TUHH
Technische Universität Hamburg-Harburg

Module Manual

Bachelor of Science

Civil- and Environmental Engineering

Cohort: Winter Term 2017

Updated: 28th June 2017

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Program description

Content

Core qualification

Module M0580: Principles of Building Materials and Building Physics

Courses

Title	Typ	Hrs/wk	CP
Building Physics (L0217)	Lecture	2	2
Building Physics (L0219)	Recitation Section (large)	1	1
Building Physics (L0247)	Recitation Section (small)	1	1
Principles of Building Materials (L0215)	Lecture	2	2

Module Responsible	Prof. Frank Schmidt-Döhl
Admission Requirements	None
Recommended Previous Knowledge	Knowledge of physics, chemistry and mathematics from school
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students are able to identify fundamental effects of action to materials and structures, to explain different types of mechanical behaviour, to describe the structure of building materials and the correlations between structure and other properties, to show methods of joining and of corrosion processes and to describe the most important regularities and properties of building materials and structures and their measurement in the field of protection against moisture, coldness, fire and noise.
Skills	The students are able to work with the most important standardized methods and regularities in the field of moisture protection, the German regulation for energy saving, fire protection and noise protection in the case of a small building.
Personal Competence	
Social Competence	The students are able to support each other to learn the very extensive specialist knowledge.
Autonomy	The students are able to make the timing and the operation steps to learn the specialist knowledge of a very extensive field.
Workload in Hours	Independent Study Time 96, Study Time in Lecture 84
Credit points	6
Examination	Written exam
Examination duration and scale	2 stündige Klausur
Assignment for the Following Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Compulsory Technomathematics: Specialisation III. Engineering Science: Elective Compulsory

Course L0217: Building Physics

Typ	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	WiSe
Content	Heat transport, thermal bridges, balances of energy consumption, German regulation for energy saving, heat protection in summer, moisture transport, condensation moisture, protection against mold, fire protection, noise protection
Literature	Fischer, H.-M. ; Freymuth, H.; Häupl, P.; Homann, M.; Jenisch, R.; Richter, E.; Stohrer, M.: Lehrbuch der Bauphysik. Vieweg und Teubner Verlag, Wiesbaden, ISBN 978-3-519-55014-3

Course L0219: Building Physics

Typ	Recitation Section (large)
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	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L0247: Building Physics	
Typ	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	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L0215: Principles of Building Materials	
Typ	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	WiSe
Content	Structure of building materials Effects of action Fundamentals of mechanical behaviour Principles of metals Joining methods Corrosion
Literature	Wendehorst, R.: Baustoffkunde. ISBN 3-8351-0132-3 Scholz, W.:Baustoffkenntnis. ISBN 3-8041-4197-8

Module M0687: Chemistry

Courses

Title	Typ	Hrs/wk	CP
Chemistry I (L0460)	Lecture	2	2
Chemistry I (L0475)	Recitation Section (large)	1	1
Chemistry II (L0465)	Lecture	2	2
Chemistry II (L0476)	Recitation Section (large)	1	1

Module Responsible	Dr. Dorothea Rechtenbach
Admission Requirements	none
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students are able to name and to describe basic principles and applications of general chemistry (structure of matter, periodic table, chemical bonds), physical chemistry (aggregate states, separating processes, thermodynamics, kinetics), inorganic chemistry (acid/base, pH-value, salts, solubility, redox, metals) and organic chemistry (aliphatic hydrocarbons, functional groups, carbonyl compounds, aromates, reaction mechanisms, natural products, synthetic polymers). Furthermore students are able to explain basic chemical terms.
Skills	After successful completion of this module students are able to describe substance groups and chemical compounds. On this basis, they are capable of explaining, choosing and applying specific methods and various reaction mechanisms.
Personal Competence	
Social Competence	Students are able to take part in discussions on chemical issues and problems as a member of an interdisciplinary team. They can contribute to those discussion by their own statements.
Autonomy	After successful completion of this module students are able to solve chemical problems independently by defending proposed approaches with arguments. They can also document their approaches.
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 Curricula	General Engineering Science (German program): Core qualification: Compulsory General Engineering Science (German program, 7 semester): Core qualification: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory Technomathematics: Specialisation III. Engineering Science: Elective Compulsory

Course L0460: Chemistry I

Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Christoph Wutz
Language	DE
Cycle	WiSe
Content	- Structure of matter - Periodic table - Electronegativity - Chemical bonds - Solid compounds and solutions - Chemistry of water - Chemical reactions and equilibria - Acid-base reactions - Redox reactions
Literature	- Blumenthal, Linke, Vieth: Chemie - Grundwissen für Ingenieure - Kickelbick: Chemie für Ingenieure (Pearson) - Mortimer: Chemie. Basiswissen der Chemie. - Brown, LeMay, Bursten: Chemie. Studieren kompakt.

Course L0475: Chemistry I	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Dorothea Rechtenbach
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L0465: Chemistry II	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dr. Christoph Wutz
Language	DE
Cycle	WiSe
Content	- Simple compounds of carbon, aliphatic hydrocarbons, aromatic hydrocarbons, - Alkohols, phenols, ether, aldehydes, ketones, carbonic acids, ester, amines, amino acids, fats, sugars - Reaction mechanisms, radical reactions, nucleophilic substitution, elimination reactions, addition reaction - Practical apllications and examples
Literature	- Blumenthal, Linke, Vieth: Chemie - Grundwissen für Ingenieure - Kickelbick: Chemie für Ingenieure (Pearson) - Schmuck: Basisbuch Organische Chemie (Pearson)

Course L0476: Chemistry II	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Dorothea Rechtenbach
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M0577: Nontechnical Complementary Courses for Bachelors

Module Responsible	Dagmar Richter
Admission Requirements	None
Recommended Previous Knowledge	None
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	**The Non-technical 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, self-management, 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, migration studies, communication 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 theoretical level of abstraction in the B.Sc. This is also reflected in the different quality of soft skills, which relate to the different team positions and different group leadership functions of Bachelor's and Master's graduates in their future working life. **Specialized Competence (Knowledge)** Students can • locate selected specialized areas with the relevant non-technical mother discipline, • 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 methods of the said scientific disciplines, • auestion a specific technical phenomena, models, theories from the viewpoint of another, aforementioned specialist discipline, • to handle simple 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)** Students are able in selected areas • to reflect on their own profession and professionalism in the context of real-life fields of application • to organize themselves and their own learning processes • to reflect and decide questions in front of a broad education background • to communicate a nontechnical item in a competent way in writen form or verbaly • to organize themselves as an entrepreneurial subject country (as far as this study-focus would be chosen)
Workload in Hours	Depends on choice of courses
Credit points	6

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

Module M0850: Mathematics I

Courses

Title	Typ	Hrs/wk	CP
Analysis I (L1010)	Lecture	2	2
Analysis I (L1012)	Recitation Section (small)	1	1
Analysis I (L1013)	Recitation Section (large)	1	1
Linear Algebra I (L0912)	Lecture	2	2
Linear Algebra I (L0913)	Recitation Section (small)	1	1
Linear Algebra I (L0914)	Recitation Section (large)	1	1

Module Responsible	Prof. Anusch Taraz
Admission Requirements	none
Recommended Previous Knowledge	School mathematics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	• Students can name the basic concepts in analysis and linear algebra. They are able to explain them using appropriate examples. • Students can discuss logical connections between these concepts. They are capable of illustrating these connections with the help of examples. • They know proof strategies and can reproduce them.
Skills	• Students can model problems in analysis and linear algebra with the help of the concepts studied in this course. Moreover, they are capable of solving them by applying established methods. • Students are able to discover and verify further logical connections between the concepts studied in the course. • For a given problem, the students can develop and execute a suitable approach, and are able to critically evaluate the results.
Personal Competence	
Social Competence	• Students are able to work together in teams. They are capable to use mathematics as a common language. • In doing so, they can communicate new concepts according to the needs of their cooperating partners. Moreover, they can design examples to check and deepen the understanding of their peers.
Autonomy	• Students are capable of checking their understanding of complex concepts on their own. They can specify open questions precisely and know where to get help in solving them. • Students have developed sufficient persistence to be able to work for longer periods in a goal-oriented manner on hard problems.
Workload in Hours	Independent Study Time 128, Study Time in Lecture 112
Credit points	8
Examination	Written exam
Examination duration and scale	60 min (Analysis I) + 60 min (Linear Algebra I)
Assignment for the Following Curricula	General Engineering Science (German program): Core qualification: Compulsory General Engineering Science (German program, 7 semester): Core qualification: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory Bioprocess Engineering: Core qualification: Compulsory Electrical Engineering: Core qualification: Compulsory Energy and Environmental Engineering: Core qualification: Compulsory Computational Science and Engineering: Core qualification: Compulsory Logistics and Mobility: Core qualification: Compulsory Mechanical Engineering: Core qualification: Compulsory Mechatronics: Core qualification: Compulsory Naval Architecture: Core qualification: Compulsory Process Engineering: Core qualification: Compulsory

