protection and Wastewater Mana	agement (L0227)	Recitation Section (large)	1	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous				
Knowledge	Basic knowledge in water management;			
· ·	 Good knowledge in urban drainage; 			
	Good knowledge of wastewater treatment technique.			
	Good knowledge of pollutants (e.g. COD, BOD, TS	S, N, P) and their properties;		
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge	The students can describe the basic principles of the re	egulatory framework related to the internatio	nal and European	water sector. They can
	explain limnological processes, substance cycles and	water morphology in detail. Thereby they a	re able to assess	complex water related
	problems. Finally, the students can demonstrate to achie	ve significant improvements in the full range of	f existing water qua	ality problems. They are
	able to judge environmental and wastewater related is	ssues and to widely consider innovative sol	utions, remediation	measures and further
	interventions as well as conceptual problem solving appre	oaches.		
Skills	Students can accurately assess current problems and	situations in a country-specific or local conte	ext. They can sugg	est concrete actions to
	contribute to the planning of tomorrow's urban water cy	cle. Furthermore, they can suggest appropria	te technical, admin	nistrative 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 pro-	para themselves before presentations and o	licoupoion Thoy o	an acquire appropriate
Autonomy	Students are able to organize their work flow to prep	date themselves belove presentations and t	iiscussioii. Tiley G	an acquire appropriate
	knowledge by making enquiries independently.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points				
Examination				
Examination duration and scale	60 min			
Assignment for the Following		Flective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering			
Juilledia	Civil Engineering: Specialisation Geolecimical Engineering: El	, ,		
	Environmental Engineering: Specialisation Water: Electiv			
	International Management and Engineering: Specialisation			
	Joint European Master in Environmental Studies - Cities a		ve Compulsory	
	Water and Environmental Engineering: Specialisation Water		. o compulatily	
	Water and Environmental Engineering: Specialisation Water and Environmental Engineering: Specialisation En			
	Water and Environmental Engineering: Specialisation En			
	vvaler and Environmental Engineering: Specialisation Cit	ies. Liective Compulsory		



Course L0963: Geo-Information-S	Course L0963: Geo-Information-Systems in Water Management and Hydraulic Engineering	
Тур	Problem-based Learning	
Hrs/wk	2	
СР	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
Content	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 and 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	
Content	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 M0705: Groundwa	ater			
Courses				
Title		Тур	Hrs/wk	СР
Geohydraulic and Solute Transport (L05	539)	Lecture	2	2
Geohydraulic and Solute Transport (L05	540)	Recitation Section (small)	1	1
Simulation in Groundwater Hydrology (L		Lecture	1	1
Simulation in Groundwater Hydrology (L	0542)	Recitation Section (small)	2	2
Module Responsible	Prof. Wilfried Schneider			
Admission Requirements	None			
Recommended Previous	Ground water hydrology			
Knowledge	Hydromechanics			
	- Tryatomostanio			
Educational Objectives	After taking part successfully, students have reached the fol	lowing learning results		
Professional Competence	3,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	3 3		
Knowledge	The students are able to describe the fate of solutes in the subsurface along the path between soil and water body quantitatively and qualitatively.			
ranomougo	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 zone. They are able to determine dispersities, sorpti			
	coefficients, decay rates and dissolution rates for organic at	•		
Personal Competence				
Social Competence	The students can help to each other.			
Autonomy	· ·			
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: El	ective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elec	ctive Compulsory		
	Process Engineering: Specialisation Environmental Proces	s Engineering: Elective Compulsory		
	Process Engineering: Specialisation Process Engineering:	Elective Compulsory		
	Water and Environmental Engineering: Specialisation Water	er: Compulsory		
	Water and Environmental Engineering: Specialisation Envi	ronment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Citie	s: 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	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 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 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 M0619: Waste Tre	atment Technologies			
Courses				
Title Waste and Environmental Chemistry (LC	0328)	Typ Laboratory Course Problem based Learning	Hrs/wk 2 3	CP 2 4
Biological Waste Treatment (L0318)	Prof. Kerstin Kuchta	Problem-based Learning	3	4
Module Responsible Admission Requirements	none			
Recommended Previous	chemical and biological basics			
Knowledge	chemical and biological basics			
Educational Objectives	After taking part successfully, students have reached the followi	ng learning results		
Professional Competence	, , , , , , , , , , , , , , , , , , ,			
Knowledge	The module aims possess knowledge concerning the planning layout of anaerobic and aerobic waste treatment plants in deta treatment plants and explain different methods for waste analytic	il, describe different techniques for w		· ·
Skills	The students are able to discuss the compilation of design and layout of plants. They can critically evaluate techniques and quality control 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 findings in the group.			
Personal Competence Social Competence	Students can participate in subject-specific and interdisciplinar front of others and promote the scientific development in fron criticism.			
Autonomy	Students can independently tap knowledge from literature, but consultation with supervisors as well as in the interim pressure furthermore, they can define targets for new application-or resell impact.	entation, to assess their learning le	evel and define furthe	er steps on this bas
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Project			
Examination duration and scale	Elaboration and presentation (15-25 minutes in groups), success	ssful participation at Praktikum		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Electiv	ve Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Ele	ective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective			
	Energy and Environmental Engineering: Specialisation Environ	mental Engineering: Elective Compu	sory	
	Environmental Engineering: Core qualification: Compulsory			
	International Management and Engineering: Specialisation II. E			1
	Joint European Master in Environmental Studies - Cities and Su		ective Compulsory	
	Water and Environmental Engineering: Specialisation Environmental Engineering: Specialisation Cities: El	' '		
	Water and Environmental Engineering: Specialisation Cities: El	ective Compulsory		



Course L0328: Waste and Environ	mental Chemistry
Тур	Laboratory Course
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Kerstin Kuchta
Language	DE/EN
Cycle	WiSe
Content	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 To	Course L0318: Biological Waste Treatment	
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 M0713: Concrete	Structures			
Courses				
Title		Тур	Hrs/wk	СР
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 dime	ensioning of structural concrete		
Knowledge	Modules 'Concrete Structures I and II'			
Educational Objectives	After taking part successfully, students have reach	ed the following learning results		
Professional Competence				
Knowledge				
	for the conception and design of concrete building	s and structural members that are often used.		
Skills	The students are able to apply procedures of the	conception and dimensioning to to practical problem	ms of structural engine	ering. They are capable
	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	•		, ,
Personal Competence				
Social Competence	The students are able to obtain results of high qua	ality in teamwork.		
Autonomy	The students are able to carry out complex conce	otion and dimensioning tasks of structures under th	e guidance of tutors.	
Workload in Hours	Independent Study Time 110, Study Time in Lectu	re 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 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	ering: Elective Compulsory		
	International Management and Engineering: Spec	cialisation II. Civil Engineering: Elective Compulsor	y	

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	 concrete buildings actions on structrues bracing systems slabs (line and point supported plates and floor slabs) membranes and deep beams shells and folded plates reinforced and prestressed members
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	3		
Courses				
Title		Тур	Hrs/wk	СР
Computational Analysis of Concrete Stru	uctures (L0598)	Lecture	2	2
Computational Analysis of Concrete Stru	uctures (L0599)	Recitation Section (large)	2	2
FE-Modeling of Concrete Structures (L0	600)	Problem-based Learning	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	none			
Recommended Previous	Basic knowledge in structural analysis and design	of reinforced concrete structures (beams, slabs,	shear walls).	
Knowledge	Lectures 'Concrete Structures I und II'			
	Lectures Concrete Structures Fund II			
	Lectures 'Structural Analysis I and II'			
	Lecture 'Concrete Structures'			
Educational Objectives	After taking part successfully, students have reached	ed 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.			
			a. o parenage.	
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			
ricionemy	with other students.	ne chacters based on a mine croment convare	paonago ana alcoaco a	no probleme and recalle
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 Engine	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	gineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer	ring: Elective Compulsory		

urse L0598: Computational Ana	alvsis of Concrete Structures
•	Lecture
Hrs/wk	
СР	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	ources 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 processes 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 water mana	agement, as well as their mutual dep	endence for sustain	able water supply. They
· ·	will understand relevant economic, environmental and social fac-			
	water companies. They will be able to explain the available water	•		
	.,			
Skills	Students will be able to assess complex problems in drinking wat	er production and establish solutions	involving water mar	nagement and technical
	measures. They will be able to assess the evaluation methods that	t can be used for this. Students will b	e able to carry out o	hemical calculations for
	selected treatment processes and apply generally accepted technical	ical rules and standards to these pro-	cesses.	
Personal Competence				
Social Competence	Working in a diverse group of specialists, students will be able to	develop and document complex solu	utions for the manag	gement and treatment of
	drinking water. They will be able to take an appropriate profession	al position, for example representing	user interests. The	y will be able to develop
	joint solutions in teams of diverse experts and present these soluti	ons to others.		
Autonomy	Students will be in a position to work on a subject independently a	nd 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 Engineering: Elect	ive Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective Co	ompulsory		
	Energy and Environmental Engineering: Specialisation Energy ar	d Environmental Engineering: Electiv	e Compulsory	
	International Management and Engineering: Specialisation II. Ene	rgy and Environmental Engineering:	Elective Compulsor	y
	Water and Environmental Engineering: Specialisation Water: Con	pulsory		
	Water and Environmental Engineering: Specialisation Environmen	nt: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities: Elec	tive Compulsory		
	• • • •	<u> </u>		

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 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
СР	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



Module M0923: Integrated	Transportation Planning
Courses	
Title	Typ Hrs/wk CP
Integrated Transportation Planning (L10	
Module Responsible	Prof. Carsten Gertz
Admission Requirements	None
Recommended Previous	some knowledge of transport planning, e.g. through taking the undergraduate class "Transport Planning and Traffic Engineerin
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.
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 perspective and document the results in the comprehensively examine a pre-defined or self-selected topic from a transportation studies perspective and document the results in the comprehensively examine a pre-defined or self-selected topic from a transportation studies perspective and document the results in the comprehensively examine a pre-defined or self-selected topic from a transportation studies perspective and document the results in the comprehensively examine a pre-defined or self-selected topic from a transportation studies perspective and document the results in the comprehensive transportation or self-selected topic from a transportation studies perspective and document the results in the comprehensive transportation or the comprehensive tr
	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:
	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
W	
Workload in Hours	
Credit points	
	Written elaboration
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 Transportation Planning		
Тур	Problem-based Learning	
Hrs/wk	4	
СР	6	
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56	
Lecturer	Prof. Carsten Gertz, Dr. Philine Gaffron, Jacqueline Bianca Maaß	
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, BU	BC)		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following learning 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 sttructu 	res		
	sketch the contructions of steel and composite bridge	es		
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			
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	180 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Co	ompulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elec	tive Compulsory		
	International Management and Engineering: Specialisation	II. Civil Engineering: Elective Compulsory		

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	Dozenten des SD B	
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	Dozenten des SD B	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Course L1097: Steel Bridges	
Тур	Lecture
Hrs/wk	2
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



Module M0969: Selected	Topics in Civil Engineering			
Courses				
Γitle		Тур	Hrs/wk	СР
Analysis of Offshore Structures (L1867)		Lecture	1	1
Design of Concrete Strucutures (L1840		Lecture	2	2
Design of Prefabricated Concrete Structures (L0596)		Lecture	1	1
Design of Prefabricated Concrete Structures (L0597)		Recitation Section (large)	1	1
Forum I - Geotechnics and Construction	n Management (L1634)	Seminar	1	1
Forum II - Geotechnics and Construction	n Management (L1635)	Seminar	1	1
imber Structures (L1151)		Seminar	2	2
Glass Structures (L1152)		Lecture	2	2
Glass Structures (L1447)		Recitation Section (large)	1	1
Project Geotechnics (L0708)		Problem-based Learning	2	4
Vind turbine design (L1905)		Lecture	1	1
Module Responsible	Prof. Uwe Starossek			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	e 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 p 	Students are able to explain basic models and procedures in selected special areas of civil and structural engineering.		
	 Students are able to interrelate scientific and ted 	hnical knowledge.		
Skills	Students are able to apply basic methods in sele	ected areas of civil and structural engineering.		
Personal Competence				
Social Competence				
Autonomy				
Autonomy	Students can chose independently, in which fiel	ds they want to deepen their knowledge and sk	ills through the elect	tion of courses.
Workload in Hours	Depends on choice of courses			
Credit points	6			
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		

Course L1867: Analysis of Offshore Structures			
Тур	Lecture		
Hrs/wk	1		
СР	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Examination Form	Kolloquium		
Examination duration and scale	30 min		
Lecturer	Dr. Said Fawad Mohammadi		
Language	DE/EN		
Cycle	SoSe		
Content			
	Einführung: Jackets Semi-Sub FPSO Spar Jackup Offshore-Windenergieanlagen Spools/Jumper Manilfold Pipelines / PLET / Umbilicals Stinger		
	Hydraulics: Deterministic Wave Theories, Airy, Stokes Current / Appearent wave length Morisons equation Irregular seastates What is a spectrum? Significant waveheight, peak period, narrow & broad band		



- What is Power Spectral density?
- How do programs determine the forces using Morisons equation?

Tubular welded connections:

- How Pipes are constructed
- · How jackets are build
- Joint Classification, K, Y, T
- Capacity calculation
- Welding process / residual stresses
- Stress Concentration Factors

Foundation:

- Anchoring through piles
- Soil Properties (cohesive, non-cohesive) and stiffness calculation
- Grouted Pile Leg connections
- Pilehead resistance
- Suction piles

Fatigue:

- What is fatigue?
- · What is crack growth?
- Paris Law
- SN-curve approach
- Spectral Fatigue (Transfer function)
- Time Domain Fatigue

Fixed Platforms:

- Installation procedure & verifications
- Inplace analysis (Extreme conditions, operational conditions, marine growth)
- Spectral fatigue application
- Time domain fatigue application

Modelling with USFOS

- Specifying Soil
- Anchors
- Jacket geometry
- Topsides geometry
- Defining wave & current action
- Inplace analysis
- Mesh tubular joint analysis
- Time domain fatigue analysis

Literature

Course L1840: Design of Concrete Strucutures				
Тур				
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	20 min			
Lecturer	Dr. Karl Morgen			
Language	DE			
Cycle	WiSe			
Content				
Literature	Schlaich/Schäfer, Konstruieren im Stahlbau, BetonKalender 2001, Tll, Verlag Ernst & Sohn			



Course L0596: Design of Prefabricated Concrete Structures					
Тур	cture				
Hrs/wk	1				
СР	1				
Workload in Hours	ependent 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 Bindseil P.: Stahlbetonfertigteile. Werner Verlag, 1998 FIP: FIP Handbuch für 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 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					
СР					
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28				
Examination Form	Klausur				
Examination duration and scale					
Lecturer	Marvin Matzik				
Language					
Cycle					
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	

Course L0708: Project Geotechnics				
Тур	Problem-based Learning			
Hrs/wk	?			
CP	4			
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28			
Examination Form	Mündliche Prüfung			
Examination duration and scale	15 min			
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 a			
	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			

Course L1905: Wind turbine design				
Тур	ecture			
Hrs/wk	1			
CP	1			
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14			
Examination Form	Schriftliche Ausarbeitung			
Examination duration and scale	60 Minuten			
Lecturer	Dr. Jörn Scheller			
Language	DE			
Cycle	SoSe			
Content				
Literature				



Module M0967: Study Wo	rk Harbour and Coastal Engineering			
Courses				
Title	Typ Hrs/wk CP			
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.			
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	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	СР
Plates and Shells (L1199)		Lecture	2	2
Nonlinear Analysis of Frame Structure (•	Lecture	2	2
Nonlinear Analysis of Frame Structure (L1201)	Recitation Section (large)	2	2
Module Responsible	Prof. Uwe Starossek			
Admission Requirements	None			
Recommended Previous	Mechanics I/II, Mathematics I/II, Differential Equa	ations I		
Knowledge				
Educational Objectives	After taking part successfully, students have read	ched the following learning results		
Professional Competence				
Knowledge	After successful completion of this module, stude	ents can explain selected elements of higher structura	al analysis.	
Skills				
			P 139 64	
	· ·	e students are able to assess the premises and the	ne applicability of the	presented methods
	advanced structural analysis. They are able to u	se these methods for performing structural analyses.		
Personal Competence				
Social Competence	Students can			
	participate in subject-specific and interdist			
	defend their own work results in front of control			
	promote the scientific development of column in the scientific development of the scientific development of the scientific development in the scientifi	•		
	Furthermore, they can give and accept process.	rotessional constructive criticism		
Autonomy	The students have the opportunity to voluntarily	and independently work homework problems.		
Workload in Hours	Independent Study Time 96, Study Time in Lectu	ure 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engi	neering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical E	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engine	eering: Elective Compulsory		



Course L1199: Plates and Shells	
Тур	Lecture
Hrs/wk	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Jürgen Priebe
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 Evamo Churchura
	Lecture Lecture
Hrs/wk	
CP	
	Independent Study Time 32, Study Time in Lecture 28
	Prof. Uwe Starossek
Cycle	
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 Geotechnical Engineering

Module M0600: Advanced	Foundation Engineering and Soil Labor	ratory Course		
Module M0039. Advanced	Troundation Engineering and 30ii Eabor	latory Course		
Courses				
Title		Тур	Hrs/wk	СР
Soil Laboratory Course (L0499)		Laboratory Course	1	2
Advanced Foundation Engineering (L04s	97)	Lecture	2	2
Advanced Foundation Engineering (L049)	98)	Recitation Section (large)	1	2
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	None			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reached th	e 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	60 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	g: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineer	ering: Compulsory		
	Civil Engineering: Specialisation Coastal Engineering:	Compulsory		
	International Management and Engineering: Specialisa	ation II. Civil Engineering: Elective Compulsory		

