

Module Manual

Master of Science

Civil Engineering

Cohort: Winter Term 2016

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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				
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.



Module M0808: Finite Eler	ments Methods			
Courses				
Title		Тур	Hrs/wk	СР
Finite Element Methods (L0291)		Lecture	2	3
Finite Element Methods (L0804)		Recitation Section (large)	2	3
Module Responsible	Prof. Otto von Estorff			
Admission Requirements	none			
Recommended Previous	Mechanics I (Statics, Mechanics of Materials) and Mechanics II (Hy	drostatics, Kinematics, Dynamics)		
Knowledge	Mathematics I, II, III (in particular differential equations)			
Educational Objectives	After taking part successfully, students have reached the following	earning results		
Professional Competence				
Knowledge	The students possess an in-depth knowledge regarding the der theoretical and methodical basis of the method.	vation of the finite element method	d and are able to g	ive an overview of the
Skills	The students are capable to handle engineering problems by formulating suitable finite elements, assembling the corresponding system matriand solving the resulting system of equations.			onding system matrice
Personal Competence Social Competence Autonomy	- The students are able to independently solve challenging computed and the results are critically scrutinized.	itational problems and develop ow	n finite element rou	tines. Problems can t
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: Core qualification: Compulsory			
Curricula	Energy Systems: Core qualification: Elective Compulsory			
Ourricula	Aircraft Systems Engineering: Specialisation Aircraft Systems: Elec	tive Compulsory		
	Aircraft Systems Engineering: Specialisation Air Transportation Sys			
	Computational Science and Engineering: Specialisation Scientific			
	International Management and Engineering: Specialisation II. Mecl			
	International Management and Engineering: Specialisation II. Prod		lective Compulsory	
	Mechatronics: Core qualification: Compulsory	aoi Bovelopinent and Froutcilon. E	.coave Compulsory	
	Biomedical Engineering: Specialisation Artificial Organs and Rege	nerative Medicine: Flootive Computer	sony	
	Biomedical Engineering: Specialisation Artificial Organis and Rege	·	301 y	
	Biomedical Engineering: Specialisation Implants and Endoprosine Biomedical Engineering: Specialisation Medical Technology and C			
		, , ,		
	Biomedical Engineering: Specialisation Management and Busines		лу	
	Product Development, Materials and Production: Core qualification			
	Technomathematics: Specialisation III. Engineering Science: Electi	ve Compulsory		
	Technomathematics: Core qualification: Elective Compulsory			
	Theoretical Mechanical Engineering: Core qualification: Compulso	ту		



Course L0291: Finite Element Met	Course L0291: Finite 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	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	3			
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28			
Lecturer	Prof. Otto von Estorff			
Language	EN			
Cycle	WiSe			
Content	See interlocking course			
Literature	See interlocking course			



Module M0962: Sustainab	ility and Risk Management			
Courses				
Title		Тур	Hrs/wk	СР
Safety, Reliability and Risk Assessment	(L1145)	Seminar	2	3
Environment and Sustainability (L0319)		Lecture	2	3
Module Responsible	Prof. Kerstin Kuchta			
Admission Requirements	none			
Recommended Previous	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	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	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 Lab	ooratory 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				
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 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				
Knowledge				
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge	The students are able to define and explain the bas	sic concepts of coastal engineering and port er	ngineering. They are at	ole to apply the concept
	to selected practical problems of coastal engineer	ing. Students can define and determine the	pasics for design and	dimensioning of coasta
	engineering constructions.			
Skills	The students are capable to apply basic design app	roaches to selected and pre-defined design tas	ks in coastal engineeri	ng.
Personal Competence				
Social Competence	The students are able to deploy their gained knowle	edge in applied problems such as the design of	f coastal protection stru	uctures. Additionaly, the
	will be able to work in team with engineers of other	disciplines, for instance designing of coastal bre	akwaters.	
Autonomy	The students will be able to independently extend the	eir knowledge 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 exa	mination includes tasks with respect to the ge	neral understanding of	the lecture contents an
	calculations tasks.			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ring: Elective 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 Compulso	ory	

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 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 different tunnel construction type	es as well as special methods and techniques of	subsoil construction. 7	he students get deep
	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 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
Lecturer Language Cycle SoSe Content 1. Introduction Development of renewable energies worldwide History History Future markets Special challenges in new markets - Overview 2. Sample project wind farm Korea Survey Technical Description Project phases and characteristics 3. Funding and financing instruments for EE projects in new markets Overview funding opportunitie Overview unding 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 Elektraiteringosprojekten 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, KIW Development Bank Geothermal Wind or CSP	CP	1
Content 1. Introduction Development of renewable energies worldwide I history Future markets Special challenges in new markets - Overview 2. Sample project wind farm Korea Survey Technical Description Project phases and characteristics 3. Funding and financing instruments for EE projects in new markets Overview funding opportunitie Overview funding opportunitie Overview countries with feed-in laws Major funding programs 4. CDM projects - why, how, examples Overview CDM process Exercise CDM 5. Rural electrification and hybrid systems - an important future market for EE Rural Electrification and hybrid systems The role of the EE Interpretation of hybrid systems The role of the EE Interpretation 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	Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Content 1. Introduction Development of renewable energies worldwide History Future markets Special challenges in new markets - Overview 2. Sample project wind farm Korea Survey Technical Description Project phases and characteristics 3. Funding and financing instruments for EE projects in new markets Overview funding opportunitie Overview 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: South Africa Brazil 7. Selected projects from the perspective of a development bank - Wesley Urena Vargas, KfW Development Bank Geothermal Wind or CSP	Lecturer	Dr. Andreas Wiese
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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 Funding and financing instruments for EE projects in new markets Overview funding opportunitie Overview funding opportunitie Overview countries with feed-in laws Major funding programs CDM projects - why, how, examples Overview CDM process Examples Examples Examples Examples Examples Pural Electrification and hybrid systems - an important future market for EE Rural Electrification: Introduction Types of Elektrizifierungsprojekten The role of the EEInterprelation of hybrid systems Project example: hybrid system Galepagos Islands Tendering process for EE projects - examples South Africa Brazil Selected projects from the perspective of a development bank - Wesley Urena Vargas, KfW Development Bank Geothermal Wind or CSP	Content	
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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
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Martin Skiba
Language	DE
Cycle	SoSe
Content	 Introduction, importance of offshore wind power generation, Specific requirements for offshore engineering Physical fundamentals for utilization of wind energy Design and operation of offshore wind turbines, presentation of different concepts of offshore wind turbines, representation of the individual system components and their system-technical relationships Foundation engineering, offshore site investigation, presentation of different concepts of offshore foundation structures, planning and fabrication of foundation structures Electrical infrastructure of an offshore wind farm, Inner Park cabling, offshore substation, grid connection Installation of offshore wind farms, installation techniques and auxiliary devices, construction logistics Development and planning of offshore wind farms Operation and optimization of offshore wind farms Day excursion
Literature	 Gasch, R.; Twele, J.: Windkraftanlagen - Grundlagen, Entwurf, Planung und Betrieb; Vieweg + Teubner, Stuttgart, 2007, 7. Auflage Molly, J. P.: Windenergie - Theorie, Anwendung, Messung; C. F. Müller, Heidel-berg, 1997, 3. Auflage Hau, E.: Windkraftanlagen; Springer, Berlin, Heidelberg, 2008, 4.Auflage Heier, S.: Windkraftanlagen - Systemauslegung, Integration und Regelung; Vieweg + Teubner, Stuttgart, 2009, 5. Auflage Jarass, L.; Obermair, G.M.; Voigt, W.: Windenergie: Zuverlässige Integration in die Energieversorgung; Springer, Berlin, Heidelberg, 2009, 2. Auflage



Module M0663: Marine Ge	otechnics and Numerics			
Courses				
Title		Тур	Hrs/wk	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-I	II		
Knowledge	courses: Soil laboratory course			
Educational Objectives	After taking part successfully, students have reached	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	70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	90 min			
Assignment for the Following	Civil Engineering: Specialisation Coastal Engineeri	ng: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engi	neering: Compulsory		
	Civil Engineering: Specialisation Structural Engineer	ering: Elective Compulsory		
	Theoretical Mechanical Engineering: Specialisation	Maritime Technology: Elective Compulsory		
	Theoretical Mechanical Engineering: Technical Cor	nplementary Course: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	on Cities: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	on Environment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	on 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 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	(L0256)	Recitation Section (small)	1	1
Transport Processes in Building Materia	ls and Damage Processes (L0254)	Lecture	1	1
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials, building	physics and building chemistry, for example by t	he modules Princip	es of Building Materials
Knowledge	and Building Physics and Building Materials and Bui	ilding Chemistry.		
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge	The students are able to describe the components of	of mineral building materials and their function in c	letail and to use the	m for the manufacture of
-	special mineral building materials. They are able	to show the characteristics of mineral building	materials. They a	re able to describe the
	manufacture, properties and fields of application of	special mortars and special concretes and the co	rrelations of their ma	aterial parameters. They
	are able to show the principles of anchor technology	and design.		
	, ,	· ·		
Skills	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 all	ble to manufacture post installed rebar connection	ns. They are able to	recognize damages, to
	assess possible causes, to use the fundamentals of	construction preservation and to select repair and	strengthening meas	ures.
Personal Competence				
Social Competence	The students are able to develop in small grous the mixture of a special mortar. They present their results to the lecturer and the other students. In			
	a critical discussion they defend and adjust their res	sults. The students are able to manufacture their	special building mat	erial on the basis of this
	feedback.			
Autonomy	The students are able to responsibly use the resor	urces of materials and lab equipment for their pr	oiect and to investi	gate and to get missing
, acinemy	components.	aroos or materials and tab equipment for their pr	ojoot and to invoca	gate and to get imporing
	components.			
Workload in Hours	Independent Study Time 96, Study Time in Lecture 8	34		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Geotechnical Engi	neering: Compulsory		
Curricula	Civil Engineering: Specialisation Coastal Engineering	ng: Elective Compulsory		
	Civil Engineering: Specialisation Structural Engineer	ring: Elective Compulsory		
	Materials Science: Specialisation Engineering Mater	rials: Elective Compulsory		

Course L0257: Anchor Technology	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	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	SoSe	
Content	Components of mineral building materials and their function, binding materials, concrete and mortar, special mortars, special concretes	
Literature	Taylor, H.F.W.: Cement Chemistry	
	Springenschmid, R.: Betontechnologie für die Praxis	

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

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



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 struct	ures.		
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 appl	ications and the various loads. They can explair	the basic design me	ethods. 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	e bridge.		
Autonomy	The students are able to design a prestressed concr	ete 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 Enginee	ring: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engin	neering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	g: Elective Compulsory		
	International Management and Engineering: Specia	isation II. Civil Engineering: Elective Compulsory	/	



Course L0603: Design of Prestres	sed Structures and Concreet Bridges
Тур	Lecture
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	SoSe
Content	prestressed structures
	 basis of prestressed structures differences between reinforced and prestressed concrete structures history of prestressing construction materials: concrete, tendons, ducts, anchorage systems construction: prestressing methods prestressing forces and member forces (friction, elongation) tendon layout time dependant prestressing losses design of prestressed structures design of anchorage region non-bonded prestressing prestressed flat slabs
	Concrete bridges history of bridges design of bridges loads on bridges 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 Prestres	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 laboratom, accuracy (Amplied atmost	uual dunamiaa)		
	courses: Soil laboratory course, (Applied struct	urai dynamics)		
Educational Objectives	After taking part successfully, students have rea	ached the following learning results		
Professional Competence				
Knowledge	After the successful completion of the module to	he students should be able to:		
	to derive and to apply the basic equatio			
		the soil under dynamic excitation and to detect the re	•	
	· ·	ld tests to determine soil dynamic characteristics and	to evaluate them,	
	to design machine foundations to dynamic control in the contr			
	 to measure shocks to perform vibration forecast, to evaluate shocks in term to their effect on people and buildings, 			
	to evaluate possibilities of isolation, to understand mechanisms that cause particulates and evaluate particulates in term of their magnitude and intensity.			
	to understand mechanisms that cause earthquakes and evaluate earthquake in term of their magnitude and intensity, to be used to determine exists its conseits intensity and the discount formula to determine exists.			ıy,
	to know methods to determine axial pile capacity, integrity and the dynamic bedding modulus, to know methods to determine axial pile capacity, integrity and the dynamic bedding modulus, to know methods to determine axial pile capacity, integrity and the dynamic bedding modulus,			actions mathematics
	• to know the mechanisms that lead to a deformation accumulation due to cyclic loading and to estimate these deformations mathematical			
	to distinguish the area of application of	 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 saturated to	· ·	o dopondom onodi odo	gar iir carcaraa ono,
	to consider the impact of the party cate.	alou of a coopage and choul chongan		
Skills				
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lec	ture 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 - Se	elected 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		
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
CP	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	ourse L0524: Boundary Element Methods		
Тур	Recitation Section (large)		
Hrs/wk	2		
CP	3		
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28		
Lecturer	Prof. Otto von Estorff		
Language	EN		
Cycle	SoSe		
Content	See interlocking course		
Literature	See interlocking course		



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 su 	bstances		
	Pipe Systems			
	, ,			
		in particular drinking water systems and urban dra	inage systems includi	ng special structures
	Hydraulics of drinking water supply system	s and sewer systems		
	Basic knowledge on water management			
Educational Objectives	After taking part successfully, students have reach	ed the following learning results		
Professional Competence	, , , , , , , , , , , , , , , , , , , ,			
Knowledge	The students are able to describe the modelling	of groundwater flow and transport as well as up	rban water infrastructu	res They can carry
raio meage	systems analyses and can detect technical and			
	interdependencies of hydraulic and toxic phenome		ioc oldaico. Deolaco li	icy are able to arial
	,			
Skille	The students are able to construct and apply scien	atific aroundwater models indipendently. They can	work on different see	narios and can comp
Skills	or assess different solutions for existing problem			
		s by application of selected software products. I	ne students are able t	to use different softw
	solutions (e.g. EPANET, EPA-SWMM).			
Personal Competence				
Social Competence	Wird nicht vermittelt.			
Autonomy	Wird nicht vermittelt.			
Workload in Hours	Independent Study Time 110, Study Time in Lectu	ro 70		
		16 70		
Credit points	6			
Examination	Oral exam			
Examination duration and scale	20 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engine			
Curricula	Civil Engineering: Specialisation Geotechnical En			
	Civil Engineering: Specialisation Coastal Enginee			
	Water and Environmental Engineering: Specialisa			
	Water and Environmental Engineering: Specialisa	· · ·		
	Water and Environmental Engineering: Specialisa	tion Cities: Elective Compulsory		