Course L1010: Analysis I	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	Foundations of differential and integrational calculus of one variable • statements, sets and functions • natural and real numbers • convergence of sequences and series • continuous and differentiable functions • mean value theorems • Taylor series • calculus • error analysis • fixpoint iteration
Literature	• http://www.math.uni-hamburg.de/teaching/export/tuhh/index.html

Course L1012: Analysis I	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1013: Analysis I	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L0912: Linear Algebra I	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Anusch Taraz, Prof. Marko Lindner
Language	DE
Cycle	WiSe
Content	• vectors: intuition, rules, inner and cross product, lines and planes • general vector spaces: subspaces, Euclidean vector spaces • systems of linear equations: Gauß-elimination, matrix product, inverse matrices, transformations, LR-decomposition, block matrices, determinants
Literature	• T. Arens u.a. : Mathematik, Spektrum Akademischer Verlag, Heidelberg 2009 • W. Mackens, H. Voß: Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994 • W. Mackens, H. Voß: Aufgaben und Lösungen zur Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994

Course L0913: Linear Algebra I	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Anusch Taraz, Prof. Marko Lindner
Language	DE
Cycle	WiSe
Content	• vectors: intuition, rules, inner and cross product, lines and planes • general vector spaces: subspaces, Euclidean vector spaces • systems of linear equations: Gauß-elimination, matrix product, inverse matrices, transformations, LR-decomposition, block matrices, determinants
Literature	• T. Arens u.a. : Mathematik, Spektrum Akademischer Verlag, Heidelberg 2009 • W. Mackens, H. Voß: Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994 • W. Mackens, H. Voß: Aufgaben und Lösungen zur Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994

Course L0914: Linear Algebra I	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Christian Seifert
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M0889: Mechanics I (Statics)

Courses

Title	Typ	Hrs/wk	CP
Mechanics I (Statics) (L1001)	Lecture	2	3
Mechanics I (Statics) (L1002)	Recitation Section (small)	2	2
Mechanics I (Statics) (L1003)	Recitation Section (large)	1	1

Module Responsible	Prof. Robert Seifried
Admission Requirements	none
Recommended Previous Knowledge	Solid school knowledge in mathematics and physics.
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students can • describe the axiomatic procedure used in mechanical contexts; • explain important steps in model design; • present technical knowledge in stereostatics.
Skills	The students can • explain the important elements of mathematical / mechanical analysis and model formation, and apply it to the context of their own problems; • apply basic statical methods to engineering problems; • estimate the reach and boundaries of statical methods and extend them to be applicable to wider problem sets.
Personal Competence	
Social Competence	The students can work in groups and support each other to overcome difficulties.
Autonomy	Students are capable of determining their own strengths and weaknesses and to organize their time and learning based on those.
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 Curricula	General Engineering Science (German program): Core qualification: Compulsory General Engineering Science (German program, 7 semester): Core qualification: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory Mechanical Engineering: Core qualification: Compulsory Mechatronics: Core qualification: Compulsory Naval Architecture: Core qualification: Compulsory

Course L1001: Mechanics I (Statics)

Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Robert Seifried
Language	DE
Cycle	WiSe
Content	Forces and equilibrium Constraints and reactions Frames Center of mass Friction Internal forces and moments for beams
Literature	**K. Magnus, H.H. Müller-Slany: Grundlagen der Technischen Mechanik. 7. Auflage, Teubner (2009).** **D. Gross, W. Hauger, J. Schröder, W. Wall: Technische Mechanik 1. 11. Auflage, Springer (2011).**

Course L1002: Mechanics I (Statics)

Typ	Recitation Section (small)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Robert Seifried
Language	DE
Cycle	WiSe
Content	Forces and equilibrium Constraints and reactions Frames Center of mass Friction Internal forces and moments for beams
Literature	K. Magnus, H.H. Müller-Slany: Grundlagen der Technischen Mechanik. 7. Auflage, Teubner (2009). D. Gross, W. Hauger, J. Schröder, W. Wall: Technische Mechanik 1. 11. Auflage, Springer (2011).

Course L1003: Mechanics I (Statics)	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Robert Seifried
Language	DE
Cycle	WiSe
Content	Forces and equilibrium Constraints and reactions Frames Center of mass Friction Internal forces and moments for beams
Literature	K. Magnus, H.H. Müller-Slany: Grundlagen der Technischen Mechanik. 7. Auflage, Teubner (2009). D. Gross, W. Hauger, J. Schröder, W. Wall: Technische Mechanik 1. 11. Auflage, Springer (2011).

Module M0579: Structural Design

Courses

Title	Typ	Hrs/wk	CP
Basics of Structural Design (L0205)	Lecture	2	1
Seminar in Structural Design (L0209)	Seminar	2	4
Seminar in Structural Design (L0208)	Recitation Section (large)	1	1

Module Responsible	Dr. Gernod Deckelmann
Admission Requirements	none
Recommended Previous Knowledge	Contents of module "Principles of Building Materials and Building Physics"
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	After attending the course students are able • to define the basics of building regulations law • to specify typical building components • to distinguish different possibilities of load bearing behaviour and risks due to lack of stability • to explain the main objectivs of fire control
Skills	After attending the course students are able • to evaluate development plans and to convert the main objectivs of building regulation laws to a architect's plan • to decide which building components should be used to get a correcct buidling enevelope and a sufficient buidling stability • to proof the moisture behaviour, the energy consumption, the acoustic protection and the fire control of a construction • to plot the results of drafts and decisions
Personal Competence	
Social Competence	After attending the course students are able • to work in a team and to persent the results of the team work • to use the feedback from other students to improve the own results • to give a feedback to other students in a constructive manner
Autonomy	After attending the course students are able • to control and improve their knowledge with the help of weeekly presentations (lecture room) and tests (STUD.IP) • to divide the main task in different parts, to deduce the needed knowledge and to schedule the different work steps
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6
Examination	Written exam
Examination duration and scale	60 minütige Klausur (max. 40 Punkte); semesterbegleitende Projektarbeit (max. 60 Punkte); Klausur mindestens mit 4,0
Assignment for the Following Curricula	General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Compulsory

Course L0205: Basics of Structural Design	
Typ	Lecture
Hrs/wk	2
CP	1
Workload in Hours	Independent Study Time 2, Study Time in Lecture 28
Lecturer	Dr. Gernod Deckelmann
Language	DE
Cycle	SoSe
Content	• Basics of building regulation laws • Foundation of buildings • Sealing of basements • facades • Ceilings • Roofs • Windows, doors and post-and-beam constructions • Staircases • Basics of strucural engineering design • Structural fire prevention • Optional tests on STUD.IP
Literature	**Vortragsfolien der Lehrveranstaltung** stehen über STUD.IP zum download zur Verfügung **Neumann, Dietrich** (Hestermann, Ulf.; Rongen, Ludwig.; Weinbrenner, Ulrich) Frick/Knöll Baukonstructionslehre 1 / [Internet-Ressource] ISBN: 978-3-8351-9121-1 Wiesbaden : B.G. Teubner Verlag / GWV Fachverlage GmbH, Wiesbaden, 2006 **Frick[Begr.], Otto** (Knöll[Begr.], Karl.; Neumann, Dietrich.; Hestermann, Ulf.; Rongen, Ludwig.) Baukonstruktionslehre 2 / [Internet-Ressource] ISBN: 978-3-8348-9486-1 Wiesbaden : Vieweg+Teubner Verlag / GWV Fachverlage GmbH, Wiesbaden, 2008 **Dierks, Klaus** (Wormuth, Rüdiger.) Baukonstruktion : [Einführung, Grundlagen, Gründungen, technische Ausrüstung, Wände, Geschossdecken, Treppen, Dächer, Fenster, Türen, Konstruktionsatlas] ISBN: 3804150454 (Gb.) ISBN: 978-3-8041-5045-4 Neuwied : Werner, 2007 **Neufert, Ernst** (Kister, Johannes) Bauentwurfslehre : Grundlagen, Normen, Vorschriften über Anlage, Bau, Gestaltung, Raumbedarf, Raumbeziehungen, Maße für Gebäude, Räume, Einrichtungen, Geräte mit dem Menschen als Maß und Ziel ; Handbuch für den Baufachmann, Bauherrn, Lehrenden und Lernend ISBN: 978-3-8348-0732-8 (GB.) Wiesbaden : Vieweg + Teubner, 2009