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Course L0499: Soil Laboratory Co	urse
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	The Control of the Co
Тур	Lecture
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	ourse 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 M0858: Coastal H	ydraulic Engineering I			
Courses				
Title		Тур	Hrs/wk	СР
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	Basics of hydraulic engineering, hydrology and hy	dromechanics		
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 basic concepts of coastal engineering and port engineering. They are able to apply the concepts			
	to selected practical problems of coastal engine	ering. Students can define and determine the b	asics for design and	dimensioning of coasta
	engineering constructions.			
Skills	The students are capable to apply basic design ap	proaches to selected and pre-defined design tas	ks in coastal engineeri	ng.
Personal Competence				
Social Competence	The students are able to deploy their gained know	vledge in applied problems such as the design o	f coastal protection stru	uctures. Additionaly, the
	will be able to work in team with engineers of othe	r disciplines, for instance designing of coastal bre	akwaters.	
Autonomy	The students will be able to independently extend	their knowledge and applyit to new problems.		
Workload in Hours	Independent Study Time 124, Study Time in Lectu	re 56		
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 2 hours. The e	xamination includes tasks with respect to the ger	neral understanding of	the lecture contents an
	calculations tasks.			
Assignment for the Following	Civil Engineering: Specialisation Structural Engine	eering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical En	gineering: Compulsory		
	Civil Engineering: Specialisation Coastal Enginee	ring: Compulsory		
	International Management and Engineering: Spec	ialisation II. Civil Engineering: Elective Compulso	ry	

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



Module M0964: Structures	s in Foundation and Hydraulic Eng	ineering		
Courses				
Title		Тур	Hrs/wk	СР
Steel Structures in Foundation and Hydro	raulic 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 enviro	onmental engineering:		
Knowledge	Geotechnics I-II			
	Steel Structures I-II			
	• Steel Structures I-II			
Educational Objectives	After taking part successfully, students have rea	ached the following learning results		
Professional Competence				
Knowledge	Knowledge of different tunnel construction types as well as special methods and techniques of subsoil construction. The students get deeper			
	knowledge of steel and ground engineering as well as constructions knowledge concerning quay walls. Futhermore, 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 elements			
	depending on the influencing conditions.			
Skills	Basic knowledge of tunnel design as well as practical skills in structural tunnel analysis. Furthermore, the students are able to dimension sheet			
	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 and			
	connections.			
Personal Competence				
Social Competence	Capacity for teamwork concerning project man	agement and design of tunnels.		
Autonomy	Promotion of independent and creative work flo	Promotion of independent and creative work flow in the framework of a design exercise.		
Workload in Hours	Independent Study Time 124, Study Time in Le	ecture 56		
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 Engineering: Compulsory			
	Civil Engineering: Specialisation Coastal Engin	neering: Compulsory		
	International Management and Engineering: S	pecialisation II. Civil Engineering: Elective Compuls	ory	

Course L1146: Steel Structures in	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	Design of a sheet pile wall, design of a combined sheet pile wall, piles, walings, connections, fatigue	
Literature	EAU 2012, EA-Pfähle, EAB	



Course L0707: Underground Constructions			
Тур	cture		
Hrs/wk			
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	Typ Recitation Section (large)			
Hrs/wk	1			
CP	CP 1			
Workload in Hours	ependent Study Time 16, Study Time in Lecture 14			
Lecturer	rius Milatz			
Language	Language DE			
Cycle	Cycle WiSe			
Content	See interlocking course			
Literature	See interlocking course			



Module M0511: Electricity	Generation from Wind and Hydro P	ower			
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	
Nind Energy Use - Focus Offshore (L0	012)	Lecture	1	1	
Module Responsible					
Admission Requirements	none				
Recommended Previous	Module: Technical Thermodynamics I,				
Knowledge	Module: Technical Thermodynamics II,				
	•				
	Module: Fundamentals of Fluid Mechanics				
Educational Objectives	After taking part successfully, students have read	ched the following learning results			
Professional Competence	-	-			
Knowledge	By ending this module students can explain in d	detail knowledge of wind turbines with a particular t	ocus of wind energy u	se in offshore condition	
		deration of current developments. Furthermore, the			
	· ·	s reproduce and explain the basic procedure in the		•	
	in countries outside Europe.	o reproduce and explain the same procedure in the	, impromoniation or ro	nowasio onorgy proje	
	in countries catalac Europe.				
	Through active discussions of various topics within the seminar of the module, students improve their understanding and the application of the				
	theoretical background and are thus able to transfer what they have learned in practice.				
Chille	Childonto are able to apply the apprised the exet		r avatama and avaluat	- and assess tasksis	
Skills	****	ical foundations on exemplary water or wind powe			
	the resulting relationships in the context of dimensioning and operation of these energy systems. They can in compare critically				
		energy projects in countries outside Europe with th	e in principie applied	approach in Europe a	
	can apply this procedure on exemplary theoretic	ai projects.			
Personal Competence					
Social Competence	Students can discuss scientific tasks subjet-spec	cificly and multidisciplinary within a seminar			
oodal oompetence	Statems can discuss scientific tasks subjet spec	chiciy and mutudiscipimary within a seminar.			
Autonomy	Students can independently exploit sources in the	ne context of the emphasis of the lecture material to	clear the contents of th	ne lecture and to acqu	
Autonomy	Students can independently exploit sources in the context of the emphasis of the lecture material to clear the contents of the lecture and to acquii the particular knowledge about the subject area.				
	the particular knowledge about the subject area.				
Workload in Hours	Independent Study Time 110, Study Time in Lect	ture 70			
Credit points	6				
Examination	Written exam				
Examination duration and scale	3 hours written exam				
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	neering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical E	Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory				
	Energy and Environmental Engineering: Specialisation Energy Engineering: Elective Compulsory				
	International Management and Engineering: Specialisation II. Renewable Energy: Elective Compulsory				
	International Management and Engineering: Spe	ecialisation II. Energy and Environmental Engineeri	ng: Elective Compulso	ry	
	Product Development, Materials and Production:	: Specialisation Product Development: Elective Cor	npulsory		
	Product Development, Materials and Production:	: Specialisation Production: Elective Compulsory			
	Product Development, Materials and Production: Specialisation Materials: Elective Compulsory				
	Renewable Energies: Core qualification: Compulsory				
	Process Engineering: Specialisation Environmental Process Engineering: Elective Compulsory				
	Water and Environmental Engineering: Specialisation Environment: Compulsory				
	g. opeoiding				

Water and Environmental Engineering: Specialisation Cities: Elective Compulsory



Course L0014: Renewable Energy	Projects in Emerged Markets				
Тур	Project Seminar				
Hrs/wk	1				
СР	1				
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14				
Lecturer	Dr. Andreas Wiese				
Language					
Cycle	SoSe				
Content					
	1. Introduction				
	Development of renewable energies worldwide				
	History				
	■ Future markets				
	Special challenges in new markets - Overview				
	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				
	Within the seminar, the various topics are actively discussed and applied to various cases of application.				
Literature	Folien der Vorlesung				
	· · · · · · · · · · · •				

Course L0013: Hydro Power Use	
Тур	Lecture
Hrs/wk	1
СР	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				
СР				
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 M1351: Construct	ion Processes			
Courses				
Title		Тур	Hrs/wk	СР
Building Information Modelling (L1908)		Lecture	2	2
Lean Construction (L1910)		Lecture	2	2
System Dynamics (L1909)		Lecture	2	2
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 96, Study Time in Lecture 8	4		
Credit points	6			
Examination	Oral exam			
Examination duration and scale	15 min			
Assignment for the Following	Civil Engineering: Specialisation Coastal Engineerin	g: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engir	neering: Elective Compulsory		
	Civil Engineering: Specialisation Structural Engineer	ing: Elective Compulsory		

Course L1908: Building Information Modelling				
Тур	Typ Lecture			
Hrs/wk	2			
CP	CP 2			
Workload in Hours	pendent Study Time 32, Study Time in Lecture 28			
Lecturer	NN			
Language	Language DE			
Cycle	SoSe			
Content				
Literature				

Course L1910: Lean Construction			
Тур	Lecture		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Lecturer Dozenten des SD B		
Language	DE		
Cycle	SoSe		
Content			
Literature			

Course L1909: System Dynamics	ourse L1909: System Dynamics		
Тур	Lecture		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Lecturer Dozenten des SD B, Dozenten des Studiengangs		
Language	DE		
Cycle	SoSe		
Content			
Literature			



Module M0593: Building N	Materials and Building Preservation			
Courses				
Title		Тур	Hrs/wk	СР
Anchor Technology and Design, Post In	stalled 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		Recitation Section (small)	1	1
Transport Processes in Building Materia		Lecture	1	1
	Prof. Frank Schmidt-Döhl			
Admission Requirements				
		ding physics and building chemistry, for example by t	he modules Princip	les of Building Materi
Knowledge	and Building Physics and Building Materials and	Building Chemistry.		
Educational Objectives	After taking part successfully, students have read	ched the following learning results		
Professional Competence				
Skills	The students are able to describe the components of mineral building materials and their function in detail and to use them for the manufacture 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 mort 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				
Autonomy	The students are able to responsibly use the recomponents.	esources of materials and lab equipment for their pr	oject and to investi	gate and to get miss
Workload in Hours	Independent Study Time 96, Study Time in Lectu	ire 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Geotechnical E	ingineering: Compulsory		
Curricula	Civil Engineering: Specialisation Coastal Engine	eering: Elective Compulsory		
	Civil Engineering: Specialisation Structural Engir	neering: Elective Compulsory		

	y and Design, Post Installed Rebar Connections
	Recitation Section (small)
Hrs/wk	1
СР	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



Module M0723: Design of	Prestressed Structures and Concrete	Bridges		
Courses				
Title		Тур	Hrs/wk	СР
Design of Prestressed Structures and C	Concreet Bridges (L0603)	Lecture	3	4
Design of Prestressed Structures and C	concreet Bridges (L0604)	Recitation Section (large)	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	None			
Recommended Previous	Detailed knowledge on the design of concrete structu	res.		
Knowledge				
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge	The students know the main bridge types, their appli	cations and the various loads. They can explain	the basic design me	thods. They can explain
	the design of a prestressed bridge.			
Skills	The students are able to design reinforced or prestressed concrete bridges.			
Personal Competence				
·	The students can design in teamwork a real concrete bridge.			
Autonomy	The students are able to design a prestressed concrete bridge and discuss the problems and results with 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 Engin	eering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineerin	g: Elective Compulsory		
	International Management and Engineering: Special	sation II. Civil Engineering: Elective Compulsory	/	



Course L0603: Design of Prestres	sed Structures and Concreet Bridges	
Тур	Lecture	
Hrs/wk		
СР	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	ecitation 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	anics and -Dynamics			
Courses				
Γitle		Тур	Hrs/wk	СР
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	modules: Mathematics I-III, Mechanics I-II, Geote	echnics I		
Knowledge	Annii datuut			
	courses: Soil laboratory course, (Applied structu	urai dynamics)		
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	ne 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	to evaluate them,	
	to design machine foundations to dynam			
	to measure shocks to perform vibration fi			
	to evaluate shocks in term to their effect 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,		ty,	
	· ·	capacity, integrity and the dynamic bedding modulu		aatia na mathamatiaa
		leformation accumulation due to cyclic loading and to	estimate these deform	nations mathematical
	• to distinguish the area of application of the	he method of elastodynamics and plastodynamics,		
	to detect the undrained shear strength a:	s a function of a number of state variables,		
		s a function of a number of state variables, sive soils and to consider the effects of creep and rate	a-denendent shear stre	anoth in calculations
	to consider the impact of the partly satural	,	o dependent onedi otte	ingui in odiodiduono,
	- to consider the impact of the party sature	ated of a scopage and should strongth.		
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lect	ture 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	150 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Eng	ineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical I			
	Civil Engineering: Specialisation Coastal Engin			

Course L0374: Soil Mechanics - Selected Topics		
Тур	Lecture	
Hrs/wk	2	
СР	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	
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

arches in Geotechnics
Laboratory Course
1
2
Independent Study Time 46, Study Time in Lecture 14
Marius Milatz
DE
SoSe SoSe
The students are supposed to:
 become acquainted with geotechnical model tests, field tests and laboratory tests as well as corresponding measurement techniques. These compromise amongst others inclinometer measurements and geophone measurements as well as high-grade laboratory tests on the stress-strain relationship of soil specimens, e. g. triaxial tests, simple shear tests and resonant column tests. gain insight into current soil mechanical research. plan, coordinate, perform and evaluate soil mechanical tests in a team. discuss, reflect, review and present the obtained results in a group. An important learning target is the introduction to scientific work for students who plan a scientific career, and for those who will work in practice with the responsibility to order corresponding tests and evaluate the results. The practical laboratory work is based on annualy changing problems, which are however related to the experience and results of the preceding year's course group.



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 Mechan	cs II (Hydrostatics, Kinematics, Dynamics)		
Knowledge	Mathematics I, II, III (in particular differential equations)			
Educational Objectives	After taking part successfully, students have reached the fo	llowing learning results		
Professional Competence	3, 3,	3 3		
Knowledge	The students possess an in-depth knowledge regarding t	he derivation of the boundary element me	ethod and are able to	give an overview of t
Momeage	theoretical and methodical basis of the method.	no deliverent of the boundary element in	striod and are able to	give an overview or t
	and meaned and meaned and and and meaned.			
Skills	The students are capable to handle engineering problem	ns hy formulating suitable boundary eler	ments assembling the	e corresponding syste
Onns	matrices, and solving the resulting system of equations.	ns by formulating suitable boundary eler	nents, assembling th	s corresponding syste
	inatioes, and solving the resulting system of equations.			
Personal Competence				
Social Competence				B. II
Autonomy		computational problems and develop owr	boundary element ro	utines. Problems can
	identified and the results are critically scrutinized.			
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points				
Examination	Written exam			
Examination duration and scale	90 min			
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		
	Energy Systems: Core qualification: Elective Compulsory	-		
	Computational Science and Engineering: Specialisation S	cientific Computing: Elective Compulsorv		
	Mechanical Engineering and Management: Specialisation		ective Compulsorv	
	Mechatronics: Specialisation System Design: Elective Con	•		
	Product Development, Materials and Production: Core qua			
	Technomathematics: Specialisation III. Engineering Science			
	Technomathematics: Specialisation iii. Engineering Scientification: Elective Compulsi			
	Theoretical Mechanical Engineering: Core qualification: El	ective Compulsory		
	Theoretical Mechanical Engineering: Technical Compleme	ntory Course: Elective Commission:		



Course L0523: Boundary Element	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	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	



Module M0827: Modeling	in Water Management			
Courses				
Title		Тур	Hrs/wk	СР
Applied Groundwater Modeling (L0543)		Lecture	1	1
Applied Groundwater Modeling (L0544)		Recitation Section (small)	2	2
Modeling of Water Supply and Sewer Ne	twork (L0875)	Problem-based Learning	2	3
Module Responsible	Prof. Wilfried Schneider			
Admission Requirements	none			
Recommended Previous	Groundwater			
Knowledge				
	 groundwater hydraulics and transport of substan 	ces		
	Pipe Systems			
	Knowledge on urban water infrastructures, in par	•	nage systems including	ng special structures
	Hydraulics of drinking water supply systems and	sewer systems		
	Basic knowledge on water management			
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge	The students are able to describe the modelling of groundwater flow and transport as well as urban water infrastructures. They can carry out			
	systems analyses and can detect technical and conceptual weak points within the systems in case studies. Besides they are able to analyse			
	interdependencies of hydraulic and toxic phenomena in soil and water.			
Skills	The students are able to construct and apply scientific of	roundwater models indipendently. They can	work on different scer	narios and can compare
- Crumo	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			
	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).			
	solutions (e.g. 21 / NV2 1, 21 / N OVVININ).			
Personal Competence				
Social Competence	Wird nicht vermittelt.			
Autonomy	Wird nicht vermittelt.			
Autonomy	vviid filetit verifilitett.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Oral exam			
Examination duration and scale	20 min			
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		
	Water and Environmental Engineering: Specialisation W	later: Compulsory		
	Water and Environmental Engineering: Specialisation E	nvironment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation C	ities: Elective Compulsory		

Course L0543: Applied Groundwat	Course L0543: Applied Groundwater 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	ourse L0544: Applied Groundwater 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	ourse 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, Weitere Mitarbeiter		
Language	DE		
Cycle	SoSe		
Content			
Literature	Mutschmann/Stimmelmayr: Taschenbuch der Wasserversorgung, 16. Auflage. Springer Vieweg - Verlag. Wiesbaden 2014.		