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 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 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	- Massaladas en Habertalandas			
Knowledge	Knowledge on Urban planning Knowledge on management for all mate protection and all	mata ahanga adaptatian		
	Knowledge on measures for climate protection and cli Region knowledge in urban drainage and starmwater.	- ·		
	Basics knowledge in urban drainage and stormwater in the stor	nanagement		
Educational Objectives	After taking part successfully, students have reached the follow	ving learning results		
Professional Competence				
Knowledge	Students can describe urban development corridors as well	as current and future urban environmen	ntal problems. They	are able to explain the
	causes of environmental problems (like noise).			
	Students can specify applications for various technical innova	tions and explain why these contribute to	the improvement of	urban life. Thev can, for
	example, derive and discuss measures for effective noise aba			
	• •			
Skills	Students are able to develop specific solutions for correctin	g existing or future environment-related	problems of urban of	development. They can
	define a range of conceptual and technical solutions for	environmental problems for different de	velopment paths. T	o solve specific urban
	environmental problems they can select technical innovations	and integrate them into the urban contex	rt.	
Personal Competence				
Social Competence	The students can work together in international groups.			
Autonomy	Students are able to organize their work flow to prepare the	emselves for presentations and contribu	tions to the discussi	ons. They can acquire
	appropriate knowledge by making enquiries independently.			
,,,				
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points				
Examination	Project Militar Papart also and Procentation			
Examination duration and scale	Written Report plus oral Presentation			
Assignment for the Following Curricula	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Electivil	, ,		
	Civil Engineering: Specialisation Coastal Engineering: Electiv Joint European Master in Environmental Studies - Cities and	• •	sony	
	Logistics, Infrastructure and Mobility: Specialisation Infrastructure	·	501 y	
	Water and Environmental Engineering: Specialisation Infrastruct			
	Water and Environmental Engineering: Specialisation Cities:	ουπραί ο υτγ		

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	
СР	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		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 following learning results		
Professional Competence				
Knowledge	The students have the capability to define and exp	lain in detail the important aspects of erosion pr	otection and flood pro	otection and are able to
	apply the aspects to practical coastal protection pro	olems. They are able to design and dimension in	nportant 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 protection measures an			
	apply these approaches to practical design tasks.			
Personal Competence				
Social Competence	The students are able to deploy their gained knowl	edge in applied problems such as the functional	and constructive des	sign of coastal and floor
•	protection structures. Additionally, they will be able to	work in team with engineers of other disciplines.		
Autonomy	The students will be able to independently extend the	eir 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 130 min. The exa	amination includes tasks with respect to the gene	ral understanding of	the lecture contents and
	calculations tasks.	•		
Assignment for the Following	Civil Engineering: Specialisation Structural Enginee	ring: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engi	neering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering			

Course L0808: Coastal- and Flood	Protection
Тур	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	SoSe
Content	Protection of sandy coasts
Literature	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	
	Coastal Engineering Manual CEM



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

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



Module M0860: Harbour E	ngineering 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 (L03	378)	Lecture	2	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have reac	hed the following learning results		
Professional Competence				
Knowledge	The students are able to define in details and to	choose design approaches for the functional desi	gn of a port and app	ly them to design tasks
-	They can design the fundamental elements of a p	port.		
Skills	The students are able to select and apply approp	riate approaches for the functional design of ports.		
Personal Competence				
·	The students are able to deploy their gained know	wledge in applied problems such as the functional de	esian of ports. Additio	naly, they will be able to
	work in team with engineers of other disciplines.		э э э э э э э э э э э э э э э э э э э	,,,
	, , , , , , , , , , , , , , , , , , ,			
Autonomy	The students will be able to independently extend	d their knowledge and apply it to new problems.		
Workload in Hours	Independent Study Time 110, Study Time in Lect	ure 70		
Credit points				
Examination				
Examination duration and scale		examination includes tasks with respect to the gene	ral understanding of	the lecture contents and
and ton daration and some	calculations tasks.	oxaa.o morados tasko war rospost to tre gene	.a. a.iaorotarianig or	and residing demonits diffe
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	neering: Flective Compulsory		
	Civil Engineering: Specialisation Geotechnical E			
Sarriodia	Civil Engineering: Specialisation Coastal Engine			
		cialisation II. Civil Engineering: Elective Compulsory	,	
	Theoretical Mechanical Engineering: Specialisat			
	Theoretical Mechanical Engineering: Technical C	• • • • • • • • • • • • • • • • • • • •		
	g. Tooliillour			

Course L0809: Habour Engineering	9	
Тур	Lecture	
Hrs/wk	2	
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 Engineerin	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 I	Port Construction
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Frank Feindt
Language	DE
Cycle	SoSe
Content	 Planning and implementation of major projects Market analysis and traffic relations Planning process and plan Port planning in urban neighborhood Development of the logistics center "Port of Hamburg" in the metropolis Quays and waterfront structure Special planning Law Harbor - securing of a flexible use of the port Dimensioning of quays Flood protection structures Port of Hamburg - Infrastructure and development Preparation of areas Scour formation in front of shore structures
Literature	Vorlesungsumdruck, s. www.tu-harburg.de/gbt



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	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 a	ctual numerical models for the simulation	on of flows and waves.	
Skills	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 is	in simple applied problems. Additional	y, they will be able to work i	n team with others.
Autonomy	The students will be able to independently extend their ki	nowledge 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 Engineeri	ing: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: E	lective Compulsory		

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



Course L0812: Modelling of Waves	s
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	Vorlagungsskrigt
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 fa
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	
СР	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
СР	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Ralf Otterpohl
Language	EN
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

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



Course L0358: Advanced Wastew	ater Treatment
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				
Courses		T	Hrs/wk	OD
Title Prinicples of City Planning (L1066)		Typ Problem-based Learning	nrs/wk	CP 3
Street Design (L1067)		Problem-based Learning	2	3
Module Responsible	Prof. Carsten Gertz			
Admission Requirements	None			
Recommended Previous	for "Principles of Urban Planning": none			
Knowledge	for "Designing Urban Streetscapes": some knowledge of transport pl	anning a g through taking the ur	nderaraduate class	Transport Planning and
	Traffic Engineering"	arrining, o.g. arroagir taking are ar	idorgradatio orașo "	Transport Flamming and
F1 " 10" "				
Educational Objectives		arning results		
Professional Competence	Students are able to:			
Kilowieage	olddonia are able to.			
	use technical terms of urban planning.			
	describe the main determinants of urban development.	lanment on he toffer		
	 explain and compare different possibilities of how urban deve discuss requirements for public streetscapes. 	iopment can be influenced.		
	explain the importance of street design.			
Skills	Students are able to:			
	read and analyze urban development concepts and designs to	or etrootecanos		
	appraise such concepts in the context of competing requirements.			
	design, justify and reflect their own solutions for concrete example.			
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 drawings for	llowing a broadly pre-defined pro	cess.	
	assess the consequences of their proposed solutions.			
	independently acquire knowledge and apply this to new issue	es or problem areas.		
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points Examination	6 Project			
Examination Examination	7			
Assignment for the Following		mnulsory		
Curricula				
23.710	Civil Engineering: Specialisation Coastal Engineering: Elective Com			
	Logistics, Infrastructure and Mobility: Specialisation Infrastructure and			
	Water and Environmental Engineering: Specialisation Water: Elective	Compulsory		
	Water and Environmental Engineering: Specialisation Environment: I			
	Water and Environmental Engineering: Specialisation Cities: Compu	sory		



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:
Literature	 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. Alberts Cord: Welcal, Julian (2000) Startislanuas: Eign illustricts Eignführung Brimus Verlag, Dermetedt.
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	
	Droblem beard Leaving
	Problem-based Learning
Hrs/wk	
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	SoSe
Content	"Designing Urban Streetscapes" covers the various functional and aesthetic requirements for designing streetscape as the most important
	elements of public space. The class deals with:
	technical and design requirements,
	the effects of streetscapes on the behaviour of their users, 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 the effects o
	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).
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Module M0977: Construct	ion Logistics and Project Manageme	ent		
Courses				
Title		Тур	Hrs/wk	CP
Construction Logistics (L1163)		Lecture	1 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 reach	ned the following learning results		
Professional Competence				
Knowledge	Students can			
		uction logistics and project development and manage	ement	
	 name advantages and disadvantages of in 			
	 explain characteristics of products, deman 	d and production of construction objects and their co	nsequences for con	struction specific supply
	chains			
	 differentiate constructions logistics from other 	her logistics systems		
Skills	Students can			
	carry out project life cycle assessments			
	apply methods and instruments of constructions	ction logistics		
	apply methods and instruments of project of apply methods and instruments of project of apply methods.			
	арр.)			
	 design supply and waste removal concept 	s for a construction project		
Personal Competence				
Social Competence	Students can			
	hald an anathra in and for any a			
	hold presentations in and for groups			
	 apply methods of conflict solving skills in g 	roup work and case studies		
Autonomy	Students can			
		and a second all to be a		
	solve problems by holistic, systemic and flue			
	 improve their creativity, negotiation skills, or 	conflict and crises solution skills by applying methods	of moderation in ca	se studies
Workload in Hours	Independent Study Time 124, Study Time in Lectu	ire 56		
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	Two written compositions and two short presentat	ions		
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	eering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Er	igineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer			
		cialisation II. Civil Engineering: Elective Compulsory		
	Logistics, Infrastructure and Mobility: Specialisation			
		on Infrastructure and Mobility: Elective Compulsory		
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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) best practice examples (construction logistics Potsdamer Platz, recent case study of the region)
	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)
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Course L1164: Construction Logis	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	
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	i)	Recitation Section (large)	1	1
Module Responsible	Prof. Uwe Starossek			
Admission Requirements				
Recommended Previous	Knowledge of linear structural analysis of statically d	eterminate and indeterminate structures; Mechanic	cs I/II, Mathematics I	/II, Differential equation
Knowledge	I			
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence	Aller laking part successions, students flave reached	i die ionowing featring fesuls		
Knowledge	After successful completion of this module, the stude	ent can explain the basis capacits of dynamic effects	on atrustures and t	ha raanaatiya mathada
	After successful completion of this module, the students will be able to predict the response of material and structures to dynamics loading using the appropriate computational approaches and methods.			
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture 8	14		
Credit points	Written exam			
Examination Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Enginee	ring: Compulsory		
Curricula				
Curricula	Civil Engineering: Specialisation Geotechnical Engin			
	Civil Engineering: Specialisation Coastal Engineerin			
	International Management and Engineering: Specia	lisation II. Civil Engineering: Elective Compulsory		

Course L1202: Structural Dynamic	cs
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
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Ingo Hadrych
Language	DE
Cycle	SoSe
Content	basics of fatigue stress and fatigue resistance and determination of fatigue strength,
	determination 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 Betriebstestigkeit; 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 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 fol	lowing learning results		
Professional Competence				
Knowledge	Students are able to prepare a part of the whole project and	explain it to the others.		
Skills	Students can produce sketches and calculations of their p	art of the project. They are able to adju	ıst 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 g	roup.		
	They have the ability to work for a broad agreement with res	spect to intergroup dependencies.		
	They can distribute and process tasks independently.			
Autonomy	Students can handle their part of the project on their own re	sposibility-		
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	: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Coastal Engineering: Elec	tive Compulsory		
	Civil Engineering: Specialisation Structural Engineering: Co	ompulsory		

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



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: 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
Language	DE
Cycle	WiSe
Content	
Literature	



Module M0595: Examinati	on of Materials, Structural Conditio	n and Damages		
Courses				
Title		Тур	Hrs/wk	СР
Examination of Materials, Structural Con	dition and Damages (L0260)	Lecture	4	4
Examination of Materials, Structural Con	dition and Damages (L0261)	Recitation Section (small)	1	2
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials 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	The students can describe the different roles	of manufacturers as well as testing, supervisory	and certification bodies	within the framework of
,	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 Led	cture 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	
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 M0581: Water Pro	tection			
Courses				
Title		Тур	Hrs/wk	CP
	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	B			
Knowledge	Basic knowledge in water management;			
	Good knowledge in urban drainage;			
	Good knowledge of wastewater treatment techniques; Good knowledge of pollutants (a.g. COD, BOD, TS, N, B)	and their properties:		
	 Good knowledge of pollutants (e.g. COD, BOD, TS, N, P) 	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 regulate	ory framework related to the internati	onal and European	water sector. They can
	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 sign	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 se	olutions, remediation	measures and further
	interventions as well as conceptual problem solving approaches	S.		
Skills	Students can accurately assess current problems and situation	ons in a country-specific or local cor	itext. They can sugg	est concrete actions to
	contribute to the planning of tomorrow's urban water cycle. Fu	rthermore, they can suggest appropr	iate technical, admin	istrative and legislative
	solutions to solve these problems.			
D				
Personal Competence	The students can walk together in international arrays			
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	. 0		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Electiv			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective			
	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: Co	* '	aive Compuisory	
	Water and Environmental Engineering: Specialisation water: Co Water and Environmental Engineering: Specialisation Environm			
	Water and Environmental Engineering: Specialisation Environmental Engineering: Specialisation Cities: Ele			
	Trador and Environmental Engineering, Specialisation Offies: Ele	Jours Compaisory		