Course L0209: Seminar in Structural Design	
Typ	Seminar
Hrs/wk	2
CP	4
Workload in Hours	Independent Study Time 92, Study Time in Lecture 28
Lecturer	Dr. Gernod Deckelmann
Language	DE
Cycle	SoSe
Content	• Constructing a small individuell buidling in groups of 4 persons • Analysing the informations and the contents of development plans and buidling regulation laws • Design of building components and approving of the funcionality (sealing, facades, roofs) • Design and approve of the funcionality of the component interconnections • Proofing and assessing of moisture behaviour, energy comsumption, acoustic protection and fire control • Assessing the building stabilty • Basics of building services • Each week the results of different work steps are presented in oral and written form
Literature	**Vortragsfolien der Lehrveranstaltung** stehen über STUD.IP zum download zur Verfügung **Neumann, Dietrich** (Hestermann, Ulf.; Rongen, Ludwig.; Weinbrenner, Ulrich) Frick/Knöll Baukonstructionslehre 1 / [Internet-Ressource] ISBN: 978-3-8351-9121-1 Wiesbaden : B.G. Teubner Verlag / GWV Fachverlage GmbH, Wiesbaden, 2006 **Frick[Begr.], Otto** (Knöll[Begr.], Karl.; Neumann, Dietrich.; Hestermann, Ulf.; Rongen, Ludwig.) Baukonstruktionslehre 2 / [Internet-Ressource] ISBN: 978-3-8348-9486-1 Wiesbaden : Vieweg+Teubner Verlag / GWV Fachverlage GmbH, Wiesbaden, 2008 **Dierks, Klaus** (Wormuth, Rüdiger.) Baukonstruktion : [Einführung, Grundlagen, Gründungen, technische Ausrüstung, Wände, Geschossdecken, Treppen, Dächer, Fenster, Türen, Konstruktionsatlas] ISBN: 3804150454 (Gb.) ISBN: 978-3-8041-5045-4 Neuwied : Werner, 2007 **Schneider, Klaus-Jürgen** (Goris, Alfons.; Berner, Klaus) Bautabellen für Ingenieure : mit Berechnungshinweisen und Beispielen ; [auf CD-ROM: Stabwerksprogramm IQ 100 B, Tools für den konstr. Ingenieurbau, Fachinformationen, Normentexte] ISBN: 3804152287 Neuwied : Werner, 2006 **Wendehorst, Reinhard** (Wetzell, Otto W.,; Baumgartner, Herwig,; Deutsches Institut für Normung) Wendehorst Bautechnische Zahlentafeln ISBN: 978-3-8351-0055-8 ISBN: 3835100556 Stuttgart [u.a.] : Teubner Berlin [u.a.] : Beuth, 2007 **Neufert, Ernst** (Kister, Johannes) Bauentwurfslehre : Grundlagen, Normen, Vorschriften über Anlage, Bau, Gestaltung, Raumbedarf, Raumbeziehungen, Maße für Gebäude, Räume, Einrichtungen, Geräte mit dem Menschen als Maß und Ziel ; Handbuch für den Baufachmann, Bauherrn, Lehrenden und Lernenden ISBN: 978-3-8348-0732-8 (GB.) Wiesbaden : Vieweg + Teubner, 2009

Course L0208: Seminar in Structural Design	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Gernod Deckelmann
Language	DE
Cycle	SoSe
Content	• Constructing a small individuell buidling in groups of 4 persons • Analysing the informations and the contents of development plans and buidling regulation laws • Design of building components and approving of the funcionality (sealing, facades, roofs) • Design and approve of the funcionality of the component interconnections • Proofing and assessing of moisture behaviour, energy comsumption, acoustic protection and fire control • Assessing the building stabilty • Basics of building services • Each week the results of different work steps are presented in oral and written form
Literature	**Vortragsfolien der Lehrveranstaltung** stehen über STUD.IP zum download zur Verfügung **Neumann, Dietrich** (Hestermann, Ulf.; Rongen, Ludwig.; Weinbrenner, Ulrich) Frick/Knöll Baukonstructionslehre 1 / [Internet-Ressource] ISBN: 978-3-8351-9121-1 Wiesbaden : B.G. Teubner Verlag / GWV Fachverlage GmbH, Wiesbaden, 2006 **Frick[Begr.], Otto** (Knöll[Begr.], Karl.; Neumann, Dietrich.; Hestermann, Ulf.; Rongen, Ludwig.) Baukonstruktionslehre 2 / [Internet-Ressource] ISBN: 978-3-8348-9486-1 Wiesbaden : Vieweg+Teubner Verlag / GWV Fachverlage GmbH, Wiesbaden, 2008 **Dierks, Klaus** (Wormuth, Rüdiger.) Baukonstruktion : [Einführung, Grundlagen, Gründungen, technische Ausrüstung, Wände, Geschossdecken, Treppen, Dächer, Fenster, Türen, Konstruktionsatlas] ISBN: 3804150454 (Gb.) ISBN: 978-3-8041-5045-4 Neuwied : Werner, 2007 **Schneider, Klaus-Jürgen** (Goris, Alfons.; Berner, Klaus) Bautabellen für Ingenieure : mit Berechnungshinweisen und Beispielen ; [auf CD-ROM: Stabwerksprogramm IQ 100 B, Tools für den konstr. Ingenieurbau, Fachinformationen, Normentexte] ISBN: 3804152287 Neuwied : Werner, 2006 **Wendehorst, Reinhard** (Wetzell, Otto W.,; Baumgartner, Herwig,; Deutsches Institut für Normung) Wendehorst Bautechnische Zahlentafeln ISBN: 978-3-8351-0055-8 ISBN: 3835100556 Stuttgart [u.a.] : Teubner Berlin [u.a.] : Beuth, 2007 **Neufert, Ernst** (Kister, Johannes) Bauentwurfslehre : Grundlagen, Normen, Vorschriften über Anlage, Bau, Gestaltung, Raumbedarf, Raumbeziehungen, Maße für Gebäude, Räume, Einrichtungen, Geräte mit dem Menschen als Maß und Ziel ; Handbuch für den Baufachmann, Bauherrn, Lehrenden und Lernenden ISBN: 978-3-8348-0732-8 (GB.) Wiesbaden : Vieweg + Teubner, 2009

Module M0696: Mechanics II: Mechanics of Materials

Courses

Title	Typ	Hrs/wk	CP
Mechanics II (L0493)	Lecture	2	2
Mechanics II (L0494)	Recitation Section (small)	2	2
Mechanics II (L1691)	Recitation Section (large)	2	2

Module Responsible	NN
Admission Requirements	none
Recommended Previous Knowledge	Mechanics I
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students name the fundamental concepts and laws of statics such as stresses, strains, Hooke's linear law.
Skills	The students apply the mathematical/mechanical analysis and modeling. The students apply the fundamental methods of elasto statics to simply engineering problems. The students estimate the validity and limitations of the introduced 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	90 min
Assignment for the Following Curricula	General Engineering Science (German program): Core qualification: Compulsory General Engineering Science (German program, 7 semester): Core qualification: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory Mechanical Engineering: Core qualification: Compulsory Mechatronics: Core qualification: Compulsory Naval Architecture: Core qualification: Compulsory