Module M0828: Urban Env	vironmental Management			
Module Moozo. Orban En	viioimentai management			
Courses				
Title		Тур	Hrs/wk	СР
Noise Protection (L1109)		Lecture	2	2
Urban Infrastructures (L0874)		Problem-based Learning	2	4
Module Responsible	Dr. Dorothea Rechtenbach			
Admission Requirements	none			
Recommended Previous				
Knowledge	Knowledge on Urban planning			
	Knowledge on measures for climate protection at			
	Basics knowledge in urban drainage and stormw	rater management		
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge	Students can describe urban development corridors as	well as current and future urban environm	ental problems. They	are able to explain the
	causes of environmental problems (like noise).			
	Students can specify applications for various technical in	nnovations and explain why these contribute	to the improvement of	urban life. They can, for
	example, derive and discuss measures for effective nois	e abatement.		
Skills	Students are able to develop specific solutions for corr	recting existing or future environment-relate	d problems of urban	development. They can
	define a range of conceptual and technical solutions for environmental problems for different development paths. To solve specific urb			
	environmental problems they can select technical innova	·		·
Personal Competence		, and the second		
Social Competence				
Autonomy		·	butions to the discuss	ions. They can acquire
	appropriate knowledge by making enquiries independer	ntly.		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Project			
Examination duration and scale	Written Report plus oral 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		
	Environmental Engineering: Core qualification: Elective	Compulsory		
	Joint European Master in Environmental Studies - Cities	and Sustainability: Core qualification: Comp	oulsory	
	Logistics, Infrastructure and Mobility: Specialisation Infra	structure and Mobility: Elective Compulsory		
	Water and Environmental Engineering: Specialisation En			
	Water and Environmental Engineering: Specialisation C	ities: 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	Prof. Martin Jäschke
Language	EN
Cycle	SoSe
Content	
Literature	1) Müller & Möser (2013): Handbook of Engineering Acoustics (also available in German)
	2) WHO (1999): Guidelines for Community Noise
	3) Environmental Noise Directive 2002/49/EG
	4) ISO 9613-2 (1996): Acoustics, Attenuation of sound during propagation outdoors, Part 2: General method of calculation



Course L0874: Urban Infrastructu	Course L0874: Urban Infrastructures	
Тур	Problem-based Learning	
Hrs/wk	2	
CP	4	
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28	
Lecturer	Dr. Dorothea Rechtenbach	
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	Depends on chosen topic.	



Module M0859: Coastal H	ydraulic Engineering II			
Courses				
Title		Тур	Hrs/wk	СР
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 fo	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 pr	otection and are able to
	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	he functional and constructional design of a	procion and flood n	rotaction massures and
Skills	apply these approaches to practical design tasks.	ne idiiciional and constituctional design of e	riosion and nood p	Totection measures and
	appry these approaches to practical design tasks.			
Personal Competence				
Social Competence	The students are able to deploy their gained knowledge	in applied problems such as the functional a	nd constructive des	sign of coastal and flood
	protection structures. Additionaly, they will be able to work	in team with engineers of other disciplines.		
Autonomy	The students will be able to independently extend their kn	owledge and apply it to new problems.		
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 130 min. The examination	tion includes tasks with respect to the genera	al understanding of	the lecture contents and
	calculations tasks.			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: E	Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	ng: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Co	mpulsory		

Course L0808: Coastal- and Flood	
	Lecture
Hrs/wk	
СР	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
	South Engineering mandar Cent



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	



Module M0860: Harbour E	Engineering and Harbour Planning			
Courses				
Title		Тур	Hrs/wk	СР
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	Basics of coastal engineering			
Knowledge				
Educational Objectives	After taking part successfully, students have rea	ached 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 tasks			
	They can design the fundamental elements of a	a port.		
Skills	The students are able to select and apply appro	ppriate approaches for the functional design of ports.		
Personal Competence				
Social Competence	The students are able to deploy their gained kn	owledge in applied problems such as the functional	design of ports. Addition	naly, they will be able
	work in team with engineers of other disciplines	S.		
Autonomy	The students will be able to independently extend their knowledge and apply it to new problems.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points				
Examination				
Examination duration and scale	The duration of the examination is 150 min. Th	e examination includes tasks with respect to the gen	eral understanding of	the lecture contents a
	calculations tasks.		•	
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory			
Curricula				
	Civil Engineering: Specialisation Coastal Engin	neering: Compulsory		
	International Management and Engineering: Sp	pecialisation II. Civil Engineering: Elective Compulso	ry	
	Theoretical Mechanical Engineering: Specialisa	ation Maritime Technology: Elective Compulsory		
	Theoretical Mechanical Engineering: Technical	• • • • • • • • • • • • • • • • • • • •		

Course L0809: Habour Engineerin	ng	
Тур	Lecture	
Hrs/wk		
СР	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 Port Construction		
Тур	Lecture	
Hrs/wk	2	
СР	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	



Module M0861: Modelling	of Hydraulic Engineering			
Courses				
Title		Тур	Hrs/wk	СР
Hydraulic Models (L0813)		Lecture	1	1
Modelling of Waves (L0812)		Lecture	1	1
Modelling of Flow in Rivers and Estuarie	s (L0810)	Lecture	3	4
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous	Coastal Hydraulic Engineering I	Coastal Hydraulic Engineering I		
Knowledge				
Educational Objectives	After taking part successfully, students have reached 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 can			
	describe the basic aspects of numerical modelling and act	tual numerical models for the simulation	on of flows and waves.	
Ol::II-	Observation and the second sec			
Skills	Students are able to apply hydrodynamic-numerical mode	is to practical hydraulic engineering t	asks.	
Personal Competence				
Social Competence	The students are able to deploy their gained knowledge in simple applied problems. Additionally, they will be able to work in team with others.			
Autonomy	The students will be able to independently extend their knowledge and apply it to new problems.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 3 hours. The examination includes tasks with respect to the general understanding of the lecture contents and			
	calculations tasks.			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineerin	g: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Ele	ective Compulsory		

Course L0813: Hydraulic Models		
Тур	Lecture	
Hrs/wk	1	
СР	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	s
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 conservation of mass conservation of momentum Initial conditions and boundary conditions Numerical Methods Time step procedure Finite differences Finite volumes 	
Literature	Vorlesungsskript	



Module M0874: Wastewate	er Systems			
Courses				
Title		Тур	Hrs/wk	СР
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	7)	Lecture	2	2
Advanced Wastewater Treatment (L035	8)	Recitation Section (large)	1	1
Module Responsible	Prof. Ralf Otterpohl			
Admission Requirements	None			
Recommended Previous	Knowledge of wastewater management and the key processes in	volved in wastewater treatment.		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following	g learning results		
Professional Competence				
Knowledge	Students are able to outline key areas of the full range of treatme	ent systems in waste water manageme	ent, as well as their	mutual dependence for
	sustainable water protection. They can describe relevant econom	ic, environmental and social factors.		
Skills	Students are able to pre-design and explain the available waste	water treatment processes and the sco	ope of their applicat	ion in municipal and for
	some industrial treatment plants.			
Personal Competence				
Social Competence				
Autonomy	Students are in a position to work on a subject and to organize th	eir work flow independently. They can	also 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	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective	Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elec	tive Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective C	compulsory		
	Bioprocess Engineering: Specialisation A - General Bioprocess E	Engineering: Elective Compulsory		
	Energy and Environmental Engineering: Specialisation Environmental	ental Engineering: Elective Compulso	ry	
	International Management and Engineering: Specialisation II. En	ergy and Environmental Engineering:	Elective Compulsor	у
	International Management and Engineering: Specialisation II. Pro	ocess Engineering and Biotechnology:	Elective Compulso	ry
	Process Engineering: Specialisation Environmental Process Eng	ineering: Elective Compulsory		
	Process Engineering: Specialisation Process Engineering: Electi	ve Compulsory		
	Water and Environmental Engineering: Specialisation Water: Cor	mpulsory		
	Water and Environmental Engineering: Specialisation Environme	nt: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities: Cor	npulsory		

Course L0934: Wastewater System	ms - 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 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	
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
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	ning			
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 IID activation of the control of	and a least the second and the second and the second	d d	Tours of Discoving
	for "Designing Urban Streetscapes": some knowledge of trans	sport planning, e.g. through taking the un	dergraduate class "	Transport Planning a
	Traffic Engineering"			
Educational Objectives	After taking part successfully, students have reached the follow	ving learning results		
Professional Competence				
Knowledge	Students are able to:			
	• use technical terms of when alcoming			
	use technical terms of urban planning. describe the main determinants of urban development			
	describe the main determinants of urban development explain and compare different possibilities of how urba			
	discuss requirements for public streetscapes.	in development can be initidenced.		
	explain the importance of street design.			
	Supram the importance of direct designs			
Skills	Students are able to:			
00				
	read and analyze urban development concepts and development concepts.			
	appraise such concepts in the context of competing re-			
	design, justify and reflect their own solutions for concre	ete examples.		
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 draw	vings following a broadly pre-defined pro	cess.	
	assess the consequences of their proposed solutions.	goog a broadly pro-defined pro-		
	independently acquire knowledge and apply this to ne	w issues or 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		ive Compulsory		
Curricula				
Garricula	Civil Engineering: Specialisation Coastal Engineering: Electiv			
	Logistics, Infrastructure and Mobility: Specialisation Infrastruct			
	Water and Environmental Engineering: Specialisation Water:			
	Water and Environmental Engineering. Specialisation Water.			
	Water and Environmental Engineering: Specialisation Water. Water and Environmental Engineering: Specialisation Environmental Engineering: Specialisation Environmental Engineering: Specialisation Water.			



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. Alters Cont Walson Indian (2000) Strategies up 2 in 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	Ť
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.
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 M0977: Construct	tion Logistics and Project Manage	ment		
Courses				
Γitle		Тур	Hrs/wk	CP
Construction Logistics (L1163)		Lecture	1	2
Construction Logistics (L1164)		Recitation Section (small)	1	2
Project Development and Management (Project Development and Management (Lecture Problem-based Learning	1	1
	1	Problem-based Learning	ı	1
Module Responsible	•			
Admission Requirements				
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have re	eached the following learning results		
Professional Competence				
Knowledge	Students can			
	give definitions of the main terms of co-	nstruction logistics and project development and mana	gement	
	name advantages and disadvantages	of internal or external construction logistics		
	explain characteristics of products, der	mand and production of construction objects and their	consequences for con	struction specific sup
	chains			
	differentiate constructions logistics from	n other logistics systems		
Skills	Students can			
00				
	carry out project life cycle assessments	S		
	 apply methods and instruments of cons 	struction logistics		
	 apply methods and instruments of projection 	ect development and management		
	 apply methods and instruments of conf 	flict management		
	design supply and waste removal cond	cepts 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 case studies		
Autonomy	Students can			
Autonomy	States no dari			
	solve problems by holistic, systemic an	nd flow oriented thinking		
	improve their creativity, negotiation skil	lls, conflict and crises solution skills by applying method	ds of moderation in ca	se studies
Workload in Hours	Independent Study Time 124, Study Time in Lo	ecture 56		
Credit points				
Examination				
Examination duration and scale		ntations		
Assignment for the Following	Civil Engineering: Specialisation Structural En			
Curricula				
Guricula	Civil Engineering: Specialisation Geolechnical Civil Engineering: Specialisation Coastal Engineering:			
			.,	
		Specialisation II. Civil Engineering: Elective Compulsor sation Production and Logistics: Elective Compulsory	у	
	Logistics, irriastructure and informity. Specialis	sation i roduction and Logistics. Elective Compulsory		

Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective Compulsory



Course L1163: Construction Logis	tics
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 addressed.
	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 flavoration to planning model of construction projects
	 flow oriented logistics systems for construction projects logistics concepts for ready to use construction projects (especially procurement and waste removel logistics)
	 logistics concepts for ready to use construction projects (especially procedented and waste remover logistics) best practice examples (construction logistics Potsdamer Platz, recent case study of the region)
	best practice examples (constitution logistics i distanter i laz, 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. Wuppertal 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 Logistik. 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	Course L1164: Construction Logistics	
Тур	Recitation Section (small)	
Hrs/wk	1	
СР	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, Dr. Anton Worobei
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	Problem-based Learning
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Heike Flämig, Dr. Anton Worobei
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course



Module M0998: Statics an	d Dynamics of Structures			
Courses				
Title		Тур	Hrs/wk	СР
Structural Dynamics (L1202)		Lecture	2	2
Structural Dynamics (L1203)		Recitation Section (large)	2	2
Fracture mechanics and fatigue in steel	structures (L0564)	Lecture	1	1
Fracture Mechanics and Fatigue (L0565	5)	Recitation Section (large)	1	1
Module Responsible	Prof. Uwe Starossek			
Admission Requirements	None			
Recommended Previous	Knowledge of linear structural analysis of statically determinat	e and indeterminate structures; Mechanic	s I/II, Mathematics I	/II, Differential equations
Knowledge	I			
E1 11 1011 11	A6			
Educational Objectives	After taking part successfully, students have reached the follow	ving learning results		
Professional Competence				
Knowledge	After successful completion of this module, the student can ex	plain the basic aspects of dynamic effects	on structures and t	he respective methods.
Skills	After successful completion of this module, the students will be	e able to predict the response of materia	I and structures to	dynamics loading using
	the appropriate computational approaches and methods.			
Personal Competence				
Social Competence	Students can			
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
	 participate in subject-specific and interdisciplinary disc 	eussions,		
	 defend their own work results in front of others 			
	 promote the scientific development of colleagues 			
	 Furthermore, they can give and accept professional co 	nstructive criticism		
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
	6			
Credit points				
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Com			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: E			
	Civil Engineering: Specialisation Coastal Engineering: Electiv			
	International Management and Engineering: Specialisation II.	Civil Engineering: Elective Compulsory		

Course L1202: Structural Dynamic	es e
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	s and fatigue in steel structures
Тур	Lecture
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Ingo Hadrych
Language	DE
Cycle	
Content	 basics of fatigue stress and fatigue resistance and determination of fatigue strength, determination anduse 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	- Seeßelberg, C.; Kranbahnen - Bemessung und konstruktive Gestaltung; 3. Auflage; Bauwerk-Verlag; Berlin 2009
	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



Course L0565: Fracture Mechanics and Fatigue	
Тур	Recitation Section (large)
Hrs/wk	1
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Ingo Hadrych
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course



Module M0999: Steel Con	struction Project			
Courses				
Title		Тур	Hrs/wk	СР
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	ne following learning results		
Professional Competence				
Knowledge	Students are able to prepare a part of the whole project	t and explain it to the others.		
Skills	Students can produce sketches and calculations of their part of the project. They are able to adjust their work in reaction to changing conditions			
	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 wi	th respect to intergroup dependencies.		
	They can distribute and process tasks independently.			
Autonomy	Students can handle their part of the project on their ov	vn resposibility-		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56	6		
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	approx. 15-20 pages (without appendix)			
Assignment for the Following	Civil Engineering: Specialisation Geotechnical Engine	ering: Elective Compulsory		<u> </u>
Curricula	Civil Engineering: Specialisation Coastal Engineering	Elective Compulsory		
	Civil Engineering: Specialisation Structural Engineering	g: Compulsory		

ourse L1206: Steel Construction Project	
Тур	Project Seminar Project Seminar
Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Dozenten des SD B
Language	DE
Cycle	SoSe
Content	Design of a big construction project (i.e skyscraper, large bridge, roof of a stadiuim) in small groups
Literature	Wird je nach Projekt individuell angegeben.



Module M0663: Marine Ge	otechnics and Numerics			
Courses				
Title		Тур	Hrs/wk	СР
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	complete modules: Geotechnics I-II, Mathemat	ics I-III		
Knowledge	courses: Soil laboratory course			
Educational Objectives	After taking part successfully, students have re	ached the following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in Le	ecture 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	90 min			
Assignment for the Following	Civil Engineering: Specialisation Geotechnical	I Engineering: Compulsory		
Curricula	Civil Engineering: Specialisation Structural En	gineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engi	neering: Compulsory		
	Theoretical Mechanical Engineering: Specialis	sation Maritime Technology: Elective Compulsory		
	Theoretical Mechanical Engineering: Technical	al Complementary Course: Elective Compulsory		
	Water and Environmental Engineering: Specia	alisation Cities: Elective Compulsory		
	Water and Environmental Engineering: Specia	alisation Environment: Elective Compulsory		
	Water and Environmental Engineering: Specia	alisation Water: Elective Compulsory		

Course L0548: Marine Geotechnic	s
Тур	Lecture
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Jürgen Grabe
Language	DE
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 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



Module M0595: Examinati	on of Materials, Structural Conditio	n and Damages		
Courses				
Title		Тур	Hrs/wk	СР
Examination of Materials, Structural Condition 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 or ma	aterial science, for example by the module Buildir	ng Materials and Building	Chemistry.
Knowledge				
Educational Objectives	After taking part successfully, students have rea	ched 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.			
	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 examination of the structural conditions of buildings. They are able to conclude from symptons to the cause of damages. They are able to describe an examination in form of a test report or expert opinion.			
Personal Competence				
Social Competence				
,	material testing. They can describe the different	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 Eng	ineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engin	eering: Elective Compulsory		
	International Management and Engineering: Sp	pecialisation II. Civil Engineering: Elective Compu	Isory	
	Materials Science: Specialisation Engineering N	Materials: Elective Compulsory		

Course L0260: Examination of Materials, Structural Condition and Damages		
Тур	Lecture	
Hrs/wk	4	
СР	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 M1350: Excavation Law				
Courses				
Title		Тур	Hrs/wk	СР
Subsoil and Underground Engineering L	aw (L0395)	Lecture	2	3
Service Contract and Procurement Law	(L1906)	Lecture	2	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 124, Study Time in Lecture 56			
Credit points	6			
Examination	Oral exam			
Examination duration and scale	15 min			
Assignment for the Following	Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Structural Eng	gineering: Elective Compulsory		

Course L0395: Subsoil and Underg	ground Engineering Law
Тур	Lecture
Hrs/wk	2
СР	3
Workload in Hours	Independent Study Time 62, 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 L1906: Service Contract and Procurement Law		
Тур	Lecture	
Hrs/wk	2	
CP	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Jürgen Grabe, Dozenten des SD B	
Language	DE	
Cycle	WiSe	
Content		
Literature		