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	Note: Management Manag		
Тур	eminar		
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 and Wastewater Management		
Тур	ecitation 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				
Module MU/05: Groundwa	iter			
Courses				
		T	Han toda	O.D.
Title	200)	Тур	Hrs/wk	CP
Geohydraulic and Solute Transport (L05 Geohydraulic and Solute Transport (L05	•	Lecture Recitation Section (small)	1	2
Simulation in Groundwater Hydrology (L		Lecture	1	1
Simulation in Groundwater Hydrology (L		Recitation Section (small)	2	2
Module Responsible	Prof. Wilfried Schneider			
Admission Requirements	None			
Recommended Previous Knowledge	Ground water hydrology Hydromechanics			
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
Knowledge	The students are able to describe the fate of solutes in	the subsurface along the path between soil and	water body quanti	tatively and qualitatively.
	They are able to do this with simulation models.			
Skills	The students are able to describe conceptually movement and storage of water in the unsaturated zone. They are able to analyse pF- functions		to analyse pF- functions	
	and Ku functions. They can model transport of solutes	s in the unsaturated and saturated zoned. They	are able to determine	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: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engine	ering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	: Elective Compulsory		
	Process Engineering: Specialisation Environmental Process Engineering: Elective Compulsory			
	Process Engineering: Specialisation Process Engineer	ring: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	Water: Compulsory		
	Water and Environmental Engineering: Specialisation	Environment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	Cities: 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 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 Groun	ourse 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, business or test reports and transform it to the course projects. They are capable, in consultation with supervisors as well as in the interim presentation, to assess their learning level and define further steps on this basis. Furthermore, they can define targets for new application-or research-oriented duties in accordance with the potential social, economic and cultural impact.			
Workload in Hours				
Credit points	6			
Examination Examination duration and scale	,	ful participation at Probitions		
Assignment for the Following	2			
	Civil Engineering: Specialisation Structural Engineering: Elective Civil Engineering: Specialisation Geotechnical Engineering: Elec			
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	NiSe	
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 reached the following learning results			
Professional Competence				
Knowledge				
	for the conception and design of concrete building	for the conception and design of concrete buildings 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
	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 quality in 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 Engineering: 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	of. 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	ourse L0577: Structural Concrete Members		
Тур	ture		
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	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	Typ Hrs/wk CP				
Computational Analysis of Concrete Structures (L0598) Lecture 2			2		
Computational Analysis of Concrete Structures (L0599) Recitation Section (large) 2			2		
FE-Modeling of Concrete Structures (L0	oncrete Structures (L0600) Problem-based Learning 2 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	The students can model and design in teamwork a re	eal concrete structure by means of a finite eleme	nt 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 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 Engir	neering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engineerin				

Course L0598: Computational Analysis of Concrete Structures			
•	Lecture		
Hrs/wk			
CP			
	Independent Study Time 32, Study Time in Lecture 28		
	Prof. Günter Rombach		
Language			
Cycle			
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	Typ Recitation Section (large)			
Hrs/wk	2			
CP	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 Co	Course L0600: FE-Modeling of Concrete Structures			
Тур	Problem-based Learning			
Hrs/wk	2			
СР	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 (L0311) Lecture 2 1				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	•	•	
	measures. They will be able to assess the evaluation methods that can be used for this. Students will be able to carry out 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 Engi	ineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical I	Engineering: Elective Compulsory			
	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: Specialisation Environment: Elective Compulsory				
Water and Environmental Engineering: Specialisation Cities: Elective Compulsory					

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



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 M0923: Integrated	d Transportation Planning			
Courses				
Title	Тур		Hrs/wk	СР
Integrated Transportation Planning (L10	968) Problem-based	d Learning	4	6
Module Responsible	Prof. Carsten Gertz			
Admission Requirements	None			
Recommended Previous	some knowledge of transport planning, e.g. through taking the undergraduate class "Tr	ansport Planning and	Traffic Engine	erin
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
Knowledge	Students are able to:			
		/ 199 1 1 1		
	describe interdependencies between land-use/location choice and transportation and available and available and accompanie offsets of transport and accompanie offsets of transport and accompanies.			
	 explain and evaluate the social, ecological and economic effects of transport an relate current issues in the area of integrated transport planning and formulate a 		asures.	
	Telate current issues in the area of integrated transport planning and formulate a	an opinion on them.		
Skills	Students are able to:			
	quantify important parameters, which influence travel demand or are influenced			
	comprehensively examine a pre-defined or self-selected topic from a transport	portation studies per	spective and di	ocument the results
	accordance with scientific conventions.			
Davagnal Commissiones				
Personal Competence	Students are able to:			
30ciai 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 necessa 	ary knowledge and us	e appropriate m	eans for its execution.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Written elaboration			
Examination duration and scale			<u> </u>	
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory			
	Logistics, Infrastructure and Mobility: Specialisation Infrastructure and Mobility: Elective	Compulsory		
	Water and Environmental Engineering: Specialisation Water: Elective Compulsory			
	Water and Environmental Engineering: Specialisation Environment: Elective Compulso	ory		
1	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	CP
Steel and Composite Structures (L1204)		Lecture	2	2
Steel and Composite Structures (L1205)		Recitation Section (large)	2	2
Steel Bridges (L1097)		Lecture	2	2
Module Responsible	Dr. Jürgen Priebe			
Admission Requirements	none			
Recommended Previous	Basics of steel construction (i.e. Steel Structures I and II, BUBC)			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following	owing 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 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	mpulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering:	Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elect	ive 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	Dr. Jürgen Priebe, Dr. Jörn Scheller	
Language	DE	
Cycle	WiSe	
Content	 Local-buckling of plated structures Warping torsion Composite-girders, -columns, -slabs, -bridges Principles in composite constructions Bridge-design and -construction 	
Literature	Petersen, C.: Stahlbau, 4.Auflage 2013, Springer-Vieweg Verlag Minnert, J. Wagenknecht, G.: Verbundbau-Praxis - Berechnung und Konstruktion nach Eurocode 4, 2.Auflage 2013, Bauwerk Beuth Verlag	

Course L1205: Steel and Composite Structures		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dr. Jürgen Priebe, Dr. Jörn Scheller	
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



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 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
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
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 th	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 procedures in selected special areas of civil and structural engineering.			
	 Students are able to interrelate scientific and ted 	chnical knowledge.		
Skills	Students are able to apply basic methods in selected 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	la Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering:	Elective Compulsory		

Course L1867: Analysis of Offshor	Course L1867: Analysis of Offshore 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			
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		
	l		



- 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	
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, Tll, Verlag Ernst & Sohn	



Course L0596: Design of Prefabrio	cated Concrete Structures	
Тур	Lecture	
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	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	
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 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				
Recommended Previous	Mechanics I/II, Mathematics I/II, Differential Equation	ons I		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
Knowledge	After successful completion of this module, studen	ts can explain selected elements of higher structura	l analysis.	
_	·			
Skills				
			P. 199. Cal.	
	· ·	students are able to assess the premises and the	e applicability of the	presented methods o
	advanced structural analysis. They are able to use	e these methods for performing structural analyses.		
Personal Competence				
Social Competence				
Autonomy	The students have the opportunity to voluntarily ar	ad independently work homework problems		
Autonomy	The students have the opportunity to voluntarily an	ia independently work nomework problems.		
Workload in Hours	Independent Study Time 96, Study Time in Lecture	e 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engine	eering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical En	gineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Enginee	ring: Elective Compulsory		



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

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



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 M0699: Advanced	Foundation Engineering and Soil Labor	ratory Course		
module moods. Advanced		idiory Course		
Courses				
Title		Тур	Hrs/wk	СР
Soil Laboratory Course (L0499)		Laboratory Course	1	2
Advanced Foundation Engineering (L049)	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 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	i		
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		

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 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 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				
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following	ng learning results		
Professional Competence				
Knowledge	The students are able to define and explain the basic concepts	of coastal engineering and port engi	neering. They are abl	le to apply the concepts
	to selected practical problems of coastal engineering. Studen	nts can define and determine the bas	sics for design and c	dimensioning of coastal
	engineering constructions.			
Skills	The students are capable to apply basic design approaches to s	selected and pre-defined design tasks	in coastal engineerin	ng.
Personal Competence				
Social Competence	The students are able to deploy their gained knowledge in app	lied problems such as the design of c	oastal protection stru	ctures. Additionaly, they
	will be able to work in team with engineers of other disciplines, to	for instance designing of coastal break	waters.	
Autonomy	The students will be able to independently extend their knowled	dge 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 in	cludes 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: Electiv	ve Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Co	mpulsory		
	Civil Engineering: Specialisation Coastal Engineering: Compuls	sory		
	International Management and Engineering: Specialisation II. C	ivil Engineering: Elective Compulsory		

Course L0807: Basics of Coastal Engineering		
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	
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	
L		



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 Hydr	aulic Engineering (L1146)	Lecture	2	3
Underground Constructions (L0707)		Lecture	1	2
Underground Constructions (L1811)		Recitation Section (large)	1	1
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	None			
Recommended Previous	Modules from Bachelor studies Civil and enviro	onmental engineering:		
Knowledge	- Oceanal visa I II			
	Geotechnics I-II Steel Structures I-II			
	Steel Structures I-II			
Educational Objectives	After taking part successfully, students have reached the following learning results			
Professional Competence				
Knowledge	Knowledge of different tunnel construction type	pes as well as special methods and techniques of	subsoil construction.	The students get deepe
_	knowledge of steel and ground engineering	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 constrution 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	· ·		
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 Engi	neering: Compulsory		
	International Management and Engineering: S	pecialisation II. Civil Engineering: Elective Compulso	ry	

Course L1146: Steel Structures in	ourse 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)	240)	Lecture	2	3
Wind Energy Use - Focus Offshore (L0		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 reached the	e following learning results		
Professional Competence				
Knowledge	By ending this module students can explain in detail kn	owledge of wind turbines with a particular f	ocus of wind energy us	se in offshore conditions
	and can critical comment these aspects in consideration	n of current developments. Furthermore, the	y are able to describe f	undamentally the use o
	water power to generate electricity. The students repro-	duce and explain the basic procedure in the	implementation of rer	ewable energy project
	in countries outside Europe.			
	Through active discussions of various topics within the	e comingr of the module, students improve	their understanding an	ed the application of the
	theoretical background and are thus able to transfer who		their understanding at	id the application of the
	lifeoretical background and are thus able to transfer with	at they have learned in practice.		
Skills	Students are able to apply the acquired theoretical fou	ndations on exemplary water or wind powe	r systems and evaluate	and assess technically
	the resulting relationships in the context of dimension	ning and operation of these energy system	ns. They can in compa	are critically the specia
	procedure for the implementation of renewable energy projects in countries outside Europe with the in principle applied approach in Europe and			
	can apply this procedure on exemplary theoretical projects.			
Personal Competence				
Social Competence				
30ciai Competence	Students can discuss scientific tasks subjet-specificly at	nu munuascipimary winini a seminar.		
Autonomy	Students can independently exploit sources in the conte	ext of the emphasis of the lecture material to	clear the contents of th	e lecture and to acquire
, ac.io.ii,	the particular knowledge about the subject area.			o rectare and to acquire
	and paradular miorroage about the easyout area.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	3 hours written exam			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Enginee	ring: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: I	Elective Compulsory		
	Energy and Environmental Engineering: Specialisation	Energy Engineering: Elective Compulsory		
	International Management and Engineering: Specialisa	tion II. Renewable Energy: Elective Compul	sory	
	International Management and Engineering: Specialisa	tion II. Energy and Environmental Engineeri	ng: Elective Compulsor	У
	Product Development, Materials and Production: Specia	alisation Product Development: Elective Con	npulsory	
	Product Development, Materials and Production: Specia	alisation Production: Elective Compulsory		
	Product Development, Materials and Production: Specia	alisation Materials: Elective Compulsory		
	Renewable Energies: Core qualification: Compulsory			
	Process Engineering: Specialisation Environmental Pro	cess Engineering: Elective Compulsory		
	Water and Environmental Engineering: Specialisation E	nvironment: Compulsory		
	Water and Environmental Engineering: Specialisation C	Sition: Floative Compulsory		



Course L0014: Renewable Energy		
Тур	Project Seminar Project Seminar	
Hrs/wk	1	
СР	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	
	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 Coloridad assistant from the account five of a development healt. We also bloom Verses (KMV Development Bealt).	
	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	

0 10040 11 1 B 11	
Course L0013: Hydro Power Use	
Тур	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Stephan Heimerl
Language	DE
Cycle	SoSe
Content	 Introduction, importance of water power in the national and global context Physical basics: Bernoulli's equation, usable height of fall, hydrological measures, loss mechanisms, efficiencies Classification of Hydropower: Flow and Storage hydropower, low and high pressure systems Construction of hydroelectric power plants: description of the individual components and their technical system interaction Structural engineering components; representation of dams, weirs, dams, power houses, computer systems, etc. Energy Technical Components: Illustration of the different types of hydraulic machinery, generators and grid connection Hydropower and the Environment Examples from practice
Literature	 Schröder, W.; Euler, G.; Schneider, K.: Grundlagen des Wasserbaus; Werner, Düsseldorf, 1999, 4. Auflage Quaschning, V.: Regenerative Energiesysteme: Technologie - Berechnung - Simulation; Carl Hanser, München, 2011, 7. Auflage Giesecke, J.; Heimerl, S.; Mosony, E.: Wasserkraftanlagen Planung, Bau und Betrieb; Springer, Berlin, Heidelberg, 2009, 5. Auflage von König, F.; Jehle, C.: Bau von Wasserkraftanlagen - Praxisbezogene Planungsunterlagen; C. F. Müller, Heidelberg, 2005, 4. Auflage Strobl, T.; Zunic, F.: Wasserbau: Aktuelle Grundlagen - Neue Entwicklungen; Springer, Berlin, Heidelberg, 2006



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

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



Module M0593: Building 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	(L0256)	Recitation Section (small)	1	1
Transport Processes in Building Materia	ls and Damage Processes (L0254)	Lecture	1	1
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials, building p	hysics and building chemistry, for example by t	he modules Principl	les of Building Materials
Knowledge	and Building Physics and Building Materials and Build	ling Chemistry.		
Educational Objectives	After taking part successfully, students have reached the	ne following learning results		
Professional Competence				
Knowledge	The students are able to describe the components of	mineral building materials and their function in c	letail and to use the	m for the manufacture of
G	special mineral building materials. They are able to	•		
	manufacture, properties and fields of application of sp			
	are able to show the principles of anchor technology a	·		,
		, , , , , ,		
Skills	The students are able to perform an optimization of gr	anulometry 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.			
ъ				
Personal Competence				
Social Competence	The students are able to develop in small grous the m			
	a critical discussion they defend and adjust their resu	a critical discussion they defend and adjust their results. The students are able to manufacture their special building material on the basis of this		
	feedback.			
Autonomy	The students are able to responsibly use the resour	cas of materials and lab aguipment for their pr	oloct and to invocti	gate and to get missing
Autonomy		ces of materials and lab equipment for their pr	ojeci 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 Engine	ering: Compulsory		
Curricula	Civil Engineering: Specialisation Coastal Engineering	: Elective Compulsory		
	Civil Engineering: Specialisation Structural Engineering	ng: Elective Compulsory		
	Materials Science: Specialisation Engineering Materia	uls: Elective Compulsory		
	, , , , , , , , , , , , , , , , , , , ,	1 7		