Course L0493: Mechanics II

Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Benedikt Kriegesmann
Language	DE
Cycle	SoSe
Content	stresses and strains Hooke's law tension and compression torsion bending stability buckling energy methods
Literature	K. Magnus, H.H. Müller -Slany, Grundlagen der Technischen Mechanik. 7. Auflage, Teubner (2005) D. Gross, W. Hauger, W. Schnell, J. Schröder, Technische Mechanik 1&2. 8. Auflage, Springer (2004). R.C. Hibbeler, Technische Mechanik 1&2. Pearson (2005)

Course L0494: Mechanics II

Typ	Recitation Section (small)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Benedikt Kriegesmann
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L1691: Mechanics II	
Typ	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Benedikt Kriegesmann
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0590: Building Materials and Building Chemistry

Courses

Title	Typ	Hrs/wk	CP
Building Materials and Building Chemistry (L0248)	Lecture	4	4
Building Materials and Building Chemistry (L0249)	Recitation Section (small)	1	2

Module Responsible	Prof. Frank Schmidt-Döhl
Admission Requirements	None
Recommended Previous Knowledge	Module Principles of Building Materials and Building Physics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students are able to explain the most important components, the manufacture, the structure, the most important characteristics of the mechanical behaviour and the corrosion behaviour, the material testing and the fields of utilization of all relevant building materials.
Skills	The students are able to assess the usability of building materials for different applications and to select building materials according to their specific advantages and disadvantages. The students are able to prepare the mixture of a normal type concrete and to consider the mixture in respect to the actual rules and the connections between the characteristic concrete parameters. They are able to select suitable materials and mixtures to avoid damage processes.
Personal Competence	
Social Competence	The students are able to support each other to learn the very extensive specialist knowledge in learning groups and to carry out exercises in small groups in the lab.
Autonomy	--
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6
Examination	Written exam
Examination duration and scale	2 stündige Klausur
Assignment for the Following Curricula	General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Compulsory

Course L0248: Building Materials and Building Chemistry

Typ	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	SoSe
Content	Cementing materials, aggregates, admixtures and other components in mortar and concrete, concrete, durability of cement bonded materials, repair of concrete structures, steel, cast iron, non-ferrous metals, metal corrosion, timber, plastics, natural stone, synthetic stones, mortar, masonry, glass, bitumen
Literature	Wendehorst, R.: Baustoffkunde. ISBN 3-8351-0132-3 Scholz, W.:Baustoffkenntnis. ISBN 3-8041-4197-8 Henning, O.; Knöfel, D.: Baustoffchemie. ISBN 3-345-00799-1 Knoblauch, H.; Schneider, U.: Bauchemie. ISBN 3-8041-5174-4

Course L0249: Building Materials and Building Chemistry

Typ	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, Klaus-Dieter Henk
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0851: Mathematics II

Courses

Title	Typ	Hrs/wk	CP
Analysis II (L1025)	Lecture	2	2
Analysis II (L1026)	Recitation Section (large)	1	1
Analysis II (L1027)	Recitation Section (small)	1	1
Linear Algebra II (L0915)	Lecture	2	2
Linear Algebra II (L0916)	Recitation Section (small)	1	1
Linear Algebra II (L0917)	Recitation Section (large)	1	1

Module Responsible	Prof. Anusch Taraz
Admission Requirements	none
Recommended Previous Knowledge	Mathematics I
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	• Students can name further concepts in analysis and linear algebra. They are able to explain them using appropriate examples. • Students can discuss logical connections between these concepts. They are capable of illustrating these connections with the help of examples. • They know proof strategies and can reproduce them.
Skills	• Students can model problems in analysis and linear algebra with the help of the concepts studied in this course. Moreover, they are capable of solving them by applying established methods. • Students are able to discover and verify further logical connections between the concepts studied in the course. • For a given problem, the students can develop and execute a suitable approach, and are able to critically evaluate the results.
Personal Competence	
Social Competence	• Students are able to work together in teams. They are capable to use mathematics as a common language. • In doing so, they can communicate new concepts according to the needs of their cooperating partners. Moreover, they can design examples to check and deepen the understanding of their peers.
Autonomy	• Students are capable of checking their understanding of complex concepts on their own. They can specify open questions precisely and know where to get help in solving them. • Students have developed sufficient persistence to be able to work for longer periods in a goal-oriented manner on hard problems.
Workload in Hours	Independent Study Time 128, Study Time in Lecture 112
Credit points	8
Examination	Written exam
Examination duration and scale	60 min (Analysis II) + 60 min (Linear Algebra II)
Assignment for the Following Curricula	General Engineering Science (German program): Core qualification: Compulsory General Engineering Science (German program, 7 semester): Core qualification: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory Bioprocess Engineering: Core qualification: Compulsory Electrical Engineering: Core qualification: Compulsory Energy and Environmental Engineering: Core qualification: Compulsory Computational Science and Engineering: Core qualification: Compulsory Logistics and Mobility: Core qualification: Compulsory Mechanical Engineering: Core qualification: Compulsory Mechatronics: Core qualification: Compulsory Naval Architecture: Core qualification: Compulsory Process Engineering: Core qualification: Compulsory

Course L1025: Analysis II	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	SoSe
Content	• power series and elementary functions • interpolation • integration (proper integrals, fundamental theorem, integration rules, improper integrals, parameter dependent integrals • applications of integration (volume and surface of bodies of revolution, lines and arc length, line integrals • numerical quadrature • periodic functions
Literature	• http://www.math.uni-hamburg.de/teaching/export/tuhh/index.html

Course L1026: Analysis II	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L1027: Analysis II	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0915: Linear Algebra II	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Anusch Taraz, Prof. Marko Lindner
Language	DE
Cycle	SoSe
Content	• linear mappings: basis transformation, orthogonal projection, orthogonal matrices, householder matrices • linear regression: QR-decomposition, normal equations, linear discrete approximation • eigenvalues: diagonalising matrices, normal matrices, symmetric and Hermite matrices, Jordan normal form, singular value decomposition • system of linear differential equations
Literature	• W. Mackens, H. Voß: Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994 • W. Mackens, H. Voß: Aufgaben und Lösungen zur Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994

Course L0916: Linear Algebra II	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Anusch Taraz, Prof. Marko Lindner
Language	DE
Cycle	SoSe
Content	• linear mappings: basis transformation, orthogonal projection, orthogonal matrices, householder matrices • linear regression: QR-decomposition, normal equations, linear discrete approximation • eigenvalues: diagonalising matrices, normal matrices, symmetric and Hermite matrices, Jordan normal form, singular value decomposition • system of linear differential equations
Literature	• W. Mackens, H. Voß: Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994 • W. Mackens, H. Voß: Aufgaben und Lösungen zur Mathematik I für Studierende der Ingenieurwissenschaften, HECO-Verlag, Alsdorf 1994

Course L0917: Linear Algebra II	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Anusch Taraz, Prof. Marko Lindner, Dr. Christian Seifert
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0976: Waste and Soil

Courses

Title	Typ	Hrs/wk	CP
Waste, Biology and Soil (L1174)	Lecture	2	2
Waste resource Management (L0322)	Lecture	2	2
Waste Resource Management (L1173)	Recitation Section (large)	1	2

Module Responsible	Prof. Kerstin Kuchta
Admission Requirements	none
Recommended Previous Knowledge	chemical basics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students know how to describe relevant waste resources as well as the principles for the collection, the treatment of waste resources and primary resource mining. They are able to discuss resource strategies, like decoupling and urban mining as well as the consequences of worldwide demand on renewable and non-renewable resources. Additional, obstacles and efforts of waste resource management and urban mining and new technological approaches can be identified by the students.
Skills	The students know relevant waste resources as well as the principles for the collection, the treatment of waste resources and primary resource mining. They have knowledge about resource strategies, like decoupling and urban mining as well as the consequences of worldwide demand on renewable and non-renewable resources. Additional, obstacles and efforts of waste resource management and urban mining and new technological approaches are identified. The students are capable to make their own decisions with respect to the selection of suitable rescources and ecologically/economically feasible treatment processes.
Personal Competence	
Social Competence	Students can • participate in subject-specific and interdisciplinary discussions, • develop cooperated solutions • defend their own work results in front of others • promote the scientific development of collegues. • Furthermore, they can give and accept professional constructive criticism.
Autonomy	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	Written exam
Examination duration and scale	1,5 Stunden
Assignment for the Following Curricula	Civil- and Environmental Engineering: Core qualification: Compulsory