Module M0581: Water Pro	tection			
Courses				
Title		Тур	Hrs/wk	СР
Geo-Information-Systems in Water Man	agement and Hydraulic Engineering (L0963)	Problem-based Learning	2	2
Water Protection and Wastewater Mana	gement (L0226)	Seminar	2	2
Water Protection and Wastewater Mana	gement (L0227)	Recitation Section (large)	1	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous	- Desig knowledge in weter management			
Knowledge	Basic knowledge in water management; Cood knowledge in when drainess.			
	 Good knowledge in urban drainage; Good knowledge of wastewater treatment techniques; 			
	Good knowledge of wastewater treatment techniques, Good knowledge of pollutants (e.g. COD, BOD, TS, N, P	and their properties:		
	a dood knowledge of politicalitie (e.g. dob, bob, 10, 14, 1	and their properties,		
Educational Objectives	After taking part successfully, students have reached the following	ng learning results		
Professional Competence				
Knowledge	The students can describe the basic principles of the regulat	ory framework related to the internation	onal and European	water sector. They car
	explain limnological processes, substance cycles and water	morphology in detail. Thereby they	are able to assess	complex water related
	problems. Finally, the students can demonstrate to achieve sig	nificant improvements in the full range	of existing water qua	ality problems. They are
	able to judge environmental and wastewater related issues	and to widely consider innovative so	olutions, remediation	measures and furthe
	interventions as well as conceptual problem solving approache	S.		
Skills	Students can accurately assess current problems and situation	ons in a country-specific or local con	text. They can sugg	est concrete actions to
	contribute to the planning of tomorrow's urban water cycle. Fu	rthermore, they can suggest appropri	ate technical, admin	istrative and legislative
	solutions to solve these problems.			
Dava anal Commatana				
Personal Competence	The students can work together in international groups			
Social Competence	The students can work together in international groups.			
Autonomy	Students are able to organize their work flow to prepare the	emselves before presentations and	discussion. They ca	an acquire appropriate
	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: Electiv	e Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Ele	ctive Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective			
	Environmental Engineering: Specialisation Water: Elective Com			
	International Management and Engineering: Specialisation II. C			
	Joint European Master in Environmental Studies - Cities and Su		tive Compulsory	
	Water and Environmental Engineering: Specialisation Water: C	• •	. ,	
	Water and Environmental Engineering: Specialisation Environn			
	Water and Francisco and Francisco and Occasionic Cities to Cities El	active Commulació		

Water and Environmental Engineering: Specialisation Cities: Elective Compulsory



Course L0963: Geo-Information-S	ystems 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
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	WiSe
Content	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
Content	The lecture focusses on:
Literature	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 The literature listed below is available in the library of the TUHH.
Literature	 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 M0705: Groundwa	iter			
Courses				
Title		Тур	Hrs/wk	CP
Geohydraulic and Solute Transport (L05	30)	Lecture	2	2
Geohydraulic and Solute Transport (L05		Recitation Section (small)	1	1
Simulation in Groundwater Hydrology (L	•	Lecture	1	1
Simulation in Groundwater Hydrology (L	0542)	Recitation Section (small)	2	2
Module Responsible	Prof. Wilfried Schneider			
Admission Requirements	None			
Recommended Previous	Ground water hydrology			
Knowledge	Hydromechanics			
Educational Objectives	After taking part successfully, students have reached the follow	ring learning results		
Professional Competence				
Knowledge	The students are able to describe the fate of solutes in the sub	surface along the path between soil and	water body quantit	atively and qualitatively.
	They are able to do this with simulation models.			
Skills	The students are able to describe conceptually movement ar	d storage of water in the unsaturated zo	ne. 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,		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	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	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	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 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	Cycle WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Course L0541: Simulation in Groun	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 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 M0619: Waste Tre	atment Technologies			
Courses				
Title Waste and Environmental Chemistry (LC Biological Waste Treatment (L0318)	3328)	Typ Laboratory Course Problem-based Learning	Hrs/wk 2 3	CP 2 4
Module Responsible	Prof. Kerstin Kuchta	r robiem bacoa zoarimig	<u> </u>	
Admission Requirements	none			
Recommended Previous	chemical and biological basics			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following	learning results		
Professional Competence				
Knowledge	The module aims possess knowledge concerning the planning of layout of anaerobic and aerobic waste treatment plants in detail, treatment plants and explain different methods for waste analytics	describe different techniques for wa		-
Skills	The students are able to discuss the compilation of design and layout of plants. They can critically evaluate techniques and quality control 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 findings in the group.			
Personal Competence Social Competence				
Autonomy	Students can independently tap knowledge from literature, busin consultation with supervisors as well as in the interim preser Furthermore, they can define targets for new application-or resea impact.	ntation, to assess their learning le	vel and define furthe	r steps on this basis.
Workload in Hours				
Credit points	6 Project			
Examination Examination duration and scale	,	ful participation at Probitions		
Assignment for the Following	Elaboration and presentation (15-25 minutes in groups), successing Civil Engineering: Specialisation Structural Engineering: Elective			
	Civil Engineering: Specialisation Structural Engineering: Elective			
34110414	Civil Engineering: Specialisation Coastal Engineering: Elective C			
	Energy and Environmental Engineering: Specialisation Environm	ental Engineering: Elective Compuls	sory	
	Environmental Engineering: Core qualification: Compulsory			
	International Management and Engineering: Specialisation II. En	ergy and Environmental Engineering	: Elective Compulsory	,
	Joint European Master in Environmental Studies - Cities and Sust	ainability: Specialisation Energy: Ele	ective Compulsory	
	Water and Environmental Engineering: Specialisation Environme			
	Water and Environmental Engineering: Specialisation Cities: Elec	ctive Compulsory		



Course L0328: Waste and Environmental Chemistry		
Тур	Laboratory Course	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Kerstin Kuchta	
Language	DE/EN	
Cycle	WiSe	
Content	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 To	Course L0318: Biological Waste Treatment	
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 M0713: Concrete	Structures			
Courses				
Title		Тур	Hrs/wk	СР
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 dimension	ning of structural concrete		
Knowledge	Modules 'Concrete Structures I and II'			
Educational Objectives	After taking part successfully, students have reached t	he 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 ar	nd structural members that are often used.		
Skills	The students are able to apply procedures of the conception and dimensioning to to practical problems of structural engineering. They are capable			
O.i.iii	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 desc	·	a 0,000 ao 111 mo 100 t	n, and dan make deeligh
	·			
Personal Competence				
Social Competence	The students are able to obtain results of high quality	n teamwork.		
Autonomy	The students are able to carry out complex conception	and dimensioning tasks of structures under th	e guidance of tutors.	
Workload in Hours	Independent Study Time 110, Study Time in Lecture 7	0		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	ng: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engine	eering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	: Elective Compulsory		
	International Management and Engineering: Specialis	ation II. Civil Engineering: Elective Compulsor	у	

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	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	 concrete buildings actions on structrues bracing systems slabs (line and point supported plates and floor slabs) membranes and deep beams shells and folded plates reinforced and prestressed members 	
Literature	- Vorlesungsunterlagen	



Course L0578: Structural Concret	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 (L0	600)	Problem-based Learning	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	none			
Recommended Previous	Basic knowledge in structural analysis and design of	reinforced concrete structures (beams, slabs, sl	near 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 8-	4		
Credit points	6			
Examination	Project			
Examination duration and scale	Oral exam (15-30 minutes per student) and project w	ork (FE calculation)		
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		

Course L0598: Computational Ana	Course L0598: Computational Analysis of Concrete Structures		
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	 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 Ana	ourse 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	Course L0600: FE-Modeling of Concrete 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	MiSe		
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		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)	T	Recitation Section (small)	1	1
Module Responsible				
Admission Requirements	None			
Recommended Previous	Knowledge of water management and the key p	rocesses involved in water treatment.		
Knowledge				
Educational Objectives	After taking part successfully, students have rea	ched the following learning results		
Professional Competence				
Knowledge	Students will be able to outline key areas of cor	nflict in water management, as well as their mutual de	pendence for sustain	able water supply. They
	will understand relevant economic, environmen	ital and social factors. Students will be able to explai	n and outline the org	anisational structures of
	water companies. They will be able to explain th	e available water treatment processes and the scope	of their application.	
Skills	· ·	ms in drinking water production and establish solution	•	•
	· ·	ation methods that can be used for this. Students will	•	chemical calculations for
	selected treatment processes and apply genera	Ily accepted technical rules and standards to these pr	ocesses.	
Personal Competence				
Social Competence	Working in a diverse group of specialists, stude	nts will be able to develop and document complex so	lutions for the manag	gement and treatment of
	drinking water. They will be able to take an appr	ropriate professional position, for example representing	g user interests. The	y will be able to develop
	joint solutions in teams of diverse experts and p	resent these solutions to others.		
Autonomy	Students will be in a position to work on a subject	ct independently and present on this subject.		
Workload in Hours	Independent Study Time 96, Study Time in Lecti	ure 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 Coastal Engine	eering: Elective Compulsory		
	Energy and Environmental Engineering: Specia	lisation Energy and Environmental Engineering: Elec	tive Compulsory	
	International Management and Engineering: Sp	ecialisation II. Energy and Environmental Engineering	: Elective Compulsor	ry
	Water and Environmental Engineering: Speciali	sation Water: Compulsory		
	Water and Environmental Engineering: Speciali	sation Environment: Elective Compulsory		
	Water and Environmental Engineering: Speciali	sation Cities: Elective Compulsory		

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 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 M	Course L0403: Water Resource Management	
Тур	Recitation Section (small)	
Hrs/wk	1	
СР	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	



0				
Courses				
Title		Тур	Hrs/wk	СР
Integrated Transportation Planning (L10	·	Problem-based Learning	4	6
Module Responsible				
Admission Requirements	None			
Recommended Previous	some knowledge of transport planning, e.g. through taking the u	ndergraduate class "Transport Plannin	g and Traffic Engine	erin
Knowledge	After telling part or consectify at idente barre years and the fall and	an languaine vanulta		
Educational Objectives	After taking part successfully, students have reached the following	ig learning results		
Professional Competence	Studente are oble to:			
Knowledge	Students are able to:			
	describe interdependencies between land-use/location	choice and transportation/mobility beha	viour	
	 explain and evaluate the social, ecological and econom 	c effects of transport and land-use polic	y measures.	
	 relate current issues in the area of integrated transport p 	anning and formulate an opinion on th	em.	
Skills	Students are able to:			
	 quantify important parameters, which influence travel de 	mand or are influenced by it.		
	comprehensively examine a pre-defined or self-selection.	•	perspective and d	locument the results i
	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. 			
	produce results in group work and document these.			
Autonomy	Students are able to:			
Autonomy	Citations are able to.			
	 assess potential consequences of their future profession 	al activities		
	 independently plan working on a pre-defined project top 	ic, acquire the necessary knowledge a	nd use appropriate n	neans for its execution.
Workload in Hours				
Credit points				
Examination	Written elaboration			
Examination duration and scale	Civil Engineering Charlelinette Charles - Charles - Charles	- Commulació		
Assignment for the Following Curricula	Civil Engineering: Specialisation Structural Engineering: Electiv Civil Engineering: Specialisation Geotechnical Engineering: Ele	' '		
Curricula	Civil Engineering: Specialisation Geolechnical Engineering: Elective			
	Logistics, Infrastructure and Mobility: Specialisation Infrastructure			
	Water and Environmental Engineering: Specialisation Water: El			
	Water and Environmental Engineering: Specialisation Water. El	, ,		
	and and an arrange opening opening and a control an	=		



Course L1068: Integrated Transportation 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, Jacqueline Bianca Maaß	
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	CP
Steel and Composite Structures (L1204)		Lecture	2 nrs/wk	2
Steel and Composite Structures (L1204)		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, BUB	C)		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the follo	wing learning 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 sttructure 	es		
	sketch the contructions of steel and composite bridges	S		
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			
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	180 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Con	npulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: Electi	ve Compulsory		
	International Management and Engineering: Specialisation II	. Civil Engineering: Elective 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	Dozenten des SD B	
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	Dozenten des SD B
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Course L1097: Steel Bridges		
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dr. Jörg Ahlgrimm	
. 33.		
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	



Module M0969: Selected	Fopics in Civil Engineering			
Courses				
Γitle		Тур	Hrs/wk	СР
Analysis of Offshore Structures (L1867)		Lecture	1	1
Design of Concrete Strucutures (L1840		Lecture	2	2
Design of Prefabricated Concrete Struc	tures (L0596)	Lecture	1	1
Design of Prefabricated Concrete Structures (L0597)		Recitation Section (large)	1	1
Forum I - Geotechnics and Construction	n Management (L1634)	Seminar	1	1
Forum II - Geotechnics and Construction	n Management (L1635)	Seminar	1	1
imber Structures (L1151)		Seminar	2	2
Glass Structures (L1152)		Lecture	2	2
Glass Structures (L1447)		Recitation Section (large)	1	1
Project Geotechnics (L0708)		Problem-based Learning	2	4
Vind turbine design (L1905)		Lecture	1	1
Module Responsible	Prof. Uwe Starossek			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	e following learning results		
Professional Competence				
Knowledge				
-	Students are able to find their way through select	ted special areas within civil and structural eng	ineering.	
	 Students are able to explain basic models and p 	rocedures in selected special areas of civil and	l structural engineer	ing.
	 Students are able to interrelate scientific and tec 	hnical knowledge.		
Skills	Students are able to apply basic methods in sele	octed areas of civil and structural engineering.		
Personal Competence				
Social Competence				
Autonomy				
Autonomy	Students can chose independently, in which field	ds they want to deepen their knowledge and sk	ills through the elect	tion of courses.
Workload in Hours	Depends on choice of courses			
Credit points	6			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Enginee	ring: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering:	Elective Compulsory		

Examination Form Kollo Examination duration and scale 30 m Lecturer Dr. S Language DE/E Cycle SoSe Content	ependent Study Time 16, Study Time in Lecture 14 loquium min Said Fawad Mohammadi
Hrs/wk 1 CP 1 Workload in Hours Indep Examination Form Kollo Examination duration and scale 30 m Lecturer Dr. S. Language DE/E Cycle SoSe	ependent Study Time 16, Study Time in Lecture 14 loquium min Said Fawad Mohammadi /EN
CP 1 Workload in Hours Indep Examination Form Kollo Examination duration and scale 30 m Lecturer Dr. S. Language DE/E Cycle SoSe Content	loquium min Said Fawad Mohammadi /EN Se
Workload in Hours Indep Examination Form Kollo Examination duration and scale 30 m Lecturer Dr. S. Language DE/E Cycle SoSe Content	loquium min Said Fawad Mohammadi /EN Se
Examination Form Kollo Examination duration and scale 30 m Lecturer Dr. S Language DE/E Cycle SoSe Content	loquium min Said Fawad Mohammadi /EN Se
Examination duration and scale 30 m Lecturer Dr. S Language DE/E Cycle SoSe Content	min Said Fawad Mohammadi /EN Se
Lecturer Dr. S. Language DE/E Cycle SoSe Content	Said Fawad Mohammadi /EN Se
Language DE/E Cycle SoSe Content	/EN
Cycle SoSe Content	Se
Content	
	führung:
Hydra	 Jackets Semi-Sub FPSO Spar Jackup Offshore-Windenergieanlagen Spools/Jumper Manilfold Pipelines / PLET / Umbilicals Stinger draulics: Deterministic Wave Theories, Airy, Stokes Current / Appearent wave length Morisons equation Irregular seastates What is a spectrum? Significant waveheight, peak period, narrow & broad band



- What is Power Spectral density?
- How do programs determine the forces using Morisons equation?