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		
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	f Prestressed Structures and Concreet Bridges (L0604) Recitation Section (large) 2 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	ethods. 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 concre	te 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 Engineer	ng: 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	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	SoSe
Content	prestressed structures
	 basis of prestressed structures differences between reinforced and prestressed concrete structures history of prestressing construction materials: concrete, tendons, ducts, anchorage systems
	construction: prestressing methods prestressing forces and member forces (friction, elongation) tendon layout time dependant prestressing losses design of prestressed structures design of anchorage region non-bonded prestressing prestressed flat slabs
	Concrete bridges • history of bridges • design of bridges • loads on bridges • member forces for slab, T-beam, hollow box, frame and arch bridges • precast bridges - precast segmental bridges • bearings • abutments, columns • construction methods
Literature	 Vorlesungsumdruck Rombach, G. (2003): Spannbetonbau. Ernst & Sohn, Berlin Wicke, M. (2002): Anwendung des Spannbetons. Betonkalender 2002, Teil II, S. 113-180, Verlag Ernst & Sohn, Berlin Leonhardt, F. (1980): Vorlesungen über Massivbau. Teil 5: Spannbeton. Berlin Mehlhorn, G. (2007): Handbuch Brücken, Springer Verlag Schäfer, H.; Kaufeld, K. (1997): Massivbrücken. Betonkalender Teil II, S. 443ff, Ernst & Sohn, Berlin Menn, Ch. (1986): Stahlbetonbrücken. Springer Verlag, Wien

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



Module M0756: Soil Mech	anics and -Dynamics			
Courses				
Γitle		Тур	Hrs/wk	СР
Soil Mechanics - Selected Topics (L037	74)	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		and dunamina)		
	courses: Soil laboratory course, (Applied structu	irai 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	e students should be able to:		
	to derive and to apply the basic equation			
		ne 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 for the shocks to perf			
	to evaluate shocks in term to their effect on people and buildings, to evaluate possibilities of isolation.			
	to evaluate possibilities of isolation, to understand mechanisms that course continuous and evaluate continuous in term of their magnitude and intensity.			
	• 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 mathematical to distinguish the area of application of the method of elastodynamics and plastodynamics, 			
	to distinguish the area of application of the	ne method of erasiodynamics and prastodynamics,		
	to detect the undrained shear strength as	s a function of a number of state variables,		
		sive soils and to consider the effects of creep and rat	e-dependent shear stre	enoth in calculations
	to consider the impact of the partly satural	· ·	o dopondom onodi on c	gar iir carcaraa ono,
	lo concider and impact of and party dataset	aloa o. a ooopago aa ooa. ca oga		
Skills				
Personal Competence				
Social Competence				
Autonomy	,			
Workload in Hours	Independent Study Time 96, Study Time in Lect	ure 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 Coastal Engine			

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		
СР		
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,	
	• 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
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	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	twork (L0875)	Problem-based Learning	2	3
Module Responsible	Prof. Wilfried Schneider			
Admission Requirements	none			
Recommended Previous	Groundwater			
Knowledge				
	 groundwater hydraulics and transport of subst 	ances		
	Pipe Systems			
	. ,			
	Knowledge on urban water infrastructures, in	,	inage systems includir	ng special structures
	Hydraulics of drinking water supply systems a	nd 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 ur	ban water infrastructu	res. They can carry ou
G	systems analyses and can detect technical and cor	· ·		
	interdependencies of hydraulic and toxic phenomena			,
Skills	The students are able to construct and apply scientific	c groundwater models indipendently. They can	work on different scer	narios and can compar
	or assess different solutions for existing problems b			
	solutions (e.g. EPANET, EPA-SWMM).	, application of colocica commune production in		o dee dinerent central
	6.g. 2. 7.1.2.1, 2. 7. 6.7.1.1.1).			
Personal Competence				
Social Competence	Wird nicht vermittelt.			
	AMP 1 1 1 1 2 1 1 1			
Autonomy	Wird nicht vermittelt.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 7	70		
Credit points	6			
Examination	Oral exam			
Examination duration and scale	20 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineeri	ng: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engin			
	Civil Engineering: Specialisation Coastal Engineering			
	Water and Environmental Engineering: Specialisation			
	Water and Environmental Engineering: Specialisation			
	Water and Environmental Engineering: Specialisation			

Course L0543: Applied Groundwat	er 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 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	CP
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 on Urban planning			
Knowledge	Knowledge on measures for climate protection and compared to the second se	limate change adaptation		
	Basics knowledge in urban drainage and stormwater			
	basics knowledge in arban dramage and stormwater	management		
Educational Objectives	After taking part successfully, students have reached the following	owing learning results		
Professional Competence				
Knowledge	Students can describe urban development corridors as we	Il as current and future urban environme	ntal problems. They	are able to explain the
	causes of environmental problems (like noise).			
	Students can specify applications for various technical innov	vations and explain why those contribute to	the improvement of	urban life. They can for
	example, derive and discuss measures for effective noise at	, ,	the improvement of	urbarrille. Triey carr, for
	example, derive and discuss measures for effective noise at	vaternent.		
Skills	Students are able to develop specific solutions for correcti	ng existing or future environment-related	problems of urban of	development. They can
	define a range of conceptual and technical solutions for	environmental problems for different de	evelopment paths. T	o 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 themselves for presentations and contributions to the discussions. They can acquire			
Autonomy	appropriate knowledge by making enquiries independently.	memserves for presentations and continue	illoris 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: Ele	ctive Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering:	Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elect	ive Compulsory		
	Joint European Master in Environmental Studies - Cities and	Sustainability: Core qualification: Compu	Isory	
	Logistics, Infrastructure and Mobility: Specialisation Infrastru	cture and Mobility: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Enviro	onment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities	: Compulsory		

Course L1109: Noise Protection	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	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 reache	d the following learning results		
Professional Competence				
Knowledge	The students have the capability to define and exp	plain in detail the important aspects of erosion pro	tection 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	s The students are able to select design approaches for the functional and constructional design of erosion and flood protection measures and		rotection measures and	
	apply these approaches to practical design tasks.			
Personal Competence				
Social Competence	The students are able to deploy their gained know	ledge in applied problems such as the functional	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 t	heir knowledge and apply it to new problems.		
Workload in Hours	Independent Study Time 110, Study Time in Lecture	e 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	The duration of the examination is 130 min. The ex	camination includes tasks with respect to the gener	al understanding of	the lecture contents and
	calculations tasks.			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	ineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer	ing: Compulsory		

Course L0808: Coastal- and Flood	Protection	
Тур	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	
Literature	Sediment transport Morphology Technical solution for the protection of sandy coasts Construction in direction of 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	vonesungsumuruck	
	Coastal Engineering Manual CEM	



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

Course L1411: Maintennance and	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	ngineering 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 (L03	378)	Lecture	2	2
Module Responsible	Prof. Peter Fröhle			
Admission Requirements	none			
Recommended Previous				
Knowledge				
Educational Objectives	After taking part successfully, students have read	ched the following learning results		
Professional Competence				
Knowledge	The students are able to define in details and to	o choose design approaches for the functional des	ign 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 approp	oriate approaches for the functional design of ports.		
Personal Competence				
·	The students are able to deploy their gained kno	wledge in applied problems such as the functional d	esian of ports. Additio	naly, they will be able to
	work in team with engineers of other disciplines.	•		,,,
	, , , , , , , , , , , , , , , , , , ,			
Autonomy	The students will be able to independently exten	d their knowledge and apply it to new problems.		
Workload in Hours	Independent Study Time 110, Study Time in Lect	ture 70		
Credit points				
Examination				
Examination duration and scale		evenination includes tasks with respect to the gard	aral understanding of	the leature contents and
Examination duration and scale	calculations tasks.	examination includes tasks with respect to the gene	ar understanding of	ine reciure contents and
A - i A f Ab - F - H i		The state of the s		
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	. ,		
Curricula	Civil Engineering: Specialisation Geotechnical E			
	Civil Engineering: Specialisation Coastal Engine		,	
		ecialisation II. Civil Engineering: Elective Compulsor	у	
	Theoretical Mechanical Engineering: Specialisate Theoretical Mechanical Engineering: Technical Control of the C	• • • • • • • • • • • • • • • • • • • •		
	medieticai Mechanicai Engineening: Technicai (Complementary Course: Elective Compulsory		

Course L0809: Habour Engineering		
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 Engineerin	ourse 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	
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 reach	ed 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 actual numerical models for the simulation	on of flows and waves.	
Skills	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 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 Engine	eering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical En	gineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer	ring: Elective Compulsory		

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



Course L0812: Modelling of Waves	
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	n Rivers and Estuaries
Тур	Lecture
Hrs/wk	3
CP	4
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42
	Prof. Peter Fröhle
Language	DE/EN
Cycle	SoSe
	 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, 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	ompulsory		
	Bioprocess Engineering: Specialisation A - General Bioprocess E	ingineering: 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. Process Engineering and Biotechnology: Elective Compulsory			
	Process Engineering: Specialisation Environmental Process Engineering: Elective Compulsory			
	Process Engineering: Specialisation Process Engineering: Electi	ve Compulsory		
	Water and Environmental Engineering: Specialisation Water: Cor	npulsory		
	Water and Environmental Engineering: Specialisation Environme	nt: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities: Cor	npulsory		

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



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

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



Course L0358: Advanced 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	ing			
Courses				
Title		Тур	Hrs/wk	CP
Prinicples of City Planning (L1066)		Problem-based Learning	2	3
Street Design (L1067)		Problem-based Learning	2	3
Module Responsible	Prof. Carsten Gertz			
Admission Requirements	None			
Recommended Previous	for "Principles of Urban Planning": none			
Knowledge	for "Designing Lishon Chrontopped", come impulsed as of transport	aut alamaina a a thuasan takina tha su	daveraduata alaas	Transport Diagning on
	for "Designing Urban Streetscapes": some knowledge of transp Traffic Engineering"	ort planning, e.g. through taking the un	dergraduate class "	Transport Flamming and
	Traille Engineering			
Educational Objectives	After taking part successfully, students have reached the following	ng learning results		
Professional Competence				
Knowledge	Students are able to:			
	use technical terms of urban planning.			
	describe the main determinants of urban development.			
	 explain and compare different possibilities of how urban 	development can be influenced.		
	 discuss requirements for public streetscapes. 			
	 explain the importance of street design. 			
Skills	Students are able to:			
	 read and analyze urban development concepts and des 	igns for streetscapes		
	 appraise such concepts in the context of competing requ 	irements.		
	 design, justify and reflect their own solutions for concrete 	e 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 drawi	ngs following a broadly pre-defined pro	cess.	
	 assess the consequences of their proposed solutions. 			
	 independently acquire knowledge and apply this to new 	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	Civil Engineering: Specialisation Structural Engineering: Elective	e Compulsory		
Curricula				
	Civil Engineering: Specialisation Coastal Engineering: Elective			
	Logistics, Infrastructure and Mobility: Specialisation Infrastructure			
	Water and Environmental Engineering: Specialisation Water: El			
	Water and Environmental Engineering: Specialisation Environm Water and Environmental Engineering: Specialisation Cities: Co			
	Trator and Environmental Engineering. Specialisation Offies. Of	ompaisory		



Course L1066: Prinicples of City P	lanning
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	
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 t
	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).
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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 reache	d the following learning results		
Professional Competence				
Knowledge	Students can			
	give definitions of the main terms of construct	stian logistics and project development and mana	noment	
		ction logistics and project development and management	gement	
	name advantages and disadvantages of integrated and disadvantages and disadvantages are disadvantages.	· ·		-tti
		and production of construction objects and their	consequences for cor	istruction specific sup
	chains			
	 differentiate constructions logistics from other 	er logistics systems		
Skills	S Students can			
	 carry out project life cycle assessments 			
	apply methods and instruments of constructi	on logistics		
	apply methods and instruments of project de-	evelopment and management		
	apply methods and instruments of conflict m	anagement		
	 design supply and waste removal concepts 	for a construction project		
Personal Competence				
Social Competence	Students can			
	 hold presentations in and for groups 			
	apply methods of conflict solving skills in group	uun work and case studies		
	apply methods of commet solving skins in git	work and case studies		
Autonomy	Students can			
	 solve problems by holistic, systemic and flow 	y oriented thinking		
		•		
	• Improve their creativity, negotiation skills, co	nflict and crises solution skills by applying method	is of 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 presentatio	ns		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng			
	Civil Engineering: Specialisation Coastal Engineeri			
	International Management and Engineering: Specia		,	
	Logistics, Infrastructure and Mobility: Specialisation			

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



Course L1163: Construction Logis	rtics
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) logistics concepts for ready to use construction projects (especially procurement and waste removel logistics)
	 best practice examples (construction logistics Potsdamer Platz, recent case study of the region)
	Contents of the lecture are deepened in special exercises.
Literature	Flämig, Heike: Produktionslogistik in Stadtregionen. In: Forschungsverbund Ökologische Mobilität (Hrsg.) Forschungsbericht Bd. 15.2. 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
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 Developme	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 (L056s	5)	Recitation Section (large)	1	1
Module Responsible	Prof. Uwe Starossek			
Admission Requirements				
Recommended Previous	Knowledge of linear structural analysis of statically determ	ninate and indeterminate structures; Mechanic	cs I/II, Mathematics I	/II, Differential equation
Knowledge	I			
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence	**			
Knowledge		n evolain the basic aspects of dynamic effects	on structures and t	he respective methods
	s After successful completion of this module, the students will be able to predict the response of material and structures to dynamics loading using the appropriate computational approaches and methods.			
Personal Competence				
Social Competence				
Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering:	Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	ng: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: El	ective Compulsory		
	International Management and Engineering: Specialisation	on II. Civil Engineering: Elective Compulsory		

Course L1202: Structural Dynamic	os de la companya de
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	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
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 fo	ollowing learning results		
Professional Competence				
Knowledge	Students are able to prepare a part of the whole project an	d explain it to the others.		
Skills	Students can produce sketches and calculations of their	part of the project. They are able to adju	ust their work in reaction	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	espect to intergroup dependencies.		
	They can distribute and process tasks independently.			
Autonomy	Students can handle their part of the project on their own r	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 Engineerin	g: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Coastal Engineering: Ele	ective Compulsory		
	Civil Engineering: Specialisation Structural Engineering: C	Compulsory		