Course L1174: Waste, Biology and Soil

Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Kerstin Kuchta
Language	EN
Cycle	SoSe
Content	Students will learn ecological and economical consequences as well as appropriate alternatives to conventional treatment of organic wastes, focusing integrated solution and concepts. Therefore, biological processes in soil, composting and anaerobic digestion will be the main topic of the course. Based on general roles, biological basics, entropic discussions and efficiency definition, specific technologies and combined or integrated processes will be taught. Seldom-used technologies, foreign developments and innovative own research concepts are presented. Students learn recycling of organic wastes in the context of sustainable material management and learn to develop systematic solutions. Topics are, e.g. • Basics of biology • Degradation principles of organic substances in soil and waste • Contaminate soils and sites • Identification, evaluation and remediation of contaminate soils • Microbiological remediation processes
Literature	1) **Waste Management**. Bernd Bilitewski; Georg Härdtle; Klaus Marek (Eds.), ISBN: 9783540592105 , Springer Verlag Lehrbuchsammlung der TUB, Signatur USH-305 2) **Solid Waste Technology and Management.** Thomas Christensen (Ed.), ISBN: 978-1-4051-7517-3 , Wiley Verlag Lesesaal 2: US - Umweltschutz, Signatur USH-332 3) **Natural attenuation of fuels and chlorinated solvents in the subsurface.** Todd H. Wiedemeier(Ed.), ISBN: 0471197491 Lesesaal 2: US - Umweltschutz, Signatur USH-844

Course L0322: Waste resource Management	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Kerstin Kuchta, Mehmet Kücüker
Language	EN
Cycle	SoSe
Content	• Decoupling • Waste as a resource • Resource Biomass - Food Waste • Resource Biomass - Waste Wood • Resource Biomass- Paper • Ores and industrial minerals - Aluminum • Ores and industrial minerals- Gold • Ores and industrial minerals - Copper • Fossil Energy carrier- RDF • Fossil Energy carrier - Biogas • Fossil Energy carrier - Plastic • Construction Material
Literature	• Decoupling natural Resource Use and Environmental impacts from economic growth UNEP 2011 • Waste ManagementInternational: Journal of Integrated Waste Management, Science and Technology, Elsevier • **International Journal of Waste Resources** (**IJWR**)[ISSN: 2252-5211]

Course L1173: Waste Resource Management	
Typ	Recitation Section (large)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Kerstin Kuchta, Mehmet Kücüker
Language	EN
Cycle	SoSe
Content	Decoupling Waste as a resource Resource Biomass - Food Waste Resource Biomass - Waste Wood Resource Biomass- Paper Ores and industrial minerals - Aluminum Ores and industrial minerals- Gold Ores and industrial minerals - Copper Fossil Energy carrier- RDF Fossil Energy carrier - Biogas Fossil Energy carrier - Plastic Construction Material
Literature	

Module M0728: Hydraulic Engineering I

Courses

Title	Typ	Hrs/wk	CP
Hydrology (L0909)	Lecture	1	1
Hydrology (L0956)	Problem-based Learning	1	2
Hydromechanics (L0615)	Lecture	2	2
Hydromechanics (L0616)	Recitation Section (large)	1	1

Module Responsible	Prof. Peter Fröhle
Admission Requirements	none
Recommended Previous Knowledge	Mathematics I, II and III Mechanik I und II
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students are able to define the basic terms of hydromechanics and hydrology and water management. They are able to derive the basic formulations of i) hydrostatics, ii) kinematics of flows and iii) conservation laws and to describe and quantify the relevant processes of the hydrological water cycle. Besides, the students can describe the main aspects of rainfall-run-off-modelling and of established reservoir / storage models as well as the concepts of the determination of a unit-hydrograph.
Skills	The students are able to apply the fundamental formulations of hydromechanics to basic practical problems. Besides this, they are able to apply basic hydrological approaches and methods to simple hydrological problems. The students have the capability to exemplarily apply simple reservoir/storage models and a unit-hydrograph to given problems. In addition, the basic concepts of field – measurements of hydrological and hydrodynamic values can be described and the students are able to perform, analyze and assess respective measurements.
Personal Competence	
Social Competence	The students are able to prepare and present technical presentations for given topics in groups.
Autonomy	Students can provide each other with feedback and suggestions on their results. They are capable of reflecting their study techniques and learning strategy on an individual basis.
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 2 hours. The examination includes tasks with respect to the general understanding of the lecture contents and calculations tasks.
Assignment for the Following Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Compulsory

Course L0909: Hydrology

Typ	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	WiSe
Content	Introduction to basics of Hydrology: • Hydrological cycle • Data acquisition • Data analyses and statistical assessment • Statistics of extremes • Regionalization methods for hydrological values Rainfall-run-off modelling on the basis of a unit hydrograph conceps
Literature	Maniak, Hydrologie und Wasserwirtschaft, Eine Einführung für Ingenieure, Springer Skript Hydrologie und Gewässerkunde

Course L0956: Hydrology	
Typ	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	WiSe
Content	Introduction to basics of Hydrology: • Hydrological cycle • Data acquisition • Data analyses and statistical assessment • Statistics of extremes • Regionalization methods for hydrological values Rainfall-run-off modelling on the basis of a unit hydrograph conceps
Literature	Maniak, Hydrologie und Wasserwirtschaft, Eine Einführung für Ingenieure, Springer Skript Hydrologie und Gewässerkunde

Course L0615: Hydromechanics	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	WiSe

Content	Fundamentals of Hydromechanics
	• Characteristics of fluids
	• Hydrostatics
	• Kinematics of flows, laminar and turbulent flows
	• Conservation laws
	  ◦ Conservation of mass
	  ◦ Conservation of Energy
	  ◦ Momentum Equation
	• Application of conservation laws to flow conditions

Literature	Skript zur Vorlesung Hydromechanik/Hydraulik, Kapitel 1-2 E-Learning Werkzeug: Hydromechanik und hydraulik (Link): (http://www.tu-harburg.de/ … hydraulik_tool/index.html) Truckenbrodt, E.: Lehrbuch der angewandten Fluidmechanik, Springer Verlag, Berlin, 1998. Truckenbrodt, E.: Grundlagen und elementare Strömungsvorgänge dichtebeständiger Fluide / Fluidmechanik, Springer Verlag, Berlin, 1996.

Course L0616: Hydromechanics	
Typ	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	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M0740: Structural Analysis I

Courses

Title	Typ	Hrs/wk	CP
Structural Analysis I (L0666)	Lecture	2	3
Structural Analysis I (L0667)	Recitation Section (large)	2	3

Module Responsible	Prof. Uwe Starossek
Admission Requirements	none
Recommended Previous Knowledge	Mechanics I, Mathematics I
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	After successfully completing this module, students can express the basic aspects of linear frame analysis of statically determinate systems.
Skills	After successful completion of this module, the students are able to distinguish between statically determinate and indeterminate structures. They are able to analyze state variables and to construct influence lines of statically determinate plane and spatial frame and truss structures.
Personal Competence	
Social Competence	Students can • participate in subject-specific and interdisciplinary discussions, • defend their own work results in front of others • promote the scientific development of colleagues • Furthermore, they can give and accept professional constructive criticism
Autonomy	The students are able work in-term homework assignments. Due to the in-term feedback, they are enabled to self-assess their learning progress during the lecture period, already.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Examination	Written exam
Examination duration and scale	90 Minuten
Assignment for the Following Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Compulsory Technomathematics: Specialisation III. Engineering Science: Elective Compulsory

Course L0666: Structural Analysis I

Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Uwe Starossek
Language	DE
Cycle	WiSe
Content	Statically determinate structural systems • basics: statically determinacy, equilibrium, method of sections • forces: determination of support reactions and internal forces • influence lines of forces • displacements: calculation of discrete displacements and rotations, calculation of deflection curves • principle of virtual displacements and virtual forces • work-engergy theorem • differential equation of beam
Literature	Krätzig, W.B., Harte, R., Meskouris, K., Wittek, U.: Tragwerke 1 - Theorie und Berechnungsmethoden statisch bestimmter Stabtragwerke. 4. Aufl., Springer, Berlin, 1999.