Tubular welded connections:

- How Pipes are constructed
- · How jackets are build
- Joint Classification, K, Y, T
- Capacity calculation
- Welding process / residual stresses
- Stress Concentration Factors

Foundation:

- Anchoring through piles
- Soil Properties (cohesive, non-cohesive) and stiffness calculation
- Grouted Pile Leg connections
- Pilehead resistance
- Suction piles

Fatigue:

- What is fatigue?
- · What is crack growth?
- Paris Law
- SN-curve approach
- Spectral Fatigue (Transfer function)
- Time Domain Fatigue

Fixed Platforms:

- Installation procedure & verifications
- Inplace analysis (Extreme conditions, operational conditions, marine growth)
- Spectral fatigue application
- Time domain fatigue application

Modelling with USFOS

- Specifying Soil
- Anchors
- Jacket geometry
- Topsides geometry
- Defining wave & current action
- Inplace analysis
- Mesh tubular joint analysis
- Time domain fatigue analysis

Literature

Course L1840: Design of Concrete	Course L1840: Design of Concrete Strucutures	
Тур	Lecture	
Hrs/wk	2	
СР	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Examination Form	Mündliche Prüfung	
Examination duration and scale	20 min	
Lecturer	Dr. Karl Morgen	
Language	DE	
Cycle	WiSe	
Content		
Literature	Schlaich/Schäfer, Konstruieren im Stahlbau, BetonKalender 2001, TII, Verlag Ernst & Sohn	



Course L0596: Design of Prefabri	cated Concrete Structures
Тур	Lecture
Hrs/wk	1
СР	1
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 Bindseil P.: Stahlbetonfertigteile. Werner Verlag, 1998 FIP: FIP Handbuch für 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 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	2
СР	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	

Course L0708: Project Geotechnic	es e	
Тур	Problem-based Learning	
Hrs/wk	2	
СР	4	
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28	
Examination Form	Mündliche Prüfung	
Examination duration and scale	15 min	
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 an	
	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	

Course L1905: Wind turbine design		
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Examination Form	Schriftliche Ausarbeitung	
Examination duration and scale	60 Minuten	
Lecturer	Dr. Jörn Scheller	
Language	DE	
Cycle	SoSe	
Content		
Literature		



Module M0966: Study Wo	rk Foundation Engineering	
Courses		
Title	Typ Hrs/wk CP	
Module Responsible	Dozenten des SD B	
Admission Requirements	none	
Recommended Previous	Subjects of the Foundation 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 geotechnical and foundation 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 geotechnical and foundation 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.	
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 Geotechnical Engineering: Compulsory	
Curricula		



Module M0997: Structural	Analysis - Selected Topics			
Courses				
Title		Тур	Hrs/wk	СР
Plates and Shells (L1199)		Lecture	2	2
Nonlinear Analysis of Frame Structure (I		Lecture	2	2
Nonlinear Analysis of Frame Structure (I		Recitation Section (large)	2	2
Module Responsible	Prof. Uwe Starossek			
Admission Requirements	None			
Recommended Previous	Mechanics I/II, Mathematics I/II, Differential Equa	ations I		
Knowledge				
Educational Objectives	After taking part successfully, students have read	ched the following learning results		
Professional Competence				
Knowledge	After successful completion of this module, stude	ents can explain selected elements of higher structur	al analysis.	
Skills				
		e students are able to assess the premises and t se these methods for performing structural analyses.		presented methods of
Personal Competence				
	Students can			
	participate in subject-specific and interdis	sciplinary discussions,		
	defend their own work results in front of controls.	others		
	 promote the scientific development of col 	lleagues		
	Furthermore, they can give and accept pr	rofessional constructive criticism		
Autonomy	The students have the opportunity to voluntarily	and independently work homework problems.		
Workload in Hours	Independent Study Time 96, Study Time in Lectu	ure 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engi	ineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical E	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engine	eering: Elective Compulsory		



Course L1199: Plates and Shells			
Тур	Lecture		
Hrs/wk			
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Dr. Jürgen Priebe		
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)		
Literature	Plate buckling Shell buckling		
	 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 Evamo Churchura	
	Lecture Lecture	
Hrs/wk		
CP		
	Independent Study Time 32, Study Time in Lecture 28	
	Prof. Uwe Starossek	
Cycle		
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	
СР	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				
Courses				
Title		Тур	Hrs/wk	CP
Soil Laboratory Course (L0499)		Laboratory Course	1	2
Advanced Foundation Engineering (L04s	•	Lecture	2	2
Advanced Foundation Engineering (L049)	,	Recitation Section (large)	1	2
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				
	Independent Study Time 124, Study Time in Lecture 56			
Credit points				
Examination				
Examination duration and scale				
	Civil Engineering: Specialisation Structural Engineering: Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineer	• • •		
	Civil Engineering: Specialisation Coastal Engineering: C			
	International Management and Engineering: Specialisati	on II. Civil Engineering: Elective Compulsory		

Course L0499: Soil Laboratory Co	urse	
Тур	poratory 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 Foundation Engineering		
Тур	Lecture	
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	ourse 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	СР
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 dimension	ning of structural concrete		
Knowledge	Modules 'Concrete Structures I and II'			
Educational Objectives	After taking part successfully, students have reached the	e 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 an	d structural members that are often used.		
Skills	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 description	riptions.		
Personal Competence				
Social Competence	The students are able to obtain results of high quality in	n teamwork.		
Autonomy	The students are able to carry out complex 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 Engineerin	g: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engine	ering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering:	Elective Compulsory		
	International Management and Engineering: Specialisa	ation 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 Concret	e 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	 concrete buildings actions on structrues bracing systems slabs (line and point supported plates and floor slabs) membranes and deep beams shells and folded plates reinforced and prestressed members
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			
module modes. Oteci and				
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	learning 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			
	3 sketch the contractions 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			
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	180 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Compuls	sory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elect	tive Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective C	ompulsory		
	International Management and Engineering: Specialisation II. Civ	il Engineering: Elective Compulsory		

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	Dozenten des SD B
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	Dozenten des SD B
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course



Course L1097: Steel Bridges	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Jörg Ahlgrimm
Language	DE
Cycle	WiSe
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



	Generation from Wind and Hydro Power			
Courses				
Courses				
Title	4.1(1994)	Тур	Hrs/wk	СР
Renewable Energy Projects in Emerged M Hydro Power Use (L0013)	narkets (L0014)	Project Seminar Lecture	1	1
Wind Turbine Plants (L0011)		Lecture	2	3
Wind Energy Use - Focus Offshore (L001)	2)	Lecture	1	1
Module Responsible			·	<u> </u>
	none			
·	Module: Technical Thermodynamics I,			
Knowledge	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
	Module: Technical Thermodynamics II,			
N	Module: Fundamentals of Fluid Mechanics			
-	After taking part successfully, students have reached the	following learning results		
Professional Competence				
-	By ending this module students can explain in detail kno			
а	and can critical comment these aspects in consideration	of current developments. Furthermore, the	y are able to describe f	undamentally the use o
v	water power to generate electricity. The students reprod	uce and explain the basic procedure in the	e implementation of rer	newable energy projects
ir	n countries outside Europe.			
l _T	Through active discussions of various topics within the	seminar of the module, students improve	their understanding ar	nd the application of the
	heoretical background and are thus able to transfer wha			
		, , , , , , , , , , , , , , , , , , , ,		
Skills	Students are able to apply the acquired theoretical four	idations on exemplary water or wind powe	r systems and evaluate	and assess technically
tr	he resulting relationships in the context of dimension	ng and operation of these energy system	ns. They can in compa	are critically the specia
p	procedure for the implementation of renewable energy p	projects in countries outside Europe with the	ne in principle applied a	approach in Europe and
C	can apply this procedure on exemplary theoretical project	ets.		
Davagnal Compotence				
Personal Competence				
Social Competence S	Students can discuss scientific tasks subjet-specificly an	d multidisciplinary within a seminar.		
Autonomy S	Students can independently exploit sources in the center	yt of the emphasis of the lecture material to	clear the contents of th	o locture and to acquire
· ·	Students can independently exploit sources in the conte he particular knowledge about the subject area.	at of the emphasis of the fectore material to	clear the contents of th	le lecture and to acquire
u	ne particular knowledge about the subject area.			
Workload in Hours	ndependent Study Time 110, Study Time in Lecture 70			
Credit points 6	6			
Examination V	Nritten exam			
Examination duration and scale 3	3 hours written exam			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineer	ing: Elective Compulsory		
C	Civil Engineering: Specialisation Coastal Engineering: E	lective Compulsory		
E	Energy and Environmental Engineering: Specialisation E	Energy Engineering: Elective Compulsory		
lr	nternational Management and Engineering: Specialisati	on II. Renewable Energy: Elective Compul	sory	
Ir	nternational Management and Engineering: Specialisati	on II. Energy and Environmental Engineeri	ng: Elective Compulsor	у
F	Product Development, Materials and Production: Specia	lisation Product Development: Elective Cor	npulsory	
F	Product Development, Materials and Production: Specia	lisation Production: Elective Compulsory		
F	Product Development, Materials and Production: Specia	lisation Materials: Elective Compulsory		
F	Renewable Energies: Core qualification: Compulsory			
F	Process Engineering: Specialisation Environmental Proc	ess Engineering: Elective Compulsory		
	Nater and Environmental Engineering: Specialisation En	ovironment: Compulsory		
V	water and Environmental Engineering. Opedatioation En	whomment. Compaisory		



Course L0014: Renewable Energy	
Тур	Project Seminar Project Seminar
Hrs/wk	1
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
	History
	■ Future markets
	Special challenges in new markets - Overview
	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
	o Brazil
	7. Selected projects from the perspective of a development bank - Wesley Urena Vargas, KfW Development Bank
	Geothermal
	Wind or CSP
	Within the seminar, the various topics are actively discussed and applied to various cases of application.
Literature	Folien der Vorlesung
Literature	i olioli doi. Yoliosurig

O LOO40: Hindus Barrer Has	
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 Plants	
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 M1351: Construct	ion Processes			
Courses				
Title		Тур	Hrs/wk	СР
Building Information Modelling (L1908)		Lecture	2	2
Lean Construction (L1910)		Lecture	2	2
System Dynamics (L1909)		Lecture	2	2
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	None			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reache	ed the following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture	84		
Credit points	6			
Examination	Oral exam			
Examination duration and scale	15 min			
Assignment for the Following	Civil Engineering: Specialisation Coastal Enginee	ring: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	gineering: Elective Compulsory		
	Civil Engineering: Specialisation Structural Engine	eering: Elective Compulsory		

Course L1908: Building Informatio	Course L1908: Building Information Modelling	
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	NN	
Language	DE	
Cycle	SoSe	
Content		
Literature		

Course L1910: Lean Construction	Course L1910: Lean Construction	
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dozenten des SD B	
Language	DE	
Cycle	SoSe	
Content		
Literature		

Course L1909: System Dynamics	ourse L1909: System Dynamics	
Тур	Lecture	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dozenten des SD B, Dozenten des Studiengangs	
Language	DE	
Cycle	SoSe	
Content		
Literature		



Module M0723: Design of Prestressed Structures and Concrete Bridges				
Courses				
Title		Тур	Hrs/wk	СР
Design of Prestressed Structures and C	Concreet Bridges (L0603)	Lecture	3	4
Design of Prestressed Structures and C	Concreet Bridges (L0604)	Recitation Section (large)	2	2
Module Responsible	Prof. Günter Rombach			
Admission Requirements	None			
Recommended Previous	Detailed knowledge on the design of concrete structu	res.		
Knowledge				
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge	The students know the main bridge types, their applic	cations and the various loads. They can explain	n the basic design me	thods. They can explain
	the design of a prestressed bridge.			
Skills	The students are able to design reinforced or prestressed concrete bridges.			
Personal Competence				
Social Competence	The students can design in teamwork a real concrete bridge.			
Autonomy	The students are able to design a prestressed concrete bridge and discuss the problems and results with other students.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 7	70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	180 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineeri	ng: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engin	eering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	g: Elective Compulsory		
	International Management and Engineering: Speciali	sation II. Civil Engineering: Elective Compulsor	У	



Course L0603: Design of Prestres	sed Structures and Concreet Bridges
Тур	Lecture
Hrs/wk	3
СР	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 Mech	anics and -Dynamics			
Courses				
Γitle		Тур	Hrs/wk	СР
Soil Mechanics - Selected Topics (L037	4)	Lecture	2	2
Soil Dynamics (L0452)		Lecture	3	2
experimental Researches in Geotechnic	cs (L0706)	Laboratory Course	1	2
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	none			
Recommended Previous	modules: Mathematics I-III, Mechanics I-II, Geo	technics I		
Knowledge	accuracy Cail laboratow accuracy (Amplied atwest	h und du na ancies)		
	courses: Soil laboratory course, (Applied struct	lural dynamics)		
Educational Objectives	After taking part successfully, students have re-	ached the following learning results		
Professional Competence				
Knowledge	After the successful completion of the module t	he students should be able to:		
	to derive and to apply the basic equation			
		the soil under dynamic excitation and to detect the re	•	
	to know the essential laboratory and field tests to determine soil dynamic characteristics and to evaluate them,			
	to design machine foundations to dynamic load,			
	to measure shocks to perform vibration			
	to evaluate shocks in term to their effect 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 method of elastodynamics and plastodynamics, 			
	to distinguish the area of application of	the method of elastodynamics and plastodynamics,		
	to detect the undrained shear strength a	as a function of a number of state variables,		
	-	esive soils and to consider the effects of creep and rat	e-denendent shear stre	enoth in calculations
	to consider the impact of the partly satu	·	o dopondom onodi odo	gar iir carcaraa ono,
	lo concider the impactor the party sala	nation of a coopage and choal calonigan		
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lec	cture 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	150 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering:	gineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical			
	Civil Engineering: Specialisation Coastal Engil			

Course L0374: Soil Mechanics - Selected Topics	
Тур	Lecture
Hrs/wk	2
СР	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	
СР	2	
Workload in Hours	Independent Study Time 18, Study Time in Lecture 42	
Language		
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	
Тур	Laboratory Course
Hrs/wk	1
СР	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Marius Milatz
Language	DE
Cycle	SoSe
Content	The students are supposed to:
	 become acquainted with geotechnical model tests, field tests and laboratory tests as well as corresponding measurement techniques. These compromise amongst others inclinometer measurements and geophone measurements as well as high-grade laboratory tests on the stress-strain relationship of soil specimens, e. g. triaxial tests, simple shear tests and resonant column tests. gain insight into current soil mechanical research. plan, coordinate, perform and evaluate soil mechanical tests in a team. discuss, reflect, review and present the obtained results in a group. An important learning target is the introduction to scientific work for students who plan a scientific career, and for those who will work in practice with the responsibility to order corresponding tests and evaluate the results. The practical laboratory work is based on annualy changing problems, which are however related to the experience and results of the preceding year's course group.
Literature	
Literature	



Module M0807: Boundary	Element Methods			
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 Mechanics I	I (Hydrostatics, Kinematics, Dynamics)		
Knowledge	Mathematics I, II, III (in particular differential equations)			
Educational Objectives	After taking part successfully, students have reached the follow	ving learning results		
Professional Competence	The many particular state in the state in th	g .oug .oou.to		
Knowledge	The students possess an in-depth knowledge regarding the of theoretical and methodical basis of the method.	derivation of the boundary element me	thod and are able to	give an overview of
Skills	The students are capable to handle engineering problems matrices, and solving the resulting system of equations.	oy formulating suitable boundary elen	nents, assembling the	corresponding syst
Personal Competence Social Competence Autonomy	- The students are able to independently solve challenging con identified and the results are critically scrutinized.	nputational problems and develop own	boundary element rou	utines. Problems can
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Written exam			
Examination duration and scale	90 min			
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		
	Energy Systems: Core qualification: Elective Compulsory			
	Computational Science and Engineering: Specialisation Scien	ntific Computing: Elective Compulsory		
	Mechanical Engineering and Management: Specialisation Pro		ctive Compulsory	
	Mechatronics: Specialisation System Design: Elective Comput	sory		
	Product Development, Materials and Production: Core qualific			
	Technomathematics: Specialisation III. Engineering Science: I	Elective Compulsory		
	Technomathematics: Core qualification: Elective Compulsory			
	Theoretical Mechanical Engineering: Core qualification: Electi	ve Compulsory		
	Theoretical Mechanical Engineering: Technical Complementa			



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	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	



Module M0827: Modeling	in Water Management			
Courses				
Title		Тур	Hrs/wk	СР
Applied Groundwater Modeling (L0543)		Lecture	1	1
Applied Groundwater Modeling (L0544)		Recitation Section (small)	2	2
Modeling of Water Supply and Sewer Ne	etwork (L0875)	Problem-based Learning	2	3
Module Responsible	Prof. Wilfried Schneider			
Admission Requirements	none			
Recommended Previous	Groundwater			
Knowledge				
	 groundwater hydraulics and transport of sul 	ostances		
	Pipe Systems			
		in particular drinking water systemsand urban dra	ainage systems includir	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	,, , ,, , ,, ,			
Knowledge	The students are able to describe the modelling	of groundwater flow and transport as well as u	rban water infrastructu	res They can carry
Mowieage	systems analyses and can detect technical and of			
	interdependencies of hydraulic and toxic phenome		ade diadied. Dediade ii	icy are able to arial
Skille	The students are able to construct and apply scien	tific groundwater models indipendently. They ca	n work on different scen	narios and can comp
Onns	or assess different solutions for existing problems			
	solutions (e.g. EPANET, EPA-SWMM).	by application of selected software products.	THE SILLUETIES ARE ADIE I	o use unierent sonw
	Solutions (e.g. LI ANLI, LI A-SWIMIN).			
Personal Competence				
Social Competence	Wird nicht vermittelt.			
,				
Autonomy	Wird nicht vermittelt.			
Workload in Hours	Independent Study Time 110, Study Time in Lectur	0.70		
	6	670		
Credit points Examination	Oral exam			
Examination duration and scale	20 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engine			
Curricula	Civil Engineering: Specialisation Geotechnical Eng			
	Civil Engineering: Specialisation Coastal Engineer			
	Water and Environmental Engineering: Specialisat			
	Water and Environmental Engineering: Specialisat	·		
	Water and Environmental Engineering: Specialisat	ion Cities: Elective Compulsory		

Course L0543: Applied Groundwat	Course L0543: Applied Groundwater 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	Course L0544: Applied Groundwater 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	ourse 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, Weitere Mitarbeiter		
Language	DE		
Cycle	SoSe		
Content			
Literature	Mutschmann/Stimmelmayr: Taschenbuch der Wasserversorgung, 16. Auflage. Springer Vieweg - Verlag. Wiesbaden 2014.		