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	Dr. Jürgen Priebe, Prof. Uwe Starossek
Language	DE
Cycle	SoSe
Content	Design of a big construction project (i.e skyscraper, large bridge, roof of a stadiuim) in small groups
Literature	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, Mathematics I-I	II		
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 Lecture	70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	90 min			
Assignment for the Following	Civil Engineering: Specialisation Coastal Engineeri	ng: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engi	neering: Compulsory		
	Civil Engineering: Specialisation Structural Engineer	ering: Elective Compulsory		
	Theoretical Mechanical Engineering: Specialisation	Maritime Technology: Elective Compulsory		
	Theoretical Mechanical Engineering: Technical Cor	nplementary Course: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	on Cities: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	on Environment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	on 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 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	ground Engineering Law
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
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				
Knowledge	Basic knowledge in water management;			
	Good knowledge in urban drainage;			
	Good knowledge of wastewater treatment techniques;			
	 Good knowledge of pollutants (e.g. COD, BOD, TS, N, P) 	and their properties;		
Educational Objectives	After taking part successfully, students have reached the followi	ng learning results		
Professional Competence	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
Knowledge	The students can describe the basic principles of the regulat	ory framework related to the internation	and Furanean	water sector. They can
Mowieage	explain limnological processes, substance cycles and water			
	problems. Finally, the students can demonstrate to achieve sign			
	able to judge environmental and wastewater related issues		-	
	interventions as well as conceptual problem solving approache		idilons, remediation	measures and lutthe
	interventions as well as conceptual problem solving approache	5.		
			_	
Skills	Students can accurately assess current problems and situation			
	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.			
Personal Competence				
·	The students can work to gether in international argume			
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.	, , , , , , , , , , , , , , , , , , ,	,	arr and arro alphroprian
	The model of manifest of the model of the mo			
W	Indiana adapt Objet. Tare 440 Ct. 1 T. 1 1 1 T.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points Examination	6 Written exam			
Examination	Willen exam			
Examination duration and scale	60 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Electiv	' '		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Ele			
	Civil Engineering: Specialisation Coastal Engineering: Elective			
	Environmental Engineering: Specialisation Water: Elective Com	pulsory		
	International Management and Engineering: Specialisation II. C	ivil Engineering: Elective Compulsory		
	Joint European Master in Environmental Studies - Cities and Su	stainability: Specialisation Water: Elec	tive Compulsory	
	Water and Environmental Engineering: Specialisation Water: Co	ompulsory		
	Water and Environmental Engineering: Specialisation Environm	ent: Compulsory		
	Weter and Environmental Environment Consider Consideration Cities El	nativa Campulaani		

Water and Environmental Engineering: Specialisation Cities: Elective Compulsory



Course L0963: Geo-Information-Sy	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
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 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 M0595: Examinati	on of Materials, Structural Conditio	n and Damages		
Courses				
Title		Тур	Hrs/wk	СР
Examination of Materials, Structural Con	dition and Damages (L0260)	Lecture	4	4
Examination of Materials, Structural Con	dition and Damages (L0261)	Recitation Section (small)	1	2
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials 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 Led	cture 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	
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 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. 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 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 Treatment		
Тур	blem-based Learning	
Hrs/wk	3	
CP	4	
Workload in Hours	Independent Study Time 78, Study Time in Lecture 42	
Lecturer	Prof. Kerstin Kuchta	
Language	EN	
Cycle	WiSe	
Content	 Introduction biological basics determination process specific material characterization aerobic degradation (Composting, stabilization) anaerobic degradation (Biogas production, fermentation) Technical layout and process design Flue gas treatment Plant design practical phase 	
Literature		



Module M0705: Groundwa	iter			
Courses				
		T	Hankada	0.0
Title	200)	Тур	Hrs/wk	CP 2
Geohydraulic and Solute Transport (L05 Geohydraulic and Solute Transport (L05		Lecture Recitation Section (small)	1	1
Simulation in Groundwater Hydrology (L	•	Lecture	1	1
Simulation in Groundwater Hydrology (L		Recitation Section (small)	2	2
Module Responsible	Prof. Wilfried Schneider			
Admission Requirements	None			
Recommended Previous Knowledge	Ground water hydrology Hydrometh price			
	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 subsurface along the path between soil and water body quantitatively and qualitatively.		atively and qualitatively.	
	They are able to do this with simulation models.			
Skills	The students are able to describe conceptually movement and storage of water in the unsaturated zone. They are able to analyse pF- functions		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: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: E	lective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory			
	Process Engineering: Specialisation Environmental Process Engineering: Elective Compulsory			
	Process Engineering: Specialisation Process Engineering: Elective 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 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 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 Groun	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 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 din	nensioning of structural concrete		
Knowledge	Modules 'Concrete Structures I and II'			
Educational Objectives	After taking part successfully, students have rea	ched the following learning results		
Professional Competence				
Knowledge				
·	for the conception and design of concrete buildi			
Skills	The students are able to apply procedures of the	e conception and dimensioning to to practical proble	ms of structural engine	ering. 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 technica	ll descriptions.		
Personal Competence				
Social Competence	The students are able to obtain results of high q	uality in teamwork.		
Autonomy	The students are able to carry out complex conc	eption and dimensioning tasks of structures under the	ne guidance of tutors.	
Workload in Hours	Independent Study Time 110, Study Time in Lec	ture 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Eng	neering: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical I	Engineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engine	eering: Elective Compulsory		
	International Management and Engineering: Sp	ecialisation 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 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 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 84			
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	<u>·</u>
	Lecture
Hrs/wk	2
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 Ana	Course L0599: Computational Analysis of Concrete Structures		
Тур	Recitation Section (large)		
Hrs/wk	2		
CP	2		
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28		
Lecturer	Prof. Günter Rombach		
Language	DE		
Cycle	WiSe		
Content	See interlocking course		
Literature	See interlocking course		

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



Module M0801: Water Res	sources and -Supply			
-				
Courses				
Title		Тур	Hrs/wk	CP
Chemistry of Drinking Water Treatment		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	•	•
	measures. They will be able to assess the evaluation methods that can be used for this. Students will be able to carry out chemical calculation			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 Engi	ineering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical I	Engineering: Elective Compulsory		
	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
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



ırses				
ı				
		Тур	Hrs/wk	CP
rated Transportation Planning (L106	8)	Problem-based Learning	4	6
Module Responsible	Prof. Carsten Gertz			
Admission Requirements	None			
Recommended Previous	some knowledge of transport planning, e.g. through takin	g the undergraduate class "Transport Plannin	g and Traffic Engine	erin
Knowledge				
Educational Objectives	After taking part successfully, students have reached the	following learning results		
Professional Competence				
Knowledge	Students are able to:			
	describe interdependencies between land-use/log			
	explain and evaluate the social, ecological and evaluate the social, ecological and evaluate the social ecological ecologi			
	relate current issues in the area of integrated trans	sport planning and formulate an opinion on th	em.	
01.71	0			
SKIIIS	Students are able to:			
	 quantify important parameters, which influence tra 	avel demand or are influenced by it.		
	 comprehensively examine a pre-defined or self 	f-selected topic from a transportation studies	perspective and o	locument the resul
	accordance with scientific conventions.			
Personal Competence				
Social Competence	Students are able to:			
	provide feedback on topical contents and their tea			
	constructively handle feedback on their own work			
	 produce results in group work and document thes 	Se.		
Autonomy	Students are able to:			
	assess potential consequences of their future pro	fessional activities		
	independently plan working on a pre-defined proj		nd use appropriate r	neans for its executi
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
	6			
•	Written elaboration			
camination duration and scale	THE GRADUIG BOTT			
	Civil Engineering Consisting Constant Factor	Flactive Compulsors		
	Civil Engineering: Specialisation Structural Engineering:			
	Civil Engineering: Specialisation Geotechnical Engineering:			
	Civil Engineering: Specialisation Coastal Engineering: E	, ,		
	Logistics, Infrastructure and Mobility: Specialisation Infras			
	Water and Environmental Engineering: Specialisation Water and Environmental Engineering: Specialisation En			



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	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 follow	ing learning results		
Professional Competence				
Knowledge	After successful completition, students can			
Skills	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 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: Comp	oulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: El	ective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective	Compulsory		
	International Management and Engineering: Specialisation II. (Civil Engineering: Elective Compulsory		

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

ourse L1205: Steel and Composite Structures		
Тур	Recitation Section (large)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Dr. Jürgen Priebe, Dr. Jörn Scheller	
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 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	s 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 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 Struc	tures (L0596)	Lecture	1	1
Design of Prefabricated Concrete Struc	tures (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 tec 	Students are able to interrelate scientific and technical knowledge.		
Skills	Students are able to apply basic methods in selected 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:	Flective Compulsory		

Course L1867: Analysis of Offshor	re 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	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, Tll, Verlag Ernst & Sohn	



Course L0596: Design of Prefabricated Concrete Structures		
Тур	Lecture	
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	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		
	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	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 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				
Recommended Previous	Mechanics I/II, Mathematics I/II, Differential Equati	ions I		
Knowledge				
Educational Objectives	After taking part successfully, students have reach	hed the following learning results		
Professional Competence		•		
Knowledge		nts can explain selected elements of higher structura	ıl analysis	
Skills				
Crune				
	After successful completion of this module, the	students are able to assess the premises and the	e applicability of the	presented methods of
	advanced structural analysis. They are able to us	e these methods for performing structural analyses.		
Personal Competence				
Social Competence				
Autonomy	The students have the opportunity to voluntarily a	nd independently work homework problems.		
Workload in Hours	Independent Study Time 96, Study Time in Lectur	re 84		
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engin	neering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical En	ngineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engine	ering: 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. Marco Schürg		
Language	DE		
Cycle	WiSe		
Content	Theory of plates loaded in-plane		
	Governing equations (equilibrium, kinematics, constitutive law) Differential equation Airy stress function Plane stress / plane strain Structural behaviour of plates loaded in-plane Theory of plates in bending Governing equations (equilibrium, kinematics, constitutive law) Differential equation Navier solution / Fourier series expansion		
	Approximation procedures Structural behaviour of plates in bending Shell theory		
	 Phenomenona of the structural behaviour of shells Membrane and bending theory Equilibrium equations of shells of revolution Stress resultants and deformations of the spherical shell, the half spherical shell, and the cylindrical shell Stability problems (overview) Plate buckling Shell buckling 		
Literature	 Basar, Y.: Krätzig, W.B. (1985): Mechanik der Flächentragwerke. Vieweg-Verlag, Braunschweig, Wiesbaden Girkmann, K. (1963): Flächentragwerke, Springer Verlag, Wien, 1963, unveränderter Nachdruck 1986 Zienkiewicz, O.C. (1977): The Finite Element Method in Enginieering Science. McGraw-Hill, London 		

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



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



Specialization Structural Engineering

Module M0699: Advanced	Foundation Engineering and Soil Labor	ratory Course		
module moods. Advanced		idiory Course		
Courses				
Title		Тур	Hrs/wk	СР
Soil Laboratory Course (L0499)		Laboratory Course	1	2
Advanced Foundation Engineering (L049)	97)	Lecture	2	2
Advanced Foundation Engineering (L04s	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 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	i		
Credit points	6			
Examination	Written exam			
Examination duration and scale	60 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: 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		

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 Foundation Engineering		
Тур	ture	
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 dimen	sioning of structural concrete		
Knowledge	Modules 'Concrete Structures I and II'			
Educational Objectives	After taking part successfully, students have reache	d the following learning results		
Professional Competence				
Knowledge				
, and the second	for the conception and design of concrete buildings	and structural members that are often used.	, ,	
Skills	The students are able to apply procedures of the co	nception and dimensioning to to practical problen	ns of structural engine	eering. 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 de	escriptions.		
Personal Competence				
Social Competence	The students are able to obtain results of high quali	ty in teamwork.		
Autonomy	The students are able to carry out complex concept	ion and dimensioning tasks of structures under the	e guidance of tutors.	
Workload in Hours	Independent Study Time 110, Study Time in Lecture	e 70		
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 minutes			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineer	ering: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	ineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineeri	ing: Elective Compulsory		
	International Management and Engineering: Specia	alisation II. Civil Engineering: Elective Compulsory	/	

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

Course L0577: Structural Concrete Members	
Тур	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	WiSe
Content	 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			
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	ng learning results		
Professional Competence				
Knowledge	After successful completition, students can			
Skills	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 After successful participation students are able to check stiffened and unstiffened plated structures recognize and verify warping tosion in strucures design composite structures edesign 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: Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Ele			
	Civil Engineering: Specialisation Coastal Engineering: Elective			
	International Management and Engineering: Specialisation II. C			

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

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



Course L1097: Steel Bridges		
Тур	Lecture	
Hrs/wk	2	
СР	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	