Course L0667: Structural Analysis I	
Typ	Recitation Section (large)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Uwe Starossek
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M0829: Foundations of Management

Courses

Title	Typ	Hrs/wk	CP
Introduction to Management (L0880)	Lecture	3	3
Project Entrepreneurship (L0882)	Problem-based Learning	2	3

Module Responsible	Prof. Christoph Ihl
Admission Requirements	None
Recommended Previous Knowledge	Basic Knowledge of Mathematics and Business
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	After taking this module, students know the important basics of many different areas in Business and Management, from Planning and Organisation to Marketing and Innovation, and also to Investment and Controlling. In particular they are able to • explain the differences between Economics and Management and the sub-disciplines in Management and to name important definitions from the field of Management • explain the most important aspects of and goals in Management and name the most important aspects of entrepreneurial projects • describe and explain basic business functions as production, procurement and sourcing, supply chain management, organization and human ressource management, information management, innovation management and marketing • explain the relevance of planning and decision making in Business, esp. in situations under multiple objectives and uncertainty, and explain some basic methods from mathematical Finance • state basics from accounting and costing and selected controlling methods.
Skills	Students are able to analyse business units with respect to different criteria (organization, objectives, strategies etc.) and to carry out an Entrepreneurship project in a team. In particular, they are able to • analyse Management goals and structure them appropriately • analyse organisational and staff structures of companies • apply methods for decision making under multiple objectives, under uncertainty and under risk • analyse production and procurement systems and Business information systems • analyse and apply basic methods of marketing • select and apply basic methods from mathematical finance to predefined problems • apply basic methods from accounting, costing and controlling to predefined problems
Personal Competence	
Social Competence	Students are able to • work successfully in a team of students • to apply their knowledge from the lecture to an entrepreneurship project and write a coherent report on the project • to communicate appropriately and • to cooperate respectfully with their fellow students.
Autonomy	Students are able to • work in a team and to organize the team themselves • to write a report on their project.
Workload in Hours	Independent Study Time 110, Study Time in Lecture 70
Credit points	6
Examination	Written exam
Examination duration and scale	90 minutes
Assignment for the Following Curricula	General Engineering Science (German program): Specialisation Electrical Engineering: Compulsory General Engineering Science (German program): Specialisation Computer Science: Compulsory General Engineering Science (German program): Specialisation Process Engineering: Compulsory General Engineering Science (German program): Specialisation Bioprocess Engineering: Compulsory General Engineering Science (German program): Specialisation Energy and Enviromental Engineering: Compulsory General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program): Specialisation Mechanical Engineering: Compulsory General Engineering Science (German program): Specialisation Biomedical Engineering: Compulsory General Engineering Science (German program): Specialisation Naval Architecture: Compulsory General Engineering Science (German program, 7 semester): Specialisation Electrical Engineering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Process Engineering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Biomedical Engineering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Naval Architecture: Compulsory General Engineering Science (German program, 7 semester): Specialisation Computer Science: Compulsory General Engineering Science (German program, 7 semester): Specialisation Bioprocess Engineering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Energy and Enviromental Engineering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering, Focus Mechatronics: Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering, Focus Biomechanics: Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering, Focus Aircraft Systems Engineering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering, Focus Materials in Engineering Sciences: Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering, Focus Theoretical Mechanical Engineering:

	Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering, Focus Product Development and Production: Compulsory General Engineering Science (German program, 7 semester): Specialisation Mechanical Engineering, Focus Energy Systems: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory Bioprocess Engineering: Core qualification: Compulsory Computer Science: Core qualification: Compulsory Electrical Engineering: Core qualification: Compulsory Energy and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program): Specialisation Bioprocess Engineering: Compulsory General Engineering Science (English program): Specialisation Electrical Engineering: Compulsory General Engineering Science (English program): Specialisation Energy and Enviromental Engineering: Compulsory General Engineering Science (English program): Specialisation Computer Science: Compulsory General Engineering Science (English program): Specialisation Mechanical Engineering: Compulsory General Engineering Science (English program): Specialisation Biomedical Engineering: Compulsory General Engineering Science (English program): Specialisation Naval Architecture: Compulsory General Engineering Science (English program): Specialisation Process Engineering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Electrical Engineering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Process Engineering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Biomedical Engineering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Naval Architecture: Compulsory General Engineering Science (English program, 7 semester): Specialisation Computer Science: Compulsory General Engineering Science (English program, 7 semester): Specialisation Bioprocess Engineering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Energy and Enviromental Engineering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Mechanical Engineering, Focus Mechatronics: Compulsory General Engineering Science (English program, 7 semester): Specialisation Mechanical Engineering, Focus Biomechanics: Compulsory General Engineering Science (English program, 7 semester): Specialisation Mechanical Engineering, Focus Aircraft Systems Engineering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Mechanical Engineering, Focus Materials in Engineering Sciences: Compulsory General Engineering Science (English program, 7 semester): Specialisation Mechanical Engineering, Focus Theoretical Mechanical Engineering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Mechanical Engineering, Focus Product Development and Production: Compulsory General Engineering Science (English program, 7 semester): Specialisation Mechanical Engineering, Focus Energy Systems: Compulsory Computational Science and Engineering: Core qualification: Compulsory Logistics and Mobility: Core qualification: Compulsory Mechanical Engineering: Core qualification: Compulsory Mechatronics: Core qualification: Compulsory Naval Architecture: Core qualification: Compulsory Technomathematics: Core qualification: Compulsory Process Engineering: Core qualification: Compulsory

Course L0880: Introduction to Management	
Typ	Lecture
Hrs/wk	3
CP	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Lecturer	Prof. Christoph Ihl, Prof. Thorsten Blecker, Prof. Christian Lüthje, Prof. Christian Ringle, Prof. Kathrin Fischer, Prof. Cornelius Herstatt, Prof. Wolfgang Kersten, Prof. Matthias Meyer, Prof. Thomas Wrona
Language	DE
Cycle	WiSe/SoSe
Content	• Introduction to Business and Management, Business versus Economics, relevant areas in Business and Management • Important definitions from Management, • Developing Objectives for Business, and their relation to important Business functions • Business Functions: Functions of the Value Chain, e.g. Production and Procurement, Supply Chain Management, Innovation Management, Marketing and Sales Cross-sectional Functions, e.g. Organisation, Human Ressource Management, Supply Chain Management, Information Management • Definitions as information, information systems, aspects of data security and strategic information systems • Definition and Relevance of innovations, e.g. innovation opporunities, risks etc. • Relevance of marketing, B2B vs. B2C-Marketing • different techniques from the field of marketing (e.g. scenario technique), pricing strategies • important organizational structures • basics of human ressource management • Introduction to Business Planning and the steps of a planning process • Decision Analysis: Elements of decision problems and methods for solving decision problems • Selected Planning Tasks, e.g. Investment and Financial Decisions • Introduction to Accounting: Accounting, Balance-Sheets, Costing • Relevance of Controlling and selected Controlling methods • Important aspects of Entrepreneurship projects
Literature	Bamberg, G., Coenenberg, A.: Betriebswirtschaftliche Entscheidungslehre, 14. Aufl., München 2008 Eisenführ, F., Weber, M.: Rationales Entscheiden, 4. Aufl., Berlin et al. 2003 Heinhold, M.: Buchführung in Fallbeispielen, 10. Aufl., Stuttgart 2006. Kruschwitz, L.: Finanzmathematik. 3. Auflage, München 2001. Pellens, B., Fülbier, R. U., Gassen, J., Sellhorn, T.: Internationale Rechnungslegung, 7. Aufl., Stuttgart 2008. Schweitzer, M.: Planung und Steuerung, in: Bea/Friedl/Schweitzer: Allgemeine Betriebswirtschaftslehre, Bd. 2: Führung, 9. Aufl., Stuttgart 2005. Weber, J., Schäffer, U. : Einführung in das Controlling, 12. Auflage, Stuttgart 2008. Weber, J./Weißenberger, B.: Einführung in das Rechnungswesen, 7. Auflage, Stuttgart 2006.

Course L0882: Project Entrepreneurship	
Typ	Problem-based Learning
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Christoph Ihl, Ann-Isabell Hnida, Hamed Farhadian, Katharina Roedelius, Oliver Welling, Maximilian Muelke
Language	DE
Cycle	WiSe/SoSe
Content	In this project module, students work on an Entrepreneurship project. They are required to go through all relevant steps, from the first idea to the concept, using their knowledge from the corresponding lecture. Project work is carried out in teams with the support of a mentor.
Literature	Relevante Literatur aus der korrespondierenden Vorlesung.