Module M0828: Urban Env	vironmental Management			
Courses				
Title		Тур	Hrs/wk	СР
Noise Protection (L1109)		Lecture	2	2
Urban Infrastructures (L0874)		Problem-based Learning	2	4
Module Responsible	Dr. Dorothea Rechtenbach			
Admission Requirements	none			
Recommended Previous Knowledge	Knowledge on Urban planning Knowledge on measures for climate protection and clir Basics knowledge in urban drainage and stormwater n			
Educational Objectives	After taking part successfully, students have reached the follow	ring learning results		
Professional Competence				
Knowledge	Students can describe urban development corridors as well	as current and future urban environme	ental problems. They	are able to explain the
	causes of environmental problems (like noise).			
	Students can specify applications for various technical innovat	ions and explain why these contribute to	the improvement of	urban life. They can, for
	example, derive and discuss measures for effective noise abar	ement.		
Skills	s Students are able to develop specific solutions for correcting existing or future environment-related problems of urban development. They can define a range of conceptual and technical solutions for environmental problems for different development paths. To solve specific urban			
	environmental problems they can select technical innovations and integrate them into the urban context.			
Personal Competence		-		
Social Competence	The students can work together in international groups.			
Autonomy	Students are able to organize their work flow to prepare the	mselves for presentations and contrib	utions to the discuss	ions. They can acquire
	appropriate knowledge by making enquiries independently.			
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Project			
Examination duration and scale	Written Report plus oral Presentation			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elect	ve Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: E	lective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective	e Compulsory		
	Environmental Engineering: Core qualification: Elective Comp	ulsory		
	Joint European Master in Environmental Studies - Cities and S	ustainability: Core qualification: Compu	llsory	
	Logistics, Infrastructure and Mobility: Specialisation Infrastructu	re and Mobility: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Environ	ment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities: 0	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	Prof. Martin Jäschke
Language	EN
Cycle	SoSe
Content	
Literature	1) Müller & Möser (2013): Handbook of Engineering Acoustics (also available in German)
	2) WHO (1999): Guidelines for Community Noise
	3) Environmental Noise Directive 2002/49/EG
	4) ISO 9613-2 (1996): Acoustics, Attenuation of sound during propagation outdoors, Part 2: General method of calculation



Course L0874: Urban Infrastructures		
Тур	Problem-based Learning	
Hrs/wk	2	
CP	4	
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28	
Lecturer	Dr. Dorothea Rechtenbach	
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	Depends on chosen topic.	



Module M0859: Coastal H	ydraulic Engineering II			
Courses				
Title		Тур	Hrs/wk	СР
Coastal- and Flood Protection (L0808)		Lecture	2	3
Coastal- and Flood Protection (L1415)		Recitation Section (large)	1	1
Maintennance and Defence of Flood Pro	etection 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 t	he following learning results		
Professional Competence				
Knowledge	The students have the capability to define and expla	in in detail the important aspects of erosion pro	ection and flood pr	otection and are able to
	apply the aspects to practical coastal protection proble	ems. They are able to design and dimension imp	ortant coastal prote	ction measures from the
	functional and from the constructional point of view.			
Skills	The students are able to select design approaches	for the functional and constructional design of	erosion and flood p	rotection measures and
	apply these approaches to practical design tasks.		, , , , , , , , , , , , , , , , , , ,	
Personal Competence				
Social Competence	The students are able to deploy their gained knowled	dge in applied problems such as the functional a	nd constructive des	sign of coastal and flood
	protection structures. Additionaly, they will be able to v	work in team with engineers of other disciplines.		
Autonomy	The students will be able to independently extend the	r knowledge and apply it to new problems.		
Workload in Hours	Independent Study Time 110, Study Time in Lecture 7	0		
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 130 min. The exam	nination includes tasks with respect to the genera	al understanding of	the lecture contents and
	calculations tasks.			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	ng: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engine	eering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	: Compulsory		

Course L0808: Coastal- and Flood	Protection
Тур	Lecture
Hrs/wk	2
СР	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
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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	ourse 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	



Module M0860: Harbour E	Engineering and Harbour Planning	l de la companya de		
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	, 	Lecture	2	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous	Basics of coastal engineering			
Knowledge				
Educational Objectives	After taking part successfully, students have re	ached the following learning results		
Professional Competence				
Knowledge	The students are able to define in details and	d to choose design approaches for the functional des	sign of a port and app	ly them to design tasks.
	They can design the fundamental elements of	a port.		
Skills	The students are able to select and apply appropriate approaches for the functional design of ports.			
Personal Competence				
Social Competence	The students are able to deploy their gained knowledge in applied problems such as the functional design of ports. Additionaly, they will be able to			
	work in team with engineers of other discipline	es.		
Autonomy	The students will be able to independently ext	end their knowledge and apply it to new problems.		
Workload in Hours	Independent Study Time 110, Study Time in Le	ecture 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 150 min. The	he examination includes tasks with respect to the gen	eral understanding of	the lecture contents and
	calculations tasks.			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnica	I Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engi	neering: Compulsory		
	International Management and Engineering: S	Specialisation II. Civil Engineering: Elective Compulsor	ry	
	Theoretical Mechanical Engineering: Specialis	sation Maritime Technology: Elective Compulsory		
	Theoretical Mechanical Engineering: Technical	al Complementary Course: Elective Compulsory		

Course L0809: Habour Engineering		
Тур	ecture	
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 Port Construction		
Тур	ecture	
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	



Module M0861: Modelling	of Hydraulic Engineering			
Courses				
Title		Тур	Hrs/wk	СР
Hydraulic Models (L0813)		Lecture	1	1
Modelling of Waves (L0812)		Lecture	1	1
Modelling of Flow in Rivers and Estuarie	s (L0810)	Lecture	3	4
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous	Coastal Hydraulic Engineering I			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the fo	ollowing learning results		
Professional Competence				
Knowledge	Students are able to define in detail the basic processes	s that are related to the modelling of	flows in hydraulic enginee	ring. Besides, they can
	describe the basic aspects of numerical modelling and act	tual numerical models for the simulation	on of flows and waves.	
01.71	0			
SKIIIS	Students are able to apply hydrodynamic-numerical models to practical hydraulic engineering tasks.			
Personal Competence				
Social Competence	The students are able to deploy their gained knowledge in	n simple applied problems. Additional	y, they will be able to work in	n team with others.
Autonomy	The students will be able to independently extend their kn	owledge and apply it to new problems	S.	
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 3 hours. The examination includes tasks with respect to the general understanding of the lecture contents and			
	calculations tasks.			
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: Ele	ective Compulsory		

Course L0813: Hydraulic Models		
Тур	cture	
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	Course L0812: Modelling of Waves	
Тур	Lecture	
Hrs/wk	1	
СР	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 conservation of momentum Initial conditions and boundary conditions Numerical Methods Time step procedure Finite differences Finite volumes
Literature	Vorlesungsskript



Module M0874: Wastewate	er Systems			
Courses				
Title		Тур	Hrs/wk	СР
Wastewater Systems - Collection, Treati	ment and Reuse (L0934)	Lecture	2	2
Wastewater Systems - Collection, Treati		Recitation Section (large)	1	1
Advanced Wastewater Treatment (L035	,	Lecture	2	2
Advanced Wastewater Treatment (L035		Recitation Section (large)	1	1
•	Prof. Ralf Otterpohl			
	None			
	Knowledge of wastewater management and the key processe	es involved in wastewater treatment.		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the follo	wing learning results		
Professional Competence				
Knowledge	Students are able to outline key areas of the full range of treat	atment systems in waste water managem	ent, as well as their	mutual dependence fo
	sustainable water protection. They can describe relevant econ	nomic, environmental and social factors.		
Skilla	Students are able to pre-design and explain the available wa	estawater treatment processes and the se	one of their applicat	ion in municipal and fo
Skills	some industrial treatment plants.	istewater treatment processes and the sc	ope of their applicat	ion in municipal and ic
	some muustnai tieatment pianis.			
Personal Competence				
Social Competence				
Autonomy	Students are in a position to work on a subject and to organiz	e their work flow independently. They can	also 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	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elec	tive Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: I	Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Electiv	ve Compulsory		
	Bioprocess Engineering: Specialisation A - General Bioproce	ss Engineering: Elective Compulsory		
	Energy and Environmental Engineering: Specialisation Enviro	onmental Engineering: Elective Compulso	ory	
	International Management and Engineering: Specialisation II.	Energy and Environmental Engineering:	Elective Compulsor	y
	International Management and Engineering: Specialisation II.	Process Engineering and Biotechnology	: Elective Compulso	ry
	Process Engineering: Specialisation Environmental Process	Engineering: Elective Compulsory		
	Process Engineering: Specialisation Process Engineering: El	ective Compulsory		
	Water and Environmental Engineering: Specialisation Water:	Compulsory		
	Water and Environmental Engineering: Specialisation Environmental	nment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities:	Compulsory		
	Process Engineering: Specialisation Process Engineering: El Water and Environmental Engineering: Specialisation Water: Water and Environmental Engineering: Specialisation Environmental	ective Compulsory Compulsory nment: Elective 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		
	Wastewater Engineering: Treatment and Reuse, Metcalf & Eddy		



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	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 Planr	ung			
Courses				
itle		Тур	Hrs/wk	СР
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 tra	anchort planning o a through taking the un	doraraduato class	Transport Planning a
	Traffic Engineering"	ansport planning, e.g. anough taking the un	dergraduate class "	mansport riaming a
Educational Objectives	After taking part successfully, students have reached the fol	lowing learning results		
Professional Competence				
Knowledge	Students are able to:			
	use technical terms of urban planning.			
	describe the main determinants of urban developments.	ent.		
	 explain and compare different possibilities of how un 	rban 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 and 	designs for streetscapes		
	appraise such concepts in the context of competing			
	design, justify and reflect their own solutions for con-			
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:			
	a independently complete a suite and a suite for the	variance following a large discount defect		
	independently complete a written report including di access the consequences of their proposed colution		cess.	
	 assess the consequences of their proposed solution independently acquire knowledge and apply this to 			
	- macpendently adjust knowledge and apply this to	non losues 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: El	ective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering			
	Civil Engineering: Specialisation Coastal Engineering: Elec			
	Logistics, Infrastructure and Mobility: Specialisation Infrastru			
	Water and Environmental Engineering: Specialisation Water	er: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Envir	ronment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities	s: 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		
3		
	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.	
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 M0977: Construct	ion Logistics and Project Managemer	nt		
Courses				
Title		Тур	Hrs/wk	СР
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 (Problem-based Learning	1	1
Module Responsible	Prof. Heike Flämig			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reache	ed the following learning results		
Professional Competence				
Knowledge	Students can			
		ction logistics and project development and manage	ement	
	 name advantages and disadvantages of interest 			
	 explain characteristics of products, demand 	and production of construction objects and their co	nsequences for con	struction specific supply
	chains			
	 differentiate constructions logistics from other 	er logistics systems		
Skills	Students can			
	carry out project life cycle assessments			
	apply methods and instruments of construct	ion logistics		
	apply methods and instruments of project de-	-		
	арр.,			
	 design supply and waste removal concepts 	ior a construction project		
Personal Competence				
Social Competence	Students can			
	hold presentations in and for groups			
	 apply methods of conflict solving skills in ground 	oup work and case studies		
Autonomy	Students can			
	a palua mushlama hu ballatia accatanti 19	u aviante d'Abialia		
	solve problems by holistic, systemic and flow			
	Improve their creativity, negotiation skills, co.	onflict and crises solution skills by applying methods	of moderation in ca	ise studies
Workload in Hours	Independent Study Time 124, Study Time in Lecture	e 56		
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	Two written compositions and two short presentation	ns		
Assignment for the Following	Civil Engineering: Specialisation Structural Engine	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	, ,		
	Civil Engineering: Specialisation Coastal Engineer			
	International Management and Engineering: Speci-			
	Logistics, Infrastructure and Mobility: Specialisation			
	Logistics, Infrastructure and Mobility: Specialisation			
	Logistics, initiastructure and initiality. Specialisation	i imasiruoture and infolinty. Elective Compulsory		



Course L1163: Construction Logis	tics
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) host and the contraction 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. Wuppertal 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 Logistik.
	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 Logistics		
Тур	Recitation Section (small)	
Hrs/wk	1	
СР	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, Dr. Anton Worobei	
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	Course L1162: Project Development and Management		
Тур	Problem-based Learning		
Hrs/wk	1		
СР	1		
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14		
Lecturer	Prof. Heike Flämig, Dr. Anton Worobei		
Language	DE		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		



Typ Hrs/wk CP tirtuctural Dynamics (L1202) tecture C1203) Recitation Section (large) Recitation Section (large) Lecture C1204 Lecture C1205 Recitation Section (large) Recit					
Type	Module M0998: Statics an	d Dynamics of Structures			
Type					
Incutural Dynamics (L1202) Incutural Dynamics (L1203) Incuture Monatines (L1203) Incuture Monatines (L1203) Incuture Monatines (L1203) Incuture Monatines and fatigue in site of structures (L0564) Incuture Monatines (L0565) Incuture Monatine Repossible (L0565) Incuture Repossible Repossible (L0565) Incuture Repossible (L0565) Incuture Repossible (L0565) Incuture Repossible (L0565) Incuture Repossible Repossible (L0565) Incuture Repossible (L0565) Incuture Repossible Repossible (L0565) Incuture Repossible Repossible (L0565) Incuture Repossible Repossi	Courses				
Intention Dynamics (11202) Incuture Incurrence Paramics Incurrence Paramics (11202) Incuture Incurrence Paramics Incurrence Paramics (11202) Incurrence Paramics	Title		Тур	Hrs/wk	СР
Recitation Section (large) 2 2	Structural Dynamics (L1202)				
Module Responsible Module Preference Module Responsible Module of International Association of the Responsibility of 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 Social Competence Social Competence Personal Competence Social Competence Social Competence Personal	Structural Dynamics (L1203)		Recitation Section (large)	2	2
Module Responsible Prof. Uwe Starossek None	Fracture mechanics and fatigue in steel	structures (L0564)	Lecture	1	1
Admission Requirements Recommended Previous Knowledge of linear structural analysis of statically determinate and indeterminate structures; Mechanics I/II, Mathematics I/II, Differential equation Knowledge After taking part successfully, students have reached the following learning results	Fracture Mechanics and Fatigue (L0565	5)	Recitation Section (large)	1	1
Recommended Previous Knowledge of linear structural analysis of statically determinate and indeterminate structures; Mechanics VII, Mathematics VII, Differential equation for the following learning results Professional Competence Knowledge After successful completion of this module, the student can explain the basic aspects of dynamic effects on structures and the respective methods 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 Social Competence Personal Competence Suddents can participate in subject-specific and interdisciplinary discussions, defend their own work results in front of others promote the scientific development of colleagues Furthermore, they can give and accept professional constructive criticism Workload in Hours Autonomy Workload in Hours Autonomy Tendit points General Response of material and structures to dynamics loading using the appropriate computational approaches and methods. Tendit points General Response of material and structures to dynamics loading using the appropriate computational approaches and methods.	Module Responsible	Prof. Uwe Starossek			
Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge After successful completion of this module, the student can explain the basic aspects of dynamic effects on structures and the respective methods shall be appropriate computational approaches and methods. Personal Competence Social Competence Social Competence 4 participate in subject-specific and interdisciplinary discussions, defend their own work results in front of others promote the scientific development of colleagues prom	Admission Requirements	None			
Educational Objectives Professional Competence Knowledge	Recommended Previous	Knowledge of linear structural analysis of statically determina	te and indeterminate structures; Mechanic	s I/II, Mathematics I	II, Differential equations
Professional Competence Knowledge 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 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 Social Competence 1 Students can 1 participate in subject-specific and interdisciplinary discussions, 1 defend their own work results in front of others 1 promote the scientific development of colleagues 1 Furthermore, they can give and accept professional constructive criticism Workload in Hours Reamination Written exam Examination duration and scale Assignment for the Following Curricula Curricula Civil Engineering: Specialisation Structural Engineering: Elective Compulsory	Knowledge	I			
Professional Competence Knowledge 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 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 Social Competence 1 Students can 1 participate in subject-specific and interdisciplinary discussions, 1 defend their own work results in front of others 1 promote the scientific development of colleagues 1 Furthermore, they can give and accept professional constructive criticism Workload in Hours Reamination Written exam Examination duration and scale Assignment for the Following Curricula Curricula Civil Engineering: Specialisation Structural Engineering: Elective Compulsory					
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 students will be able to predict the response of material and structures to dynamics loading usin the appropriate computational approaches and methods. **Personal Competence** **Social Competence** **Social Competence** **Social Competence** **Participate in subject-specific and interdisciplinary discussions, **defend their own work results in front of others **promote the scientific development of colleagues **Furthermore, they can give and accept professional constructive criticism **Workload in Hours** **Workload in Hours** **Morkload in Hours** **Independent Study Time 96, Study Time in Lecture 84 **Credit points* **Examination** **Examination** **Written exam** Examination duration and scale** **Assignment for the Following Civil Engineering: Specialisation Structural Engineering: Compulsory **Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory **Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory		Atter taking part successfully, students have reached the follo	wing learning results		
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 Participate in subject-specific and interdisciplinary discussions, defend their own work results in front of others promote the scientific development of colleagues furthermore, they can give and accept professional constructive criticism Autonomy Workload in Hours Credit points Examination duration and scale Assignment for the Following Curricula Assignment for the Following Curricula Civil Engineering: Specialisation Geotechnical Engineering: Compulsory Civil Engineering: Specialisation Structural Engineering: Compulsory Civil Engineering: Specialisation Geotechnical Engineering: Compulsory	·				
Personal Competence Social Competence Social Competence participate in subject-specific and interdisciplinary discussions, defend their own work results in front of others promote the scientific development of colleagues promote the	Knowledge	After successful completion of this module, the student can ex	xplain the basic aspects of dynamic effects	on structures and t	ne respective methods.
Personal Competence Social Competence Social Competence participate in subject-specific and interdisciplinary discussions, defend their own work results in front of others promote the scientific development of colleagues promote the					
Personal Competence Social Competence Social Competence participate in subject-specific and interdisciplinary discussions, defend their own work results in front of others promote the scientific development of colleagues promote the					
Personal Competence Social Competence Social Competence participate in subject-specific and interdisciplinary discussions, defend their own work results in front of others promote the scientific development of colleagues promote the					
Personal Competence Social Competence Social Competence participate in subject-specific and interdisciplinary discussions, defend their own work results in front of others promote the scientific development of colleagues promote the					
Personal Competence Social Competence Social Competence participate in subject-specific and interdisciplinary discussions, defend their own work results in front of others promote the scientific development of colleagues promote the					
Personal Competence Social Competence Social Competence participate in subject-specific and interdisciplinary discussions, defend their own work results in front of others promote the scientific development of colleagues promote the	Skills	After successful completion of this module, the students will	be able to predict the response of materia	I and structures to	dynamics loading using
Personal Competence Social Competence Social Competence Students can • participate in subject-specific and interdisciplinary discussions, • defend their own work results in front of others • promote the scientific development of colleagues • Furthermore, they can give and accept professional constructive criticism Autonomy Workload in Hours Independent Study Time 96, Study Time in Lecture 84 Credit points Examination Written exam Examination duration and scale 135 min Assignment for the Following Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Curricula Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory	e.i.iio	•	so asio to product are respense or materia	4.14 0.14014100 10	aynamoo roaamg aomg
Social Competence • participate in subject-specific and interdisciplinary discussions, • defend their own work results in front of others • promote the scientific development of colleagues • Furthermore, they can give and accept professional constructive criticism 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 Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Curricula Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory		and appropriate computational approaches and methods.			
Social Competence • participate in subject-specific and interdisciplinary discussions, • defend their own work results in front of others • promote the scientific development of colleagues • Furthermore, they can give and accept professional constructive criticism 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 Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Curricula Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory					
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defend their own work results in front of others promote the scientific development of colleagues Furthermore, they can give and accept professional constructive criticism 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 Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Curricula Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory		 participate in subject-specific and interdisciplinary dis- 	cussions,		
Furthermore, they can give and accept professional constructive criticism 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 Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Curricula Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory					
Furthermore, they can give and accept professional constructive criticism 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 Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Curricula Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory		 promote the scientific development of colleagues 			
Autonomy Workload in Hours Independent Study Time 96, Study Time in Lecture 84 Credit points 6 Examination duration and scale 135 min Assignment for the Following Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Curricula Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory		Furthermore, they can give and accept professional co	onstructive criticism		
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 Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory		, , ,			
Credit points 6 Examination Written exam Examination duration and scale 135 min Assignment for the Following Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory	Autonomy				
Examination Written exam Examination duration and scale Assignment for the Following Curricula Civil Engineering: Specialisation Structural Engineering: Elective Compulsory Curricula	Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Examination duration and scale 135 min Assignment for the Following Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory	Credit points	6			
Assignment for the Following Curricula Civil Engineering: Specialisation Structural Engineering: Compulsory Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory	Examination	Written exam			
Curricula Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory	Examination duration and scale	135 min			
Curricula Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory	Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Con	npulsory		
International Management and Engineering: Specialisation II. Civil Engineering: Elective Compulsory					