Module M0511: Electricity	Generation from Wind and Hydro Power	•		
Caurage				
Courses		T	Herefords	0.00
Title	I Marketa (LOO14)	Typ Project Seminar	Hrs/wk 1	CP
Renewable Energy Projects in Emerged Hydro Power Use (L0013)	Tiviarkets (L0014)	Lecture	1	1
Wind Turbine Plants (L0011)		Lecture	2	3
Wind Energy Use - Focus Offshore (L0	012)	Lecture	1	1
Module Responsible				
Admission Requirements				
Recommended Previous	Module: Technical Thermodynamics I,			
Knowledge	Module: Technical Thermodynamics II,			
	module. reclinical memodynamics ii,			
	Module: Fundamentals of Fluid Mechanics			
Educational Objectives	After taking part successfully, students have reached the	e following learning results		
Professional Competence				
Knowledge	By ending this module students can explain in detail kr	nowledge of wind turbines with a particular for	ocus of wind energy us	se in offshore conditions
	and can critical comment these aspects in consideratio	n of current developments. Furthermore, the	y are able to describe f	undamentally the use of
	water power to generate electricity. The students repro	duce and explain the basic procedure in the	implementation of rer	newable energy projects
	in countries outside Europe.			
	Through active discussions of various topics within the	e seminar of the module students improve	their understanding ar	nd the application of the
	theoretical background and are thus able to transfer wh		aron anaorotanang ar	та пто арриоавот от вто
	and the trial and the trial and to the trial and trial a	at they have learned in practice.		
Skills	Students are able to apply the acquired theoretical fou	undations on exemplary water or wind power	r systems and evaluate	e and assess technically
	the resulting relationships in the context of dimension	ning and operation of these energy system	ns. They can in compa	are critically the special
	procedure for the implementation of renewable energy	projects in countries outside Europe with th	e in principle applied a	approach in Europe and
	can apply this procedure on exemplary theoretical proje	ects.		
Personal Competence				
Social Competence				
30ciai Competence	Students can discuss scientific tasks subjet-specificly a	ina manaiscipiinary within a seminar.		
Autonomy	Students can independently exploit sources in the cont	ext of the emphasis of the lecture material to	clear the contents of th	ne lecture and to acquire
riaterioniy	the particular knowledge about the subject area.	ext of the emphasis of the locate material to	order the demonits of the	ie leotare and to acquire
	and particular rand medge about the easyout area.			
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70			
Credit points	6			
Examination	Written exam			
Examination duration and scale	3 hours written exam			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineer	ering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering:	Elective Compulsory		
	Energy and Environmental Engineering: Specialisation	Energy Engineering: Elective Compulsory		
	International Management and Engineering: Specialisa	ation II. Renewable Energy: Elective Compuls	sory	
	International Management and Engineering: Specialisa	ation II. Energy and Environmental Engineeri	ng: Elective Compulsor	ry
	Product Development, Materials and Production: Speci	alisation Product Development: Elective Con	npulsory	
	Product Development, Materials and Production: Speci	alisation Production: Elective Compulsory		
	Product Development, Materials and Production: Speci	alisation Materials: Elective Compulsory		
	Renewable Energies: Core qualification: Compulsory			
	Process Engineering: Specialisation Environmental Pro	ocess Engineering: Elective Compulsory		
	Water and Environmental Engineering: Specialisation E	Environment: Compulsory		
	Water and Environmental Engineering: Specialisation (Cition, Floring Commulator		



Course L0014: Renewable Energy	Projects in Emerged Markets		
Тур	Project Seminar Project Seminar		
Hrs/wk			
CP			
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		
	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 Plants		
Тур	ecture	
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	

0 10040 WE 15	5 0"		
Course L0012: Wind Energy Use -			
Тур	Lecture		
Hrs/wk			
СР	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 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 structures			
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 applications and the various loads. They can explain the basic design methods. 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 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 Engineer	ing: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: E	lective Compulsory		
	International Management and Engineering: Specialisat	on II. Civil Engineering: Elective Compulsory		



Course L0603: Design of Prestres	sed Structures and Concreet Bridges		
Тур	Lecture		
Hrs/wk	3		
CP			
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 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	s The students are capable to handle engineering problems by formulating suitable boundary elements, assembling the corresponding systematrices, and solving the resulting system of equations.			
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	

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



Courses Title Typ Hrs/wk CP Soil Mechanics - Selected Topics (L0374) Lecture 2	>				
Title Soil Mechanics - Selected Topics (L0374) Soil Mechanics - Selected Topics (L0374) Lecture 2 2 2 Soil Dynamics (L0452) Experimental Researches in Geotechnics (L0706) Recommended Responsible Admission Requirements Recommended Previous Knowledge Courses: Soil laboratory course, (Applied structural dynamics) Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge After the successful completion of the module the students should be able to: • to derive and to apply the basic equation of a simple mass oscillator, • 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,					
Title Soil Mechanics - Selected Topics (L0374) Soil Mechanics - Selected Topics (L0374) Lecture 2 2 2 Soil Dynamics (L0452) Experimental Researches in Geotechnics (L0706) Prof. Jürgen Grabe Module Responsible Admission Requirements Recommended Previous Knowledge Courses: Soil laboratory course, (Applied structural dynamics) Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge After the successful completion of the module the students should be able to: • to derive and to apply the basic equation of a simple mass oscillator, • 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,	,				
Soil Mechanics - Selected Topics (L0374) Lecture 2 2 Soil Dynamics (L0452) Experimental Researches in Geotechnics (L0706) Module Responsible Admission Requirements Recommended Previous Knowledge After taking part successfully, students have reached the following learning results Professional Competence Knowledge After the successful completion of the module the students should be able to: • to derive and to apply the basic equation of a simple mass oscillator, • 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,					
Soil Dynamics (L0452) Experimental Researches in Geotechnics (L0706) Module Responsible Prof. Jürgen Grabe Admission Requirements none Recommended Previous Knowledge Courses: Soil laboratory course, (Applied structural dynamics) Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge After the successful completion of the module the students should be able to: • to derive and to apply the basic equation of a simple mass oscillator, • 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,					
Module Responsible Prof. Jürgen Grabe Admission Requirements none Recommended Previous Knowledge Courses: Soil laboratory course, (Applied structural dynamics) Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge Knowledge Knowledge Knowledge After the successful completion of the module the students should be able to: • to derive and to apply the basic equation of a simple mass oscillator, • 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,					
Module Responsible Prof. Jürgen Grabe Admission Requirements none Recommended Previous Modules: Mathematics I-III, Mechanics I-II, Geotechnics I Courses: Soil laboratory course, (Applied structural dynamics) Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge After the successful completion of the module the students should be able to: • to derive and to apply the basic equation of a simple mass oscillator, • 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,	-				
Admission Requirements none Recommended Previous Knowledge courses: Soil laboratory course, (Applied structural dynamics) Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge After the successful completion of the module the students should be able to: • to derive and to apply the basic equation of a simple mass oscillator, • 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,					
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Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge After the successful completion of the module the students should be able to: • to derive and to apply the basic equation of a simple mass oscillator, • 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,					
courses: Soil laboratory course, (Applied structural dynamics) Educational Objectives After taking part successfully, students have reached the following learning results Professional Competence Knowledge After the successful completion of the module the students should be able to: • to derive and to apply the basic equation of a simple mass oscillator, • 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,					
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 to design machine foundations to dynamic load, to measure shocks to perform vibration forecast, 					
to measure shocks to perform vibration forecast,					
 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 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 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 may 	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 as a function of a number of state variables, 					
• to capture the visous behaviour of cohesive soils and to consider the effects of creep and rate-dependent shear strength in cal	calculations,				
 to consider the impact of the partly saturated of a seepage and shear strength. 					
Skills					
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 150 min					
Assignment for the Following Civil Engineering: Specialisation Structural Engineering: Elective Compulsory					
Curricula Civil Engineering: Specialisation Geotechnical Engineering: Compulsory					
Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory					

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



Course L0452: Soil Dynamics						
Тур	Lecture					
Hrs/wk	3					
СР	2					
Workload in Hours	endent Study Time 18, Study Time in Lecture 42					
Language						
Cycle	SoSe					
Content	mass-spring-damper systems,					
	• wave propagation in soils,					
	dynamic soil parameters,					
	termination 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,					
	ynamic 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	



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	etwork (L0875)	Problem-based Learning	2	3
Module Responsible	Prof. Wilfried Schneider			
Admission Requirements	none			
Recommended Previous	Groundwater			
Knowledge	 groundwater hydraulics and transport or 	cubetanese		
	groundwater riyuraulics and transport of	Substances		
	Pipe Systems			
	Knowledge on urban water infrastructure	es, in particular drinking water systemsand urban dra	inaga ayatama inaludi	ag an agial atrusturas
			image systems includi	ng special structures
	Hydraulics of drinking water supply syst Rasis knowledge on water management			
	Basic knowledge on water management			
Educational Objectives	After taking part successfully, students have rea	ched the following learning results		
Professional Competence				
Knowledge	The students are able to describe the modelli	ng of groundwater flow and transport as well as u	ban water infrastructu	res. They can carry
	systems analyses and can detect technical and conceptual weak points within the systems in case studies. Besides they are able to			
	interdependencies of hydraulic and toxic pheno	omena in soil and water.		
Skills	The students are able to construct and apply so	sientific groundwater models indipendently. They car	work on different sce	narios and can compa
S.I.IIS		ems by application of selected software products. T		
	solutions (e.g. EPANET, EPA-SWMM).	sins by application of sciedled software products. I	ne students are able	o ase amerent solw
	Soldions (e.g. El Alver, El A Gyvivily).			
Personal Competence				
Social Competence	Wird nicht vermittelt.			
Autonomy	Wird nicht vermittelt.			
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			
		unooring: Floative Compulsory		
Assignment for the Following	Civil Engineering: Specialisation Structural Eng			
Curricula	Civil Engineering: Specialisation Geotechnical			
	Civil Engineering: Specialisation Coastal Engin			
	Water and Environmental Engineering: Special			
	Water and Environmental Engineering: Special			
	Water and Environmental Engineering: Special	isation Cities: Elective Compulsory		

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 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 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	- Kasadadas sa Hiban alamina			
Knowledge	Knowledge on Urban planning Knowledge on measures for alimete protection and alimeters.	mata ahanga adaptatian		
	Knowledge on measures for climate protection and clim Paging knowledge in urban drainage and starmwater in			
	Basics knowledge in urban drainage and stormwater r	nanagement		
Educational Objectives	After taking part successfully, students have reached the follow	ving learning results		
Professional Competence				
Knowledge	Students can describe urban development corridors as well	as current and future urban environmen	ntal problems. They	are able to explain the
	causes of environmental problems (like noise).			
	Students can specify applications for various technical innovations and explain why these contribute to the improvement of urban life. They ca			
	example, derive and discuss measures for effective noise abatement.			
Skills	Students are able to develop specific solutions for correcting	g existing or future environment-related	problems of urban of	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 innovations	and integrate them into the urban contex	rt.	
Personal Competence				
Social Competence	The students can work together in international groups.			
Autonomy	Students are able to organize their work flow to prepare the	emselves for presentations and contribu	tions to the discussi	ons. They can acquire
	appropriate knowledge by making enquiries independently.			
W 11 1: ··	1.1. 1.10.1.7. 101.0.1.7. 1.1.			
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points				
Examination	Project Written Peneut plus and Procentation			
Examination duration and scale	Written Report plus oral Presentation			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elec			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Election			
	Civil Engineering: Specialisation Coastal Engineering: Electiv		con	
	Joint European Master in Environmental Studies - Cities and Studies - Infractructure and Mobility: Specialisation Infractructure		SULY	
	Logistics, Infrastructure and Mobility: Specialisation Infrastruct			
	Water and Environmental Engineering: Specialisation Environ			
	Water and Environmental Engineering: Specialisation Cities:	Joinpulsory		

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	res
Тур	Problem-based Learning
Hrs/wk	2
СР	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	CP	
Coastal- and Flood Protection (L0808)		Lecture	2	3	
Coastal- and Flood Protection (L1415)		Recitation Section (large)	1	1	
Maintennance and Defence of Flood Pro	, ,	Lecture	2	2	
Module Responsible					
Admission Requirements	none				
Recommended Previous	Coastal Engineering I				
Knowledge					
Educational Objectives	After taking part successfully, students have read	ched the following learning results			
Professional Competence					
Knowledge	The students have the capability to define and	explain in detail the important aspects of erosion pr	otection 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			ction measures from the	
	functional and from the constructional point of vie	functional and from the constructional point of view.			
Skills	The students are able to select design approa	The students are able to select design approaches for the functional and constructional design of erosion and flood protection measures			
	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 and constructive design of coastal and floo				
	protection structures. Additionaly, they will be ab	le to work in team with engineers of other disciplines			
Autonomy	The students will be able to independently exten	nd their knowledge and apply it to new problems.			
Workload in Hours	Independent Study Time 110, Study Time in Lec	ture 70			
Credit points	6				
Examination	Written exam				
Examination duration and scale	The duration of the examination is 130 min. The	examination includes tasks with respect to the gene	eral understanding of	the lecture contents and	
	calculations tasks.				
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: Compulsory			

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



Course L1415: Coastal- and Flood Protection		
Тур	Recitation Section (large)	
Hrs/wk	1	
СР	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	ngineering and Harbour Planning				
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 (L03	378)	Lecture		2	2
Module Responsible	Prof. Peter Fröhle				
Admission Requirements	none				
Recommended Previous					
Knowledge					
Educational Objectives	After taking part successfully, students have re	ached the following learning results			
Professional Competence					
Knowledge	The students are able to define in details and	d to choose design approaches for the	functional design	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 appl	ropriate approaches for the functional de	sign of ports.		
Personal Competence					
·	The students are able to deploy their gained k	nowledge in applied problems such as the	ne functional desig	in of ports. Additio	naly they will be able to
eesia. eenipeienee	The students are able to deploy their gained knowledge in applied problems such as the functional design of ports. Additionally, they will be able work in team with engineers of other disciplines.			nai, aroj um so asio a	
	work in tour war ongreeous or outer closepinio				
Autonomy	The students will be able to independently extended	end their knowledge and apply it to new	problems.		
Workload in Hours	Independent Study Time 110, Study Time in Le	ecture 70			
Credit points					
Examination					
	The duration of the examination is 150 min. The	no ovamination includes tasks with room	act to the general	undorstanding of	the lecture contents and
Examination duration and scale	calculations tasks.	ne examination includes tasks with respi	ect to the general	understanding of	me recture contents and
Assignment for the F-II		aine a singu Floative Compulars			
Assignment for the Following	Civil Engineering: Specialisation Structural En				
Curricula	Civil Engineering: Specialisation Geotechnica				
	Civil Engineering: Specialisation Coastal Engi		ia Campulaari		
	International Management and Engineering: S				
	Theoretical Mechanical Engineering: Specialis	• • • • • • • • • • • • • • • • • • • •			
	Theoretical Mechanical Engineering: Technical	ai Complementary Course: Elective Com	puisory		