Module M0878: Applications in Civil and Environmental Engineering

Courses

Title	Typ	Hrs/wk	CP
Applied Numerical Methods (L0211)	Seminar	3	3
Applied Structural Dynamics (L0791)	Lecture	2	2
AutoCAD (L1211)	Recitation Section (small)	2	3
Building Information Modeling (L1903)	Lecture	1	1
Building Information Modeling (L1904)	Recitation Section (large)	2	2
Computational Analysis of Structures (L0370)	Lecture	1	3
Computational Analysis of Structures (L0372)	Recitation Section (large)	1	1
Introduction in Statitics with R (L0286)	Lecture	1	1
Introduction in Statitics with R (L0776)	Recitation Section (large)	1	1
Principles of Geomatics (L0470)	Lecture	2	2
Principles of Geomatics (L0471)	Recitation Section (small)	2	2
Numeric and Matlab (L0125)	Laboratory Course	2	2
Practical Course in Drinking Water Chemistry (L1744)	Laboratory Course	1	2
Projects II (L1228)	Project Seminar	2	2
Fire Protection and Prevention (L0472)	Lecture	2	2

Module Responsible	Prof. Wilfried Schneider
Admission Requirements	none
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students are at home doing with typical applications of the study programme.
Skills	The students are able to use the methods that are provided during the lectures for practical questions. They are able to work in the learnt methods into new forms of application independently".
Personal Competence	
Social Competence	According to the course chosen students are able to perform tasks or to conduct a project in teams. If so, they can present, discuss and document results accordingly.
Autonomy	According to the course chosen individual students can plan and document tasks and work flow for themselves or for the team.
Workload in Hours	Depends on choice of courses
Credit points	6
Assignment for the Following Curricula	General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Elective Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Elective Compulsory

Course L0211: Applied Numerical Methods	
Typ	Seminar
Hrs/wk	3
CP	3
Workload in Hours	Independent Study Time 48, Study Time in Lecture 42
Examination Form	Schriftliche Ausarbeitung
Examination duration and scale	4 schriftliche Ausarbeitungen und erfolgreiche Bearbeitung von semesterbegleitenden Vips
Lecturer	Dr. Gernod Deckelmann
Language	DE
Cycle	WiSe
Content	• Possible methods to solve engineering problems • Application of numerical methods • Basic steps in the finite element method • Requests for the geometric modell • Linear, quadratic and cubic elements • Minimum total potential energy formulation and verification of results • Non-linear problems and error-estimation procedures • Application of ANSYS to solve typical problems in the fields of civil engineering
Literature	**Vortragsfolien der Lehrveranstaltung** stehen über STUD.IP zum download zur Verfügung **Müller, Günter** (Groth, Clemens) FEM für Praktiker ISBN: 3816926851 (Kt.) ISBN: 978-3-8169-2685-6 Renningen : expert-Verl, 2007 **Groth, Clemens** (Müller, Günter) FEM für Praktiker ISBN: 3816918581 Renningen : Expert-Verl, 2001 **Chandrupatla, Tirupathi R** (Belegundu, Ashok D.; Ramesh, T.) Introduction to finite elements in engineering ISBN: 0132162741 (United States ed.) ISBN: 9780132162746 (United States ed.) ISBN: 0273763687 (International ed.) ISBN: 9780273763680 (International ed.) Upper Saddle River, NJ [u.a.] Prentice Hall, 2012 Gvk **Moaveni, Saeed** Finite element analysis : theory and application with ANSYS ISBN: 0132416514 ISBN: 9780132416511 Upper Saddle River, NJ Pearson Prentice-Hall, 2008 Gvk **Patankar, Suhas V** Numerical heat transfer and fluid flow ISBN: 0891165223 New York [u.a.] : Hemisphere Publ. Co, 1980 **Bathe, Klaus-Jürgen** (Zimmermann, Peter) Finite-Elemente-Methoden ISBN: 3540668063 (Gb.) ISBN: 978-3-540-66806-0 Berlin [u.a.] : Springer, 2002

Course L0791: Applied Structural Dynamics	
Typ	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	15 min
Lecturer	Dr. Kira Holtzendorff
Language	DE
Cycle	WiSe
Content	The lecture gives an introduction into the classical structural dynamics, whereas the focus lies on the practical applications. The theoretical basics are worked out in order to apply them for typical issues in practice. For an effective vibration isolation due to vibration excitations by e.g. railway traffic, operating machines oder moving people, different structural measures are presented. The lecture is completed by performing examples of vibration measurements as well as interactive dynamic experiments in the laboratory. The following topics are covered: Particular features in structural dynamics Basic terms of time-dependent excitations Free vibrations (natural frequencies) Induced vibrations Impact excitations of structures Methods of amplitude reduction (vibration isolation) Introduction to soil dynamics Vibration measurements and requirements for vibration protection Vibrations induced by people
Literature	Helmut Kramer: Angewandte Baudynamik, Ernst & Sohn Verlag, 2. Auflage 2013 Christian Petersen: Dynamik der Baukonstruktionen, Vieweg Verlag, 2. Auflage von 2000

Course L1211: AutoCAD	
Typ	Recitation Section (small)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Examination Form	Klausur
Examination duration and scale	90 Minuten
Lecturer	Thomas Kölzer
Language	DE
Cycle	WiSe/SoSe
Content	Designing of drawings (e. g. line, circle, arc, ...) Modifying of drawings (e. g. copy, mirror, extend, trim, fillet, ...) Applying and managing of layers Operating in Model- and Layout-Tabs Applying of Plotstyle-Manager Dimensioning of designs and structural elements Inscribing of designs and structural elements Hatching of structural elements
Literature	Ludolph, M. / Wüstefeld, J. (2011): AutoCAD 2D-Grundlagen (Skript zur Übung)

Course L1903: Building Information Modeling	
Typ	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	siehe Modulhandbuch
Lecturer	Prof. Frank Schmidt-Döhl
Language	DE
Cycle	SoSe
Content	
Literature	

Course L1904: Building Information Modeling	
Typ	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Schriftliche Ausarbeitung
Examination duration and scale	siehe Modulhandbuch
Lecturer	Prof. Frank Schmidt-Döhl
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0370: Computational Analysis of Structures	
Typ	Lecture
Hrs/wk	1
CP	3
Workload in Hours	Independent Study Time 76, Study Time in Lecture 14
Examination Form	Klausur
Examination duration and scale	60 min
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	WiSe
Content	• basics of the Finite Element Method, Spreadsheets • basics of software 'SOFiSTiK' • modeling of an arbitrary cross-section • modeling of an arbitrary 2D truss structure incl. loads • Teddy; usage of global and local variables • design of a concrete section • modeling of a T-beam bridge by means of a grillage system • modeling and design of a rectangular slab • building models
Literature	• Skript zu Vorlesung • Tutorials von SOFiSTiK • 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. C1.-C.36)

Course L0372: Computational Analysis of Structures	
Typ	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 L0286: Introduction in Statitics with R	
Typ	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	Dr. Joachim Behrendt
Language	DE
Cycle	WiSe
Content	Introduction to R Graphics with R Descriptive Statistic (Boxplot, Percentiles, outliers) Propability (Combinatorics, relative frequency, dependand probability) random numbers and distibutions (confidence interval, uniform and discrete distributions, test-distributions (t-F-X²-distribiution)) Correlation and Regression analysis (Confidence interval of calibration curves, linearity) Statistic test procedures (mean value-t-Test, Chi^2-Test, F-Test) Analysis of variance (ANOVA, Bartlett-Test, Kruskal-Wallis Rank sum test) Introduction time series (tseries) Introduction cluster analysis (k-means)
Literature	**Regionales Rechenzentrum für Niedersachsen** Statistik mit R Grundlagen der Datenanalyse , 2013 Einführung in die Statistik mit R, Andreas Handl, Skript Uni Bielefeld http://www.wiwi.uni-bielefeld.de/fileadmin/emeriti/frohn/handl_grundausbildung/statskript.pdf und die dazugehörige Aufgabensammlung http://www.wiwi.uni-bielefeld.de/fileadmin/emeriti/frohn/handl_grundausbildung/statauf.pdf Induktive Statistik [Elektronische Ressource] : eine Einführung mit R und SPSS / Helge... von Toutenburg, Helge 2008 http://dx.doi.org/10.1007/978-3-540-77510-2http://dx.doi.org/10.1007/978-3-540-77510-2 R-Referenzcard: http://cran.r-project.org/doc/contrib/Short-refcard.pdfhttp://cran.r-project.org/doc/contrib/Short-refcard.pdf Grafiken und Statistik in R von Andreas Plank Nachschlage Skript mit Beispielen: http://www.geo.fu-berlin.de/geol/fachrichtungen/pal/mitarbeiter/plank/Formeln_in_R.pdfhttp://www.geo.fu-berlin.de/geol/fachrichtungen/pal/mitarbeiter/plank/Formeln_in_R.pdf