Course L1202: Structural Dynamic	os
Тур	Lecture
Hrs/wk	2
СР	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 Dynamic	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	es and fatigue in steel structures
Тур	Lecture
Hrs/wk	1
СР	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 anduse 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	· Seeßelberg, C.; Kranbahnen - Bemessung und konstruktive Gestaltung; 3. Auflage; Bauwerk-Verlag; Berlin 2009
	- 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



Course L0565: Fracture Mechanic	Course L0565: Fracture Mechanics and Fatigue	
Тур	Recitation Section (large)	
Hrs/wk	1	
СР	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Dr. Ingo Hadrych	
Language	DE	
Cycle	SoSe	
Content	See interlocking course	
Literature	See interlocking course	



Module M0593: Ruilding M	Materials and Building Preservation			
Module M0333. Building in	laterials and building Freservation			
Courses				
Title		Тур	Hrs/wk	CP
Anchor Technology and Design, Post In	stalled Rebar Connections (L0257)	Recitation Section (small)	1	1
Repair of Structures (L0255)		Lecture	1	1
Mineral Building Materials (L0253)	(1.0050)	Lecture	2	2
Technology of mineral Building Materials Transport Processes in Building Materia		Recitation Section (small) Lecture	1	1
Module Responsible	Prof. Frank Schmidt-Döhl	Lectul e		'
Admission Requirements	None			
Recommended Previous		ng physics and building chemistry, for example by th	o modulos Princip	los of Building Material
			le modules Emicip	les of building Material
Knowledge	and Building Physics and Building Materials and Br	unding 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 de	etail and to use the	m for the manufacture o
_	special mineral building materials. They are abl	le to show the characteristics of mineral building	materials. They a	re able to describe the
	manufacture, properties and fields of application o	of special mortars and special concretes and the con	relations of their ma	aterial parameters. The
	are able to show the principles of anchor technolog			
0.111				
Skills	' '	of granulometry of a mineral building material. They		•
		able to manufacture post installed rebar connection		-
	assess possible causes, to use the fundamentals of	of construction preservation and to select repair and s	trengthening 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 resu	ilts to the lecturer a	nd the other students. In
	a critical discussion they defend and adjust their re	esults. The students are able to manufacture their sp	pecial building mat	erial on the basis of thi
	feedback.			
Autonomy	The etudente are able to reconcibly use the rec	aureas of materials and lab acrimment for their ma	ingt and to invest	ante and to ant minnin
Autonomy		ources of materials and lab equipment for their pro	njeci and to investi	gate and to get missing
	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 Geotechnical Eng	gineering: Compulsory		
Curricula	Civil Engineering: Specialisation Coastal Engineer	ring: Elective Compulsory		
	Civil Engineering: Specialisation Structural Engine	ering: Elective Compulsory		

Course L0257: Anchor Technology	y and Design, Post Installed Rebar Connections
-	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 Structure	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 mine	ourse 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	



Module M0999: Steel Construction Project				
Courses				
Title		Тур	Hrs/wk	СР
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 fo	llowing learning results		
Professional Competence				
Knowledge	Students are able to prepare a part of the whole project and	d explain it to the others.		
Skills	Students can produce sketches and calculations of their p	eart of the project. They are able to adju	ust their work in reaction	to changing conditions
	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 re	spect to intergroup dependencies.		
	They can distribute and process tasks independently.			
Autonomy	Students can handle their part of the project on their own re	esposibility-		
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 Geotechnical Engineering	g: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Coastal Engineering: Ele	ctive Compulsory		
	Civil Engineering: Specialisation Structural Engineering: C	ompulsory		

Course L1206: Steel Construction	ourse L1206: Steel Construction Project	
Тур	Project Seminar	
Hrs/wk	4	
CP	6	
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56	
Lecturer	Dozenten des SD B	
Language	DE	
Cycle	SoSe	
Content	Design of a big construction project (i.e skyscraper, large bridge, roof of a stadiuim) in small groups	
Literature	Wird je nach Projekt individuell angegeben.	



Module M0663: Marine Ge	otechnics and Numerics			
Courses				
Γitle		Тур	Hrs/wk	СР
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	complete modules: Geotechnics I-II, Mathematics I-	III		
Knowledge	courses: Soil laboratory course			
Educational Objectives	After taking part successfully, students have reache	d the following learning results		
Professional Competence				
Knowledge				
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in Lecture	e 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	90 min			
Assignment for the Following	Civil Engineering: Specialisation Geotechnical Eng	ineering: Compulsory		
Curricula	Civil Engineering: Specialisation Structural Engineer	ering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer	ing: Compulsory		
	Theoretical Mechanical Engineering: Specialisation	n Maritime Technology: Elective Compulsory		
	Theoretical Mechanical Engineering: Technical Co.	mplementary Course: Elective Compulsory		
	Water and Environmental Engineering: Specialisati	ion Cities: Elective Compulsory		
	Water and Environmental Engineering: Specialisati	ion Environment: Elective Compulsory		
	Water and Environmental Engineering: Specialisati	ion Water: Elective Compulsory		

Course L0548: Marine Geotechnic	Course L0548: Marine Geotechnics	
Тур	Lecture	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Jürgen Grabe	
Language	DE	
Cycle	SoSe	
Content	Geotechnical investigation an description of the seabed Foundations of Offshore-Constructions Colifferosion 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	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 		



Module M0595: Examinati	on of Materials, Structural Condition	n and Damages		
Courses				
Title		Тур	Hrs/wk	CP
Examination of Materials, Structural Con	dition and Damages (L0260)	Lecture	4	4
Examination of Materials, Structural Con	• , ,	Recitation Section (small)	1	2
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials or ma	aterial science, for example by the module Buildin	g Materials and Building	Chemistry.
Knowledge				
Educational Objectives	After taking part successfully, students have read	ched the following learning results		
Professional Competence				
Knowledge		trading, use and marking of construction produce and know the limitations and characterics of the		
	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 examination of the structural conditions of buildings. They are able to conclude from symptons to the cause of damages. They are able to describe a examination in form of a test report or expert opinion.			
Personal Competence				
Social Competence	The students can describe the different roles of	of manufacturers as well as testing, supervisory	and certification bodies	within the framework of
,	material testing. They can describe the different	• • • •		
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in Lec	cture 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engi	ineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical E	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engine	eering: Elective Compulsory		
	International Management and Engineering: Sp	ecialisation II. Civil Engineering: Elective Compu	sory	
	Materials Science: Specialisation Engineering N	Materials: Elective Compulsory		

Course L0260: Examination of Ma	urse 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 M1350: Excavatio	n Law			
Courses				
Title Typ Hrs/wk CP			СР	
Subsoil and Underground Engineering L	aw (L0395)	Lecture	2	3
Service Contract and Procurement Law	(L1906)	Lecture	2	3
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	None			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reached the follo	owing 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	Oral exam			
Examination duration and scale	15 min			
Assignment for the Following	Civil Engineering: Specialisation Coastal Engineering: Electi	ve Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Structural Engineering: Elec	ctive Compulsory		

Course L0395: Subsoil and Underg	around Engineering Law
	Lecture
Hrs/wk	
CP	
	Independent Study Time 62, Study Time in Lecture 28
	Dr. Georg-Friedger Drewsen
Language	
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 L1906: Service Contract and Procurement Law		
Тур	Lecture	
Hrs/wk	2	
CP	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Prof. Jürgen Grabe, Dozenten des SD B	
Language	DE	
Cycle	WiSe	
Content		
Literature		



Module M0581: Water Pro	tection			
Courses				
Title		Тур	Hrs/wk	СР
Geo-Information-Systems in Water Man	nagement and Hydraulic Engineering (L0963)	Problem-based Learning	2	2
Water Protection and Wastewater Mana	agement (L0226)	Seminar	2	2
Water Protection and Wastewater Mana	agement (L0227)	Recitation Section (large)	1	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous				
Knowledge	Basic knowledge in water management;			
	Good knowledge in urban drainage;			
	Good knowledge of wastewater treatment technique Good knowledge of a liketoote (a.g. COD, BOD, TO			
	Good knowledge of pollutants (e.g. COD, BOD, TS	, N, P) and their properties;		
Educational Objectives	After taking part successfully, students have reached the f	ollowing learning results		
Professional Competence				
Knowledge	The students can describe the basic principles of the re	egulatory framework related to the internation	nal and European	water sector. They can
I	explain limnological processes, substance cycles and	water morphology in detail. Thereby they a	re able to assess	complex water related
	problems. Finally, the students can demonstrate to achieve	ve significant improvements in the full range of	f existing water qua	ality problems. They are
	able to judge environmental and wastewater related is	sues and to widely consider innovative sol	utions, remediation	measures and further
	interventions as well as conceptual problem solving appro	paches.		
Skills	Students can accurately assess current problems and	situations in a country-specific or local conte	ext. They can sugg	est concrete actions to
	contribute to the planning of tomorrow's urban water cyc	cle. Furthermore, they can suggest appropria	te technical, admin	istrative 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 prep	are themselves before presentations and o	liscussion They ca	an acquire appropriate
ricionomy	knowledge by making enquiries independently.	are memberses service precentations and c		an adding appropriate
	and the state of t			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points				
Examination				
Examination duration and scale	60 min			
Assignment for the Following		Floative Compulsory		
Curricula	Civil Engineering: Specialisation Structural Engineering: I			
Curricula	Civil Engineering: Specialisation Geolechnical Engineering: Ele	, ,		
	Environmental Engineering: Specialisation Water: Elective			
	International Management and Engineering: Specialisation			
	Joint European Master in Environmental Studies - Cities a		ve Compulsory	
	Water and Environmental Engineering: Specialisation Wa		vo Joinpuisory	
	Water and Environmental Engineering: Specialisation was Water and Environmental Engineering: Specialisation Environmental Engineering: Specialisation Environmental Engineering: Specialisation was a			
	Water and Environmental Engineering: Specialisation Environmental Engineering: Specialisation Citi			
	vvater and Environmental Engineering: Specialisation Citi	es. Lieguve Compusory		



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	

O	a West water Management
Course L0226: Water Protection a	-
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 M0603: Nonlinear	Structural Analysis			
Courses				
Title		Тур	Hrs/wk	CP
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 follow	wing learning results		
Professional Competence				
Knowledge	Students are able to			
_	+ give an overview of the different nonlinear phenomena in st	ructural mechanics.		
	+ explain the mechanical background of nonlinear phenomen			
	+ to specify problems of nonlinear structural analysis, to ide		to 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 co	moutational procedure		
	+ apply finite element procedures for nonlinear structural anal			
	+ critically verify and judge results of nonlinear finite elements			
	+ to transfer their knowledge of nonlinear solution procedures			
Personal Competence				
Social Competence	Students are able to			
Social Competence	+ solve problems in heterogeneous groups and to document	he corresponding results		
	+ share new knowledge with group members.	ne corresponding results.		
	+ shale new knowledge with group members.			
Autonomy	Students are able to			
	+ assess their knowledge by means of exercises and E-Learn	ing.		
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	Civil Engineering: Specialisation Structural Engineering: Elec	tive Compulsory		
Curricula	International Management and Engineering: Specialisation II.	Civil Engineering: Elective Compulso	ory	
	Materials Science: Specialisation Modeling: Elective Compuls	sory		
	Mechatronics: Specialisation System Design: Elective Compu	Isory		
	Product Development, Materials and Production: Core qualific	cation: Elective Compulsory		
	Naval Architecture and Ocean Engineering: Core qualification			
	Ship and Offshore Technology: Core qualification: Elective Co			
	Theoretical Mechanical Engineering: Core qualification: Elect	•		
	Theoretical Mechanical Engineering: Technical Complementa			



Course L0277: Nonlinear Structura	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
Litoroturo	[1] Alexander Düster, Nonlinear Structrual Analysis, Lecture Notes, Technische Universität Hamburg-Harburg, 2014.
Literature	
	[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	



Module M0619: Waste Tre	atment Technologies			
Courses				
Waste and Environmental Chemistry (L0328) Laboratory Course 2 2				CP 2 4
Module Responsible	Prof. Kerstin Kuchta	r robiem bacoa zoarimig	<u> </u>	
Admission Requirements	none			
Recommended Previous	chemical and biological basics			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following	learning results		
Professional Competence				
Knowledge	The module aims possess knowledge concerning the planning of layout of anaerobic and aerobic waste treatment plants in detail, treatment plants and explain different methods for waste analytics	describe different techniques for wa		-
Skills	The students are able to discuss the compilation of design and layout of plants. They can critically evaluate techniques and quality control 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 findings in the group.			
Personal Competence Social Competence	Students can participate in subject-specific and interdisciplinary front of others and promote the scientific development in front oriticism.			
Autonomy	Students can independently tap knowledge from literature, busin consultation with supervisors as well as in the interim preser Furthermore, they can define targets for new application-or resea impact.	ntation, to assess their learning le	vel and define furthe	r steps on this basis.
Workload in Hours				
Credit points	6 Project			
Examination Examination duration and scale	,	ful participation at Probitions		
Assignment for the Following	Elaboration and presentation (15-25 minutes in groups), successing Civil Engineering: Specialisation Structural Engineering: Elective			
	Civil Engineering: Specialisation Structural Engineering: Elective			
34110414	Civil Engineering: Specialisation Coastal Engineering: Elective C			
	Energy and Environmental Engineering: Specialisation Environm	ental Engineering: Elective Compuls	sory	
	Environmental Engineering: Core qualification: Compulsory			
	International Management and Engineering: Specialisation II. Eng	ergy and Environmental Engineering	: Elective Compulsory	,
	Joint European Master in Environmental Studies - Cities and Sust	ainability: Specialisation Energy: Ele	ective Compulsory	
	Water and Environmental Engineering: Specialisation Environme			
	Water and Environmental Engineering: Specialisation Cities: Elec	ctive Compulsory		