Course L0809: Habour Engineering	9
Тур	Lecture
Hrs/wk	2
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 F	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			
Knowledge				
Educational Objectives	After taking part successfully, students have reache	ed the following learning results		
Professional Competence				
Knowledge	Students are able to define in detail the basic pro	ocesses that are related to the modelling of	flows in hydraulic engine	ering. Besides, they car
	describe the basic aspects of numerical modelling	and actual numerical models for the simulation	on of flows and waves.	
Skills	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 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 Lectur	e 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 Engine	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	gineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer	ring: Elective 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	
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
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	CP	
Wastewater Systems - Collection, Treat	ment and Reuse (L0934)	Lecture	2	2
Wastewater Systems - Collection, Treat	ment and Reuse (L0943)	Recitation Section (large)	1	1
Advanced Wastewater Treatment (L035		Lecture	2	2
Advanced Wastewater Treatment (L035		Recitation Section (large)	1	1
Module Responsible	Prof. Ralf Otterpohl			
Admission Requirements	None			
Recommended Previous	Knowledge of wastewater management and the key process	ses involved in wastewater treatment.		
Knowledge				
Educational Objectives	After taking part successfully, students have reached the following	owing learning results		
Professional Competence				
Knowledge	Students are able to outline key areas of the full range of treatment systems in waste water management, as well as their mutual dependence for sustainable water protection. They can describe relevant economic, environmental and social factors.			
Skills	Students are able to pre-design and explain the available 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 organi	ze their work flow independently. They can	also present on this	s subject.
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84			
Credit points	6			
Examination	Written exam			
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Ele	ctive Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering:			
	Civil Engineering: Specialisation Coastal Engineering: Elect	ive Compulsory		
	Bioprocess Engineering: Specialisation A - General Bioproc	ess Engineering: Elective Compulsory		
	Energy and Environmental Engineering: Specialisation Envi	ronmental Engineering: Elective Compulso	ory	
	International Management and Engineering: Specialisation II. Energy and Environmental Engineering: Elective Compulsory			
	International Management and Engineering: Specialisation II. Process Engineering and Biotechnology: Elective Compulsory			
	Process Engineering: Specialisation Environmental Process Engineering: Elective Compulsory			
	Process Engineering: Specialisation Process Engineering: E	Elective Compulsory		
	Water and Environmental Engineering: Specialisation Water	:: Compulsory		
	Water and Environmental Engineering: Specialisation Enviro	onment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities	: Compulsory		

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



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

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



Course L0358: Advanced 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	ning			
Courses				
Courses		T	Hrs/wk	0.00
Title Prinicples of City Planning (L1066)		Typ Problem-based Learning	Hrs/wk 2	CP 3
Street Design (L1067)		Problem-based Learning 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	enort planning a g through taking the un	deraraduate class	Transport Planning ar
	Traffic Engineering"	opon planning, e.g. anough taking are an	dergradate orașe "	Transport Flamming at
Educational Objectives		wing learning results		
Professional Competence	Students are able to:			
Knowledge	Students are able to.			
	use technical terms of urban planning.			
	describe the main determinants of urban developmen			
	 explain and compare different possibilities of how urbs discuss requirements for public streetscapes. 	an development can be influenced.		
	 explain the importance of street design. 			
	explain the imperialise of direct deelight			
Skills	Students are able to:			
	a road and analyze urban dayalanment cancents and d	onigno for etroetooppe		
	 read and analyze urban development concepts and d appraise such concepts in the context of competing re 			
	design, justify and reflect their own solutions for concrete their own solutions.			
	,,,,			
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	wings following a broadly pre-defined pro-	cess.	
	assess the consequences of their proposed solutions.			
	independently acquire knowledge and apply this to not	ew issues or problem areas.		
	1			
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points				
Examination	· ·			
Examination duration and scale		 		
Assignment for the Following				
Curricula				
	Civil Engineering: Specialisation Coastal Engineering: Electiv Logistics, Infrastructure and Mobility: Specialisation Infrastruc			
	Water and Environmental Engineering: Specialisation Water:			
	3			
	Water and Environmental Engineering: Specialisation Environmental	nment: Elective 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	
ŭ	Drahlam haad Lawing
	Problem-based Learning
Hrs/wk	
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 Manageme	nt		
Courses				
Title		Тур	Hrs/wk	СР
Construction Logistics (L1163)		Lecture	1 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 reach	ed the following learning results		
Professional Competence				
Knowledge	Students can			
		iction logistics and project development and manage	ement	
	 name advantages and disadvantages of in 	•		
	 explain characteristics of products, demand 	d and production of construction objects and their co	nsequences for con	struction specific supply
	chains			
	 differentiate constructions logistics from oth 	er logistics systems		
Skills	Students can			
	carry out project life cycle assessments			
	apply methods and instruments of constructions	tion logistics		
	apply methods and instruments of project d			
	4,5,7,			
	 design supply and waste removal concepts 	s for a construction project		
Personal Competence				
Social Competence	Students can			
	hald an analytic as in and for surviva			
	hold presentations in and for groups			
	 apply methods of conflict solving skills in gr 	oup work and case studies		
Autonomy	Students can			
	and the combiners by helicities and the 187	on and analysis defined as		
	solve problems by holistic, systemic and flo			
	improve their creativity, negotiation skills, c	onflict and crises solution skills by applying methods	of moderation in ca	ise studies
Workload in Hours	Independent Study Time 124, Study Time in Lectur	re 56		
Credit points	6			
Examination	Written elaboration			
Examination duration and scale	Two written compositions and two short presentations	ons		
Assignment for the Following	Civil Engineering: Specialisation Structural Engine	ering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical En	, ,		
	Civil Engineering: Specialisation Coastal Enginee			
		ialisation II. Civil Engineering: Elective Compulsory		
	Logistics, Infrastructure and Mobility: Specialisation			
	Logistics, Infrastructure and Mobility: Specialisation			
	Logistics, irriastructure ariu iviobility. Specialisatio	i ilinasii uoture anu iviobility. Elective Compuisory		



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
	flow oriented logistics systems for construction projects logistics systems for construction projects
	 logistics concepts for ready to use construction projects (especially procurement and waste removel logistics) best practice examples (construction logistics Potsdamer Platz, recent case study of the region)
	best practice examples (constitution rogistics i otsuanier i ratz, 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 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			
module mosso. Staties an	a Dynamics of Structures			
Courses				
itle		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				
Recommended Previous	Knowledge of linear structural analysis of statically	y determinate and indeterminate structures; Mechanic	cs I/II, Mathematics I	II, Differential equation
Knowledge	I			
Educational Objectives	After taking part successfully, students have reach	ed the following learning results		
Professional Competence	3,	3 · · · · · · 3		
•	After successful completion of this module, the stu	dent can explain the basic aspects of dynamic effects	on structures and t	ne respective methods
Skills Personal Competence	After successful completion of this module, the stuthe appropriate computational approaches and me	udents will be able to predict the response of material ethods.	al and structures to	dynamics loading usin
·				
Social Competence Autonomy				
Workload in Hours	Independent Study Time 96, Study Time in Lecture	0.84		
Credit points	6	5 04		
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engine	eering: Compulsory		
Curricula		•		
	Civil Engineering: Specialisation Coastal Enginee			
	- 5g	2		

Course L1202: Structural Dynamic	CS		
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 mechanics and fatigue in steel structures		
Тур	Lecture	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Dr. Ingo Hadrych	
Language	DE	
Cycle	SoSe	
Content	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 fo	ollowing learning results		
Professional Competence				
Knowledge	Students are able to prepare a part of the whole project an	d explain it to the others.		
Skills	Students can produce sketches and calculations of their	part of the project. They are able to adju	ust their work in reaction	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	espect to intergroup dependencies.		
	They can distribute and process tasks independently.			
Autonomy	Students can handle their part of the project on their own r	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 Engineerin	g: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Coastal Engineering: Ele	ective Compulsory		
	Civil Engineering: Specialisation Structural Engineering: C	Compulsory		

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	Dr. Jürgen Priebe, Prof. Uwe Starossek
Language	DE
Cycle	SoSe
Content	Design of a big construction project (i.e skyscraper, large bridge, roof of a stadiuim) in small groups
Literature	Wird je nach Projekt individuell angegeben.



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	; (L0256)	Recitation Section (small)	1	1
Transport Processes in Building Materia	als and Damage Processes (L0254)	Lecture	1	1
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials, building	physics and building chemistry, for example by the	ne modules Princip	les of Building Materials
Knowledge	and Building Physics and Building Materials and Buil	ding Chemistry.		
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledge	The students are able to describe the components of	f mineral building materials and their function in d	etail and to use the	m for the manufacture o
	special mineral building materials. They are able	to show the characteristics of mineral building	materials. They a	re able to describe the
	manufacture, properties and fields of application of s			
	are able to show the principles of anchor technology	·		,
	,			
Skills	The students are able to perform an optimization of g	granulometry of a mineral building material. They	are able to design	a special mineral morta
	and to manufacture this mortar. The students are ab	le to manufacture post installed rebar connection	ns. They are able to	recognize damages, to
	assess possible causes, to use the fundamentals of c	construction preservation and to select repair and	strengthening meas	ures.
Personal Competence				
•				
Social Competence	, ,			
	a critical discussion they defend and adjust their res	ults. The students are able to manufacture their s	special building mat	erial on the basis of this
	feedback.			
Autonomy	The students are able to responsibly use the resou	irces of materials and lab equipment for their pr	oject and to investi	gate and to get missing
	components.			
	·			
Workload in Hours		Independent Study Time 96, Study Time in Lecture 84		
Credit points				
Examination		Written exam		
Examination duration and scale	120 min			
Assignment for the Following	Civil Engineering: Specialisation Geotechnical Engin	eering: Compulsory		
Curricula	Civil Engineering: Specialisation Coastal Engineering	g: Elective Compulsory		
	Civil Engineering: Specialisation Structural Engineeri	ing: Elective Compulsory		
	Materials Science: Specialisation Engineering Materi	als: Elective Compulsory		

Course L0257: Anchor Technology	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
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	Course L0256: Technology of mineral Building Materials	
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	1	
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	SoSe	
Content	Design and production of mineral building materials	
Literature	Taylor, H.F.W.: Cement Chemistry	
	Springenschmid, R.: Betontechnologie für die Praxis	

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



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, Mathematics I-I	II		
Knowledge	courses: Soil laboratory course			
Educational Objectives	After taking part successfully, students have reached	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 Coastal Engineeri	ng: Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	ineering: Compulsory		
	Civil Engineering: Specialisation Structural Engineer	ering: Elective Compulsory		
	Theoretical Mechanical Engineering: Specialisation	Maritime Technology: Elective Compulsory		
	Theoretical Mechanical Engineering: Technical Cor	mplementary Course: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	on Cities: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	on Environment: Elective Compulsory		
	Water and Environmental Engineering: Specialisation	on 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 M1350: Excavatio	n Law			
Courses				
Title		Тур	Hrs/wk	СР
Subsoil and Underground Engineering La	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 Engine	ering: Elective Compulsory		
	Civil Engineering: Specialisation Structural Engineering	ng: Elective Compulsory		

Course L0395: Subsoil and Underg	ground Engineering Law
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
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 drainers.			
	 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 proportios:		
	dood knowledge of politicarits (e.g. COD, BOD, 13, 14, 1	and their properties,		
Educational Objectives	After taking part successfully, students have reached the followi	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 sign	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	lutions, 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			
	solutions to solve these problems.			
	·			
Personal Competence				
Social Competence	The students can work together in international groups.			
Autonomy	Students are able to organize their work flow to prepare the	nemselves 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				
Examination	Written exam			
Examination duration and scale	60 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective	e Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Ele	ective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective	Compulsory		
	Environmental Engineering: Specialisation Water: Elective Com	pulsory		
	International Management and Engineering: Specialisation II. C	ivil Engineering: Elective Compulsory		
	Joint European Master in Environmental Studies - Cities and Su	stainability: Specialisation Water: Elec	tive Compulsory	
	Water and Environmental Engineering: Specialisation Water: Co	ompulsory		
	Water and Environmental Engineering: Specialisation Environm			
	Water and For increased For increase 0 - 1 - 1 - 1 - 1 - 1 - 1	antiva Campulanu		

Water and Environmental Engineering: Specialisation Cities: Elective Compulsory



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

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



Module M0595: Examinati	on of Materials, Structural Condition	n and Damages		
Courses				
Title		Тур	Hrs/wk	СР
Examination of Materials, Structural Con	dition and Damages (L0260)	Lecture	4	4
Examination of Materials, Structural Con	dition and Damages (L0261)	Recitation Section (small)	1	2
Module Responsible	Prof. Frank Schmidt-Döhl			
Admission Requirements	None			
Recommended Previous	Basic knowledge about building materials or ma	terial science, for example by the module Buildi	ng 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.			
Skills	The students are able to responsibly discover the rules for trading and using of building products in Germany. They are able to chose suitable methods for the testing and inspection of construction products, the examination of damages and the 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	• •		
Autonomy				
Workload in Hours	Independent Study Time 110, Study Time in Lec	ture 70		
Credit points	6			
Examination				
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: Spe	ecialisation II. Civil Engineering: Elective Compu	ılsory	
	Materials Science: Specialisation Engineering N	laterials: Elective Compulsory		

averal 10000. Evansination of Materials Christman Candition and Damages			
Course Luzou: Examination of Ma	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 Materials, Structural Condition and Damages		
Тур	Recitation Section (small)	
Hrs/wk	1	
CP	2	
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14	
Lecturer	Prof. Frank Schmidt-Döhl	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Module M0603: Nonlinear	Structural Analysis			
Courses				
Title		Тур	Hrs/wk	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 Facilities O (Partial Differential Facilities)			
	Differential Equations 2 (Partial Differential Equations)			
Educational Objectives	After taking part successfully, students have reached the follow	ring learning results		
Professional Competence				
Knowledge	Students are able to			
	+ give an overview of the different nonlinear phenomena in str	uctural mechanics.		
	+ explain the mechanical background of nonlinear phenomena	a in structural mechanics.		
	+ to specify problems of nonlinear structural analysis, to ide	ntify them in a given situation and 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 con	nputational procedure.		
	+ apply finite element procedures for nonlinear structural analy	rsis.		
	+ critically verify and judge results of nonlinear finite elements.			
	+ to transfer their knowledge of nonlinear solution procedures	to new problems.		
Personal Competence				
Social Competence	Students are able to			
	+ solve problems in heterogeneous groups and to document the	ne corresponding results.		
	+ share new knowledge with group members.			
Autonomy				
	+ assess their knowledge by means of exercises and E-Learni	ng.		
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: Elect	ive Compulsory		
Curricula	International Management and Engineering: Specialisation II.	Civil Engineering: Elective Compulsory	/	
	Materials Science: Specialisation Modeling: Elective Compuls	ory		
	Mechatronics: Specialisation System Design: Elective Compul	sory		
	Product Development, Materials and Production: Core qualific	ation: Elective Compulsory		
	Naval Architecture and Ocean Engineering: Core qualification	: Elective Compulsory		
	Ship and Offshore Technology: Core qualification: Elective Co	mpulsory		
	Theoretical Mechanical Engineering: Core qualification: Electi	ve Compulsory		
	Theoretical Mechanical Engineering: Technical Complementa	ry Course: Elective Compulsory		



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
1 14 4	MA Alexandra District New York of Analysis Leature Makes Traditional Halles were 11 and 11 an
Literature	[1] Alexander Düster, Nonlinear Structrual Analysis, Lecture Notes, Technische Universität Hamburg-Harburg, 2014.
	[2] Peter Wriggers, Nonlinear Finite Element Methods, Springer 2008.
	[3] Peter Wriggers, Nichtlineare Finite-Elemente-Methoden, Springer 2001.
	[4] Javier Bonet and Richard D. Wood, Nonlinear Continuum Mechanics for Finite Element Analysis, Cambridge University Press, 2008.