Course L0776: Introduction in Statitics with R	
Typ	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 Vorlesung
Lecturer	Dr. Joachim Behrendt
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L0470: Principles of Geomatics	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Schriftliche Ausarbeitung
Examination duration and scale	schriftliche Ausarbeitungen zu allen fünf Übungen, ggf. Testklausur
Lecturer	Prof. Peter Andree
Language	DE
Cycle	SoSe
Content	• Overview of geomatics in general • Units of measurements • Generating of topographical maps • Basic surveying instruments and handling • Geodetic surveying lines and verification of measurements • Methods of horizontal survey • Components of geodetic surveying instruments • Height determination • Setting out points • Topographical survey • Directions and angles • Determination of coordinates • Traversing • Basics on surveying and positioning with GNSS
Literature	Andree, P.: Grundlagen der Geomatik (Skript) Resnik, B. / Bill, R.: Vermessungskunde für den Planungs- Bau- und Umweltbereich, Wichmann-verlag Witte, B. / Sparla, P.: Vermessungskunde und Grundlagen der Statistik für das Bauwesen, Wichmann-Verlag Gruber, F.J. / Joeckel, R.: Formelsammlung für das Vermessungswesen, Vieweg + Teubner-Verlag

Course L0471: Principles of Geomatics	
Typ	Recitation Section (small)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Hausarbeit
Examination duration and scale	
Lecturer	Prof. Peter Andree
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0125: Numeric and Matlab	
Typ	Laboratory Course
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Projektarbeit
Examination duration and scale	5 Übungsaufgaben jeweils mit Testat am Ende
Lecturer	Prof. Siegfried Rump, Weitere Mitarbeiter
Language	DE
Cycle	SoSe
Content	1. Programming in Matlab 2. Numerical methods for systems of nonlinear equations 3. Basics in computer arithmetic 4. Linear and nonlinear optimization 5. Condition of problems and algorithms 6. Verified numerical results with INTLAB
Literature	**Literatur (Software-Teil):** 1. Moler, C., Numerical Computing with MATLAB, SIAM, 2004 2. The Math Works, Inc. , MATLAB: The Language of Technical Computing, 2007 3. Rump, S. M., INTLAB: Interval Labority, http://www.ti3.tu-harburg.de 4. Highham, D. J.; Highham, N. J., MATLAB Guide, SIAM, 2005

Course L1744: Practical Course in Drinking Water Chemistry	
Typ	Laboratory Course
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Examination Form	Hausarbeit
Examination duration and scale	6 Versuchsprotokolle
Lecturer	Dr. Klaus Johannsen
Language	DE
Cycle	WiSe
Content	!Max.12 students! The students learn basic experimental work in the laboratory. The experiments give an overview about the most important chemical analysis methods of drinking water. This includes sampling, photometric measurement, complexometric titration as well as acid/base titration. The experiments are strongly related to the processes in drinking water treatment and water distribution (e. g. removal of iron and manganese, softening and conditioning). Instrumental analytics is not subject of this practical course. 1. Day: Introduction, safety instructions 2. Day: Electrical conductivity, Saturation with respect to calcite, hardness 3. Day: Organic carbon, iron, acid and base neutralization capacity 4. Day: Writing protocols of experiments 5. Day: Evaluation of the protocols
Literature	Siehe Skript. See Script.

Course L1228: Projects II	
Typ	Project Seminar
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Examination Form	Referat
Examination duration and scale	ca. zehnminütige Präsentation
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	SoSe
Content	Excursions to different construction and enviromental projects.
Literature	keine

Course L0472: Fire Protection and Prevention	
Typ	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	Andreas Kattge
Language	DE
Cycle	SoSe
Content	• Introduction • fire in residential and office buildings • town planning: location of residential, office and industry areas, location of fire stations • design of roads an water pipes • explosions
Literature	• Schneider U. : Ingenieurmethoden im baulichen Brandschutz. Expert Verlag, 2. Aufl., 2002

Module M0853: Mathematics III

Courses

Title	Typ	Hrs/wk	CP
Analysis III (L1028)	Lecture	2	2
Analysis III (L1029)	Recitation Section (small)	1	1
Analysis III (L1030)	Recitation Section (large)	1	1
Differential Equations 1 (Ordinary Differential Equations) (L1031)	Lecture	2	2
Differential Equations 1 (Ordinary Differential Equations) (L1032)	Recitation Section (small)	1	1
Differential Equations 1 (Ordinary Differential Equations) (L1033)	Recitation Section (large)	1	1

Module Responsible	Prof. Anusch Taraz
Admission Requirements	none
Recommended Previous Knowledge	Mathematics I + II
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	• Students can name the basic concepts in the area of analysis and differential equations. They are able to explain them using appropriate examples. • Students can discuss logical connections between these concepts. They are capable of illustrating these connections with the help of examples. • They know proof strategies and can reproduce them.
Skills	• Students can model problems in the area of analysis and differential equations with the help of the concepts studied in this course. Moreover, they are capable of solving them by applying established methods. • Students are able to discover and verify further logical connections between the concepts studied in the course. • For a given problem, the students can develop and execute a suitable approach, and are able to critically evaluate the results.
Personal Competence	
Social Competence	• Students are able to work together in teams. They are capable to use mathematics as a common language. • In doing so, they can communicate new concepts according to the needs of their cooperating partners. Moreover, they can design examples to check and deepen the understanding of their peers.
Autonomy	• Students are capable of checking their understanding of complex concepts on their own. They can specify open questions precisely and know where to get help in solving them. • Students have developed sufficient persistence to be able to work for longer periods in a goal-oriented manner on hard problems.
Workload in Hours	Independent Study Time 128, Study Time in Lecture 112
Credit points	8
Examination	Written exam
Examination duration and scale	60 min (Analysis III) + 60 min (Differential Equations 1)
Assignment for the Following Curricula	General Engineering Science (German program): Core qualification: Compulsory General Engineering Science (German program, 7 semester): Core qualification: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory Bioprocess Engineering: Core qualification: Compulsory Computer Science: Core qualification: Compulsory Electrical Engineering: Core qualification: Compulsory Energy and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Core qualification: Compulsory General Engineering Science (English program, 7 semester): Core qualification: Compulsory Computational Science and Engineering: Core qualification: Compulsory Mechanical Engineering: Core qualification: Compulsory Mechatronics: Core qualification: Compulsory Naval Architecture: Core qualification: Compulsory Process Engineering: Core qualification: Compulsory

Course L1028: Analysis III	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	Main features of differential and integrational calculus of several variables • Differential calculus for several variables • Mean value theorems and Taylor's theorem • Maximum and minimum values • Implicit functions • Minimization under equality constraints • Newton's method for multiple variables • Double integrals over general regions • Line and surface integrals • Theorems of Gauß and Stokes
Literature	• http://www.math.uni-hamburg.de/teaching/export/tuhh/index.html

Course L1029: Analysis III	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1030: Analysis III	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1031: Differential Equations 1 (Ordinary Differential Equations)	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	Main features of the theory and numerical treatment of ordinary differential equations • Introduction and elementary methods • Exsitence and uniqueness of initial value problems • Linear differential equations • Stability and qualitative behaviour of the solution • Boundary value problems and basic concepts of calculus of variations • Eigenvalue problems • Numerical methods for the integration of initial and boundary value problems • Classification of partial differential equations
Literature	• http://www.math.uni-hamburg.de/teaching/export/tuhh/index.html

Course L1032: Differential Equations 1 (Ordinary Differential Equations)	
Typ	Recitation Section (small)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L1033: Differential Equations 1 (Ordinary Differential Equations)	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dozenten