Course L0328: Waste and Environmental Chemistry				
Тур	Laboratory Course			
Hrs/wk	2			
СР	2			
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28			
Lecturer	Prof. Kerstin Kuchta			
Language	DE/EN			
Cycle	WiSe			
Content	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 Treatment			
Тур	elem-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	ater			
Courses				
Title		Тур	Hrs/wk	СР
Geohydraulic and Solute Transport (L05	539)	Lecture	2	2
Geohydraulic and Solute Transport (L05	540)	Recitation Section (small)	1	1
Simulation in Groundwater Hydrology (L	0541)	Lecture	1	1
Simulation in Groundwater Hydrology (L	0542)	Recitation Section (small)	2	2
Module Responsible	Prof. Wilfried Schneider			
Admission Requirements	None			
Recommended Previous	Ground water hydrology			
Knowledge	Hydromechanics			
	hydromechanics			
Educational Objectives	After taking part successfully, students have reached the	a following learning results		
Professional Competence	Aller taking part successiony, students have reached the	o tollowing learning results		
Knowledge	The students are able to describe the fate of solutes in t	he subsurface along the noth between soil an	d water hady guantit	ativaly and qualitativaly
Miowieage	The students are able to describe the fate of solutes in the subsurface along the path between soil and water body quantitatively and qualitatively.			alively and quantalively
Skille	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- fu			
	and Ku functions. They can model transport of solutes in the unsaturated and saturated zoned. They are able to determine dispersiities, coefficients, decay rates and dissolution rates for organic and inorganic substances.			
Personal Competence	coemicients, decay rates and dissolution rates for organi	e and morganic substances.		
•	The students can help to each other.			
Autonomy	'			
Workload in Hours				
Credit points				
Examination	Written exam			
Examination duration and scale	60 min written exam and written papers			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Enginee	ring: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: I	Elective Compulsory		
	Process Engineering: Specialisation Environmental Pro	cess Engineering: Elective Compulsory		
	Process Engineering: Specialisation Process Engineeri	ng: Elective Compulsory		
	Water and Environmental Engineering: Specialisation V	/ater: Compulsory		
	Water and Environmental Engineering: Specialisation E	nvironment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation C	ities: Elective Compulsory		

Course L0539: Geohydraulic and Solute Transport				
Тур	ecture			
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 Genuchter			
	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	f. Wilfried Schneider	
Language)E	
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 movemen	
	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	citation Section (small)			
Hrs/wk	2			
CP				
Workload in Hours	ependent Study Time 32, Study Time in Lecture 28			
Lecturer	f. Wilfried Schneider			
Language	E			
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	ictures (L0598)	Lecture	2	2		
Computational Analysis of Concrete Stru	ictures (L0599)	Recitation Section (large)	2	2		
FE-Modeling of Concrete Structures (L0	600)	Problem-based Learning	2	2		
Module Responsible	Prof. Günter Rombach					
Admission Requirements	none					
Recommended Previous	Basic knowledge in structural analysis and design of re	inforced concrete structures (beams, slabs, she	ear walls).			
Knowledge	Lectures 'Concrete Structures I und II'					
	Lectures 'Structural Analysis I and 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 wor	k (FE calculation)				
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				

Тур	cture				
Hrs/wk	2				
СР	2				
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28				
	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	ecitation Section (large)			
Hrs/wk	2			
CP				
Workload in Hours	ependent Study Time 32, Study Time in Lecture 28			
Lecturer	f. Günter Rombach			
Language				
Cycle	WiSe			
Content	See interlocking course			
Literature	See interlocking course			

Course L0600: FE-Modeling of Cor	ncrete Structures			
Тур	roblem-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		Lecture	2	1
Chemistry of Drinking Water Treatment	(L0312)	Recitation Section (large)	1	2
Water Resource Management (L0402)		Lecture Recitation Section (small)	2	2
Water Resource Management (L0403)	la cum e :	necitation Section (Smail)	I	ı
Module Responsible				
Admission Requirements	None			
Recommended Previous	Knowledge of water management and the key p	rocesses involved in water treatment.		
Knowledge	71			
Educational Objectives	After taking part successfully, students have rea	ched the following learning results		
Professional Competence	, , , , , , , , , , , , , , , , , , ,			
Knowledge	Students will be able to outline key areas of cor	nflict in water management, as well as their mutual o	lenendence for sustain	nable water supply. They
	· ·	ntal and social factors. Students will be able to expl	•	
	· ·	ne available water treatment processes and the scop		,
	water comparison may min be able to explain a	io available water a calment proceeded and are coop	о от итот арриоалоти	
Skills	Students will be able to assess complex probler	ms in drinking water production and establish solution	ons involving water ma	nagement and technical
	measures. They will be able to assess the evaluation	uation methods that can be used for this. Students w	ill be able to carry out	chemical calculations for
	selected treatment processes and apply genera	lly accepted technical rules and standards to these	orocesses.	
Personal Competence				
•	Working in a divorce group of enecialists stude	nts will be able to develop and document complex	colutions for the mana	goment and treatment of
30ciai Competence		ropriate professional position, for example represen		-
	joint solutions in teams of diverse experts and p		ing user interests. The	y will be able to develop
	Joint solutions in teams of diverse experts and p	resent these solutions to others.		
Autonomy	Students will be in a position to work on a subje-	ct independently and present on this subject.		
Workload in Hours	1 7 7	ure 84		
Credit points				
Examination	Written exam			
Examination duration and scale	60 min (chemistry) + presentation			
Assignment for the Following	Civil Engineering: Specialisation Structural Eng			
Curricula	0 0 1			
	Civil Engineering: Specialisation Coastal Engine			
		lisation Energy and Environmental Engineering: Ele		
	International Management and Engineering: Sp	ecialisation II. Energy and Environmental Engineeri	ng: Elective Compulso	ry
	Water and Environmental Engineering: Speciali	sation Water: Compulsory		
	Water and Environmental Engineering: Speciali	sation Environment: Elective Compulsory		
	Water and Environmental Engineering: Speciali	sation Cities: Elective Compulsory		

Course L0311: Chemistry of Drink	ing Water Treatment
Тур	Lecture
Hrs/wk	2
СР	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	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
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



Module M0858: Coastal H	ydraulic Engineering I			
Courses				
Title		Тур	Hrs/wk	СР
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	Basics of hydraulic engineering, hydrology and hy	dromechanics		
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 b	asic concepts of coastal engineering and port er	gineering. They are ab	ole to apply the concept
	to selected practical problems of coastal engine	ering. Students can define and determine the b	asics for design and	dimensioning of coasta
	engineering constructions.			
Skills	The students are capable to apply basic design ap	proaches to selected and pre-defined design tas	ks in coastal engineeri	ng.
Personal Competence				
Social Competence	The students are able to deploy their gained know	vledge in applied problems such as the design o	f coastal protection stru	uctures. Additionaly, the
	will be able to work in team with engineers of othe	r disciplines, for instance designing of coastal bre	akwaters.	
Autonomy	The students will be able to independently extend	their knowledge and applyit to new problems.		
Workload in Hours	Independent Study Time 124, Study Time in Lectu	re 56		
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 2 hours. The e	xamination includes tasks with respect to the ger	neral understanding of	the lecture contents an
	calculations tasks.			
Assignment for the Following	Civil Engineering: Specialisation Structural Engine	eering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical En	gineering: Compulsory		
	Civil Engineering: Specialisation Coastal Enginee	ring: Compulsory		
	International Management and Engineering: Spec	ialisation II. Civil Engineering: Elective Compulso	ry	

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
Integrated Transportation Planning (L10		Problem-based Learning	4	6
Module Responsible				
Admission Requirements	None			
Recommended Previous	some knowledge of transport planning, e.g. through taking the	indergraduate class "Transport Plannin	g and Traffic Engine	erin
Knowledge	After taking part as apportally at salamta bases you had the follow	na le amina veculta		
Educational Objectives	After taking part successfully, students have reached the follow	rig rearring results		
Professional Competence	Chi danta ara abla ta			
Knowledge	Students are able to:			
	 describe interdependencies between land-use/location 	choice and transportation/mobility beha	viour	
	 explain and evaluate the social, ecological and econom 	ic effects of transport and land-use polic	y measures.	
	 relate current issues in the area of integrated transport; 	lanning and formulate an opinion on th	em.	
Skills	Students are able to:			
	 quantify important parameters, which influence travel de 	mand or are influenced by it.		
	comprehensively examine a pre-defined or self-selection.	•	perspective and d	locument the results i
	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.			
	produce rooms in group work and document areas.			
Autonomy	Students are able to:			
	assess potential consequences of their future professio			
	 independently plan working on a pre-defined project to 	ic, acquire the necessary knowledge a	nd use appropriate n	neans for its execution.
Workload in Hours				
Credit points				
Examination	Written elaboration			
Examination duration and scale	Civil Engineering Charlelinetic - Other tree!	a Compulson		
Assignment for the Following Curricula	Civil Engineering: Specialisation Structural Engineering: Electi Civil Engineering: Specialisation Geotechnical Engineering: El	' '		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective			
	Logistics, Infrastructure and Mobility: Specialisation Infrastructure			
	Water and Environmental Engineering: Specialisation Water: E			
	Water and Environmental Engineering: Specialisation			



Course L1068: Integrated Transpo	Course L1068: Integrated Transportation 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, Jacqueline Bianca Maaß		
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 M0964: Structures	s in Foundation and Hydraulic En	gineering		
Courses				
Title		Тур	Hrs/wk	СР
Steel Structures in Foundation and Hydro	raulic 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 envir	ronmental engineering:		
Knowledge	- Ocean de mises I II			
	Geotechnics I-II George Chrysters I-II			
	Steel Structures I-II			
Educational Objectives	After taking part successfully, students have re	eached the following learning results		
Professional Competence				
Knowledge	Knowledge of different tunnel construction types as well as special methods and techniques of subsoil construction. The students get deeper			
	knowledge of steel and ground engineering	as well as constructions knowledge concerning qu	ay walls. Futhermore,	the students get all th
	neccessary knowledge to design singular construction elements for sheet pile walls and they know how to choose the right construction elements			
	depending on the influencing conditions.			
Skills	Basic knowledge of tunnel design as well as practical skills in structural tunnel analysis. Furthermore, the students are able to dimension shere			
	pile wall construction regarding all constrution	elements, to choose the suitable construction elements	nts with respect to the i	nfluencing conditions,
	design all kinds of sheet pile walls (wave s	heet pile walls and combined sheet pile walls) and	d to dimension all cor	nstruction elements ar
	connections.			
Personal Competence				
Social Competence	Capacity for teamwork concerning project man	nagement and design of tunnels.		
Autonomy	Promotion of independent and creative work fl	ow in the framework of a design exercise.		
Workload in Hours	Independent Study Time 124, Study Time in L	ecture 56		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Er	ngineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnica	l Engineering: Compulsory		
	Civil Engineering: Specialisation Coastal Eng	ineering: Compulsory		
	International Management and Engineering: S	Specialisation II. Civil Engineering: Elective Compulso	ry	

Course L1146: Steel Structures in	Course L1146: Steel Structures in Foundation and Hydraulic Engineering	
Тур	Lecture	
Hrs/wk	2	
СР	3	
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28	
Lecturer	Frank Feindt	
Language	DE	
Cycle	WiSe	
Content	Design of a sheet pile wall, design of a combined sheet pile wall, piles, walings, connections, fatigue	
Literature	EAU 2012, EA-Pfähle, EAB	



Course L0707: Underground Cons	tructions
Тур	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



Module M0969: Selected	Topics in Civil Engineering			
Courses				
				0.0
Title		Тур	Hrs/wk	СР
Analysis of Offshore Structures (L1867		Lecture	1	1
Design of Concrete Strucutures (L1840		Lecture	2	2
Design of Prefabricated Concrete Struc		Lecture	1	1
Design of Prefabricated Concrete Struc		Recitation Section (large)	1	1
Forum I - Geotechnics and Constructio		Seminar	1	1
Forum II - Geotechnics and Construction	n Management (L1635)	Seminar	1	1
Γimber Structures (L1151)		Seminar	2	2
Glass Structures (L1152)		Lecture	2	2
Glass Structures (L1447)		Recitation Section (large)	1	1
Project Geotechnics (L0708)		Problem-based Learning	2	4
Wind turbine design (L1905)		Lecture	1	1
Module Responsible	Prof. Uwe Starossek			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the follow	owing learning results		
Professional Competence				
Knowledge				
	 Students are able to find their way through selected s 	pecial areas within civil and structural eng	ineering.	
	Students are able to explain basic models and proceed	dures in selected special areas of civil and	l structural engineer	ing.
	Students are able to interrelate scientific and technical	al knowledge.		
Ckilla				
Skills	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 the	ey want to deepen their knowledge and sk	ills through the elect	tion of courses.
Workload in Hours	Depends on choice of courses			
	'			
Credit points				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Ele			
Curricula				
	Civil Engineering: Specialisation Coastal Engineering: Electi	ve Compulsory		

Course L1867: Analysis of Offsho	re Structures
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Kolloquium
Examination duration and scale	30 min
Lecturer	Dr. Said Fawad Mohammadi
Language	DE/EN
Cycle	SoSe
Content	Einführung: Jackets Semi-Sub FPSO Spar Jackup Offshore-Windenergieanlagen Spools/Jumper Manilfold Pipelines / PLET / Umbilicals Stinger
	Hydraulics: Deterministic Wave Theories, Airy, Stokes Current / Appearent wave length Morisons equation Irregular seastates What is a spectrum? Significant waveheight, peak period, narrow & broad band



- What is Power Spectral density?
- How do programs determine the forces using Morisons equation?

Tubular welded connections:

- How Pipes are constructed
- · How jackets are build
- Joint Classification, K, Y, T
- Capacity calculation
- Welding process / residual stresses
- Stress Concentration Factors

Foundation:

- Anchoring through piles
- Soil Properties (cohesive, non-cohesive) and stiffness calculation
- Grouted Pile Leg connections
- Pilehead resistance
- Suction piles

Fatigue:

- What is fatigue?
- · What is crack growth?
- Paris Law
- SN-curve approach
- Spectral Fatigue (Transfer function)
- Time Domain Fatigue

Fixed Platforms:

- Installation procedure & verifications
- Inplace analysis (Extreme conditions, operational conditions, marine growth)
- Spectral fatigue application
- Time domain fatigue application

Modelling with USFOS

- Specifying Soil
- Anchors
- Jacket geometry
- Topsides geometry
- Defining wave & current action
- Inplace analysis
- Mesh tubular joint analysis
- Time domain fatigue analysis

Literature

Course L1840: Design of Concrete Strucutures	
Тур	Lecture
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	20 min
Lecturer	Dr. Karl Morgen
Language	DE
Cycle	WiSe
Content	
Literature	Schlaich/Schäfer, Konstruieren im Stahlbau, BetonKalender 2001, TII, Verlag Ernst & Sohn



Course L0596: Design of Prefabrio	cated Concrete Structures
Тур	Lecture
Hrs/wk	1
СР	1
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 Bindseil P.: Stahlbetonfertigteile. Werner Verlag, 1998 FIP: FIP Handbuch für 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
СР	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 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	2
СР	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Klausur
Examination duration and scale	60 min
	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
СР	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

Course L0708: Project Geotechnics		
Тур	Problem-based Learning	
Hrs/wk	2	
CP	4	
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28	
Examination Form	Mündliche Prüfung	
Examination duration and scale	15 min	
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	

Course L1905: Wind turbine design	
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Examination Form	Schriftliche Ausarbeitung
Examination duration and scale	60 Minuten
Lecturer	Dr. Jörn Scheller
Language	DE
Cycle	SoSe
Content	
Literature	



Module M0965: Study Wo	rk Structural Engineering
Courses	
Title	Typ Hrs/wk CP
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 learning results
Professional Competence	
Knowledge	The students are able to demonstrate their detailed knowledge in the field of structural and construction 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 structural and construction 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
Autonomy	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.
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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: Compulsory
Curricula	



Module M0997: Structural	Analysis - Selected Topics			
Courses				
Title		Тур	Hrs/wk	СР
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	None			
Recommended Previous	Mechanics I/II, Mathematics I/II, Differential Equa	ations I		
Knowledge				
Educational Objectives	After taking part successfully, students have rea	ched the following learning results		
Professional Competence				
Knowledge	After successful completion of this module, stud	ents can explain selected elements of higher structura	al analysis.	
Skills				
	After an acceptable and the second of the se	a skudanta ana alda ta assas tha manaisas and th		
	· ·	e students are able to assess the premises and the	ie applicability of the	e presented methods
	advanced structural analysis. They are able to t	use these methods for performing structural analyses.		
Personal Competence				
Social Competence	Students can			
	participate in subject-specific and interd			
	defend their own work results in front of			
	promote the scientific development of co	· ·		
	Furthermore, they can give and accept p	professional constructive criticism		
Autonomy	The students have the opportunity to voluntarily	and independently work homework problems.		
Workload in Hours	Independent Study Time 96, Study Time in Lect	ure 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Eng			
Curricula	Civil Engineering: Specialisation Geotechnical			
1	Civil Engineering: Specialisation Coastal Engin	eering: Elective Compulsory		



Course L1199: Plates and Shells	
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	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



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

Module M-002: Master The	esis
Courses	
Γitle	Typ Hrs/wk CP
Module Responsible	Professoren der TUHH
Admission Requirements	A 5 4 0 4 15 40 (4)
	According to General Regulations §24 (1):
	At least 78 credit points have to be achieved in study programme. The examinations board decides on exceptions.
Recommended Previous	
Knowledge	
Educational Objectives	
Professional Competence	
Knowledge	
	The students can use specialized knowledge (facts, theories, and methods) of their subject competently on specialized issues. 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 current 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.
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Skills	The students are able:
	To select apply and if pagessary dayslon further methods that are suitable for solving the appelaint and problem in question.
	 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 incompletel
	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 upholding
	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	
Examination	
Examination duration and scale	
Assignment for the Following	
•	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
	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
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Ship and Offshore Technology: Thesis: Compulsory
Theoretical Mechanical Engineering: Thesis: Compulsory
Process Engineering: Thesis: Compulsory
Water and Environmental Engineering: Thesis: Compulsory