Course L0279: Nonlinear Structure	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 M0705: Groundwa	ater			
inodule moreo. Greandwe				
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			
	Trydromechanics			
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.			
ruiomoago	They are able to do this with simulation models.	and pair someon con and	maio. Dody quaria.	aurory and quantaurory.
Skills	The students are able to describe conceptually movement and storage of water in the unsaturated zone. They are able to analyse pF- functions			
	and Ku functions. They can model transport of solutes in the unsaturated and saturated zoned. They are able to determine dispersities, s			
	coefficients, decay rates and dissolution rates for organic at	•		
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: El	ective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elec	ctive Compulsory		
	Process Engineering: Specialisation Environmental Process 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 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 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 Groun	Course L0542: Simulation in Groundwater Hydrology	
Тур	Recitation Section (small)	
Hrs/wk	2	
CP	2	
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28	
Lecturer	Prof. Wilfried Schneider	
Language	DE	
Cycle	WiSe	
Content	See interlocking course	
Literature	See interlocking course	



Module M0722: Computat	ional Analysis of Concrete Structures	s		
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	0600)	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, s	shear 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	t work (FE calculation)		
Assignment for the Following	Civil Engineering: Specialisation Structural Engine	eering: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Eng	gineering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineer	ring: Elective Compulsory		

urse L0598: Computational Ana	alysis of Concrete Structures		
•	ecture		
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	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 M0619: Waste Tre	atment Technologies			
Courses				
Title Waste and Environmental Chemistry (L0 Biological Waste Treatment (L0318)	328)	Typ Laboratory Course Problem-based Learning	Hrs/wk 2 3	CP 2 4
Module Responsible	Prof. Kerstin Kuchta			
Admission Requirements	none			
Recommended Previous Knowledge	chemical and biological basics			
Educational Objectives	After taking part successfully, students have reached the following	wing learning results		
Professional Competence Knowledge	The module aims possess knowledge concerning the planning of biological waste treatment plants. Students are able to explain the design and layout of anaerobic and aerobic waste treatment plants in detail, describe different techniques for waste gas treatment plants for biological waste treatment plants and explain different methods for waste analytics.			
Skills	The students are able to discuss the compilation of design and layout of plants. They can critically evaluate techniques and quality 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 discussions, develop cooperated solutions and defend their own work results in front of others and promote the scientific development in front of colleagues. Furthermore, they can give and accept professional constructive criticism.			
Autonomy	Students can independently tap knowledge from literature, business or test reports and transform it to the course projects. They are capable, in consultation with supervisors as well as in the interim presentation, to assess their learning level and define further steps on this basis. Furthermore, they can define targets for new application-or research-oriented duties in accordance with the potential social, economic and cultural impact.			
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), succ	cessful participation at Praktikum		
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective Compulsory			
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory			
	Civil Engineering: Specialisation Coastal Engineering: Electi		ion.	
	Energy and Environmental Engineering: Specialisation Envir Environmental Engineering: Core qualification: Compulsory	onnental Engineering: Elective Compuls	ыту	
	International Management and Engineering: Specialisation	. Energy and Environmental Engineering	: Elective Compulsory	,
	Joint European Master in Environmental Studies - Cities and			
	Water and Environmental Engineering: Specialisation Enviro			
	Water and Environmental Engineering: Specialisation Cities:	Elective 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	oblem-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	ViSe		
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 M0801: Water Resources and -Supply Courses Title Typ Hrs/wk CP				
111 111				
111 111				
Title Tun Heckel CB				
Title Typ 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 management, as well as their mutual dependence for sustainable water s	supply. They			
will understand relevant economic, environmental and social factors. Students will be able to explain and outline the organisational st				
water companies. They will be able to explain the available water treatment processes and the scope of their application.				
and sometimes and a supramation and a supramatio				
Skills Students will be able to assess complex problems in drinking water production and establish solutions involving water management ar	nd technical			
measures. They will be able to assess the evaluation methods that can be used for this. Students will be able to carry out chemical calc	culations for			
selected treatment processes and apply generally accepted technical rules and standards to these processes.				
Personal Competence				
Social Competence Working in a diverse group of specialists, students will be able to develop and document complex solutions for the management and	treatment of			
drinking water. They will be able to take an appropriate professional position, for example representing user interests. They will be able				
joint solutions in teams of diverse experts and present these solutions to others.				
,				
Autonomy Students will be in a position to work on a subject independently and present on this subject.				
Workload in Hours Independent Study Time 96, Study Time in Lecture 84				
Credit points 6				
Examination Written exam				
Examination duration and scale 60 min (chemistry) + presentation				
Assignment for the Following Civil Engineering: Specialisation Structural Engineering: Elective Compulsory				
Curricula Civil Engineering: Specialisation Geotechnical Engineering: Elective Compulsory				
Civil Engineering: Specialisation Coastal Engineering: Elective Compulsory				
Energy and Environmental Engineering: Specialisation Energy and Environmental Engineering: Elective Compulsory				
International Management and Engineering: Specialisation II. Energy and Environmental Engineering: Elective Compulsory				
Water and Environmental Engineering: Specialisation Water: Compulsory				
Water and Environmental Engineering: Specialisation Environment: Elective Compulsory				
Water and Environmental Engineering: Specialisation Cities: Elective Compulsory				

Course L0311: Chemistry of 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					
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 engineering. Students can define and determine the basics for design and dimensioning of coasta			
	engineering constructions.			
Skills	The students are capable to apply basic design approaches to selected and pre-defined design tasks in coastal engineering.			
Personal Competence				
Social Competence	The students are able to deploy their gained knowledge in applied problems such as the design of coastal protection structures. Additionally, they			
	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	ependent 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	1	Problem-based Learning	4	6
Module Responsible				
Admission Requirements				
Recommended Previous	some knowledge of transport planning, e.g. through taking the un	ndergraduate class "Transport Plannin	g and Traffic Engine	erin
Knowledge	46	1 1		
Educational Objectives		g learning results		
Professional Competence				
Knowledge	Students are able to:			
	describe interdependencies between land-use/location of	hoice and transportation/mobility beha	viour	
	explain and evaluate the social, ecological and economic	effects of transport and land-use polic	cy measures.	
	relate current issues in the area of integrated transport pl.	anning and formulate an opinion on th	em.	
Skills	Students are able to:			
	 quantify important parameters, which influence travel der 	nand or are influenced by it		
	comprehensively examine a pre-defined or self-selecte	·	norenostive and d	ocument the results i
	accordance with scientific conventions.	ed topic from a transportation studies	s perspective and d	ocument the results i
	accordance with scientific conventions.			
Personal Competence				
Social 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 topi		nd use appropriate n	neans for its execution.
		-, a-q	The second property of	
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56			
Credit points	6			
Examination	Written elaboration			
Examination duration and scale				
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Elective	e Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering: Ele	ctive Compulsory		
	Civil Engineering: Specialisation Coastal Engineering: Elective (Compulsory		
	Logistics, Infrastructure and Mobility: Specialisation Infrastructure	e and Mobility: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Water: Ele	ective Compulsory		
	Water and Environmental Engineering: Specialisation Environm	ent: Elective Compulsory		
	Water and Environmental Engineering: Specialisation Cities: Co	mnulson		



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 Engi	neering		
Courses				
Title		Тур	Hrs/wk	СР
Steel Structures in Foundation and Hydr	aulic Engineering (L1146)	Lecture	2	3
Underground Constructions (L0707)		Lecture	1	2
Underground Constructions (L1811)		Recitation Section (large)	1	1
Module Responsible	Prof. Jürgen Grabe			
Admission Requirements	None			
Recommended Previous	Modules from Bachelor studies Civil and enviror	nmental engineering:		
Knowledge	0			
	Geotechnics I-II Geotechnics 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 different tunnel construction types as well as special methods and techniques of subsoil construction. The students get deepe			
	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 element			
	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 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 manage	gement and design of tunnels.		
Autonomy	Promotion of independent and creative work flow in the framework of a design exercise.			
Workload in Hours	Independent Study Time 124, Study Time in Lec	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 Compulso	ory	

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	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	

ourse L1811: Underground Constructions		
	Typ 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				
Title		Тур	Hrs/wk	CP
		Lecture	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1
Analysis of Offshore Structures (L1867) 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 Construction		Seminar	1	1
Forum II - Geotechnics and Construction		Seminar	1	1
Timber Structures (L1151)	in Management (E1633)	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	Lecture	i	
Admission Requirements				
Recommended Previous				
	none			
Knowledge				
Educational Objectives	After taking part successfully, students have reached the foll	owing learning results		
Professional Competence				
Knowledge				
	Students are able to find their way through selected:		-	
	Students are able to explain basic models and proce	·	I structural engineer	ing.
	Students are able to interrelate scientific and technic	al knowledge.		
Skills				
	 Students are able to apply basic methods in selected 	d areas of civil and structural engineering.		
B				
Personal Competence				
Social Competence				
Autonomy	 Students can chose independently, in which fields th 	and all and a second state of the state of the second state of the	الممام مطابعات معطاب	ion of courses
	Students can chose independently, in which lields th	ley want to deepen then knowledge and sk	ills (illough the elect	ion or courses.
Workload in Hours	Depends on choice of courses			
Credit points	6			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineering: Ele	ective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engineering	: Elective 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 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, Tll, Verlag Ernst & Sohn



Course L0596: Design of Prefabrio	cated Concrete Structures
Тур	Lecture
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	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	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
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 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				
Recommended Previous	Mechanics I/II, Mathematics I/II, Differential Equations	I		
Knowledge				
Educational Objectives	After taking part successfully, students have reached	the following learning results		
Professional Competence				
Knowledae	After successful completion of this module, students of	an explain selected elements of higher structura	ıl analysis.	
Skills				
	After successful completion of this module, the stu-	dents are able to assess the premises and the	e applicability of the	e presented methods of
	advanced structural analysis. They are able to use the	ese methods for performing structural analyses.		
Personal Competence				
·				
Social Competence				
Autonomy	The students have the opportunity to voluntarily and i	ndependently work homework problems.		
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84	1		
Credit points	6			
Examination	Written exam			
Examination duration and scale	135 min			
Assignment for the Following	Civil Engineering: Specialisation Structural Engineeri	ng: Elective Compulsory		
Curricula	Civil Engineering: Specialisation Geotechnical Engin	eering: Elective Compulsory		
	Civil Engineering: Specialisation Coastal Engineering	g: 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. Marco Schürg
Language	DE
Cycle	WiSe
Content	Theory of plates loaded in-plane
	Governing equations (equilibrium, kinematics, constitutive law) Differential equation Airy stress function Plane stress / plane strain Structural behaviour of plates loaded in-plane Theory of plates in bending Governing equations (equilibrium, kinematics, constitutive law) Differential equation Navier solution / Fourier series expansion Approximation procedures Structural behaviour of plates in bending Shell theory Phenomenona of the structural behaviour of shells Membrane and bending theory Equilibrium equations of shells of revolution Stress resultants and deformations of the spherical shell, the half spherical shell, and the cylindrical shell Stability problems (overview) Plate buckling Shell buckling
Literature	 Basar, Y.: Krätzig, W.B. (1985): Mechanik der Flächentragwerke. Vieweg-Verlag, Braunschweig, Wiesbaden Girkmann, K. (1963): Flächentragwerke, Springer Verlag, Wien, 1963, unveränderter Nachdruck 1986 Zienkiewicz, O.C. (1977): The Finite Element Method in Enginieering Science. McGraw-Hill, London

Causes I 1000: Naulineau Analysia	of Frame Chrysleria
Course L1200: Nonlinear Analysis	
	Lecture
Hrs/wk	
	Independent Study Time 32, Study Time in Lecture 28
	Prof. Uwe Starossek
0 0	
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



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.
	,
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	



Thesis

	e <mark>sis</mark>
Courses	
Title	Typ Hrs/wk CP
Module Responsible	Professoren der TUHH
Admission Requirements	
	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 explain in depth the relevant approaches and terminologies in one or more areas of their subject, describing cur developments and taking up a critical position on them.
	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.
	The students can place a research task in their subject area in its context and describe and children assess the state of research.
Skills	The students are able:
	Total described Wassers and Supplied to the Control of the Control
	 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 incomplex.
	 To apply knowledge they have acquired and methods they have learnt in the course of their studies to complex and/or incomplet defined problems in a solution-oriented way.
	To develop new scientific findings in their subject area and subject them to a critical assessment.
	g
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 upholo
	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
	Environmental Engineering: Thesis: Compulsory Aircraft Systems Engineering: Thesis: Compulsory
	Environmental Engineering: Thesis: Compulsory
	Environmental Engineering: Thesis: Compulsory Aircraft Systems Engineering: Thesis: Compulsory Global Innovation Management: Thesis: Compulsory
	Environmental Engineering: Thesis: Compulsory Aircraft Systems Engineering: Thesis: Compulsory Global Innovation Management: Thesis: Compulsory Computational Science and Engineering: 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
	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
	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
	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
	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
	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
	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
	Environmental Engineering: Thesis: Compulsory Aircraft Systems Engineering: Thesis: Compulsory Global Innovation Management: Thesis: Compulsory Computational Science and Engineering: Thesis: Compulsory Information and Communication Systems: Thesis: Compulsory International Production Management: Thesis: Compulsory International Management and Engineering: Thesis: Compulsory Joint European Master in Environmental Studies - Cities and Sustainability: Thesis: Compulsory Logistics, Infrastructure and Mobility: Thesis: Compulsory Materials Science: Thesis: Compulsory Mechanical Engineering and Management: Thesis: Compulsory Mechatronics: Thesis: Compulsory Biomedical Engineering: Thesis: Compulsory Microelectronics and Microsystems: Thesis: Compulsory
	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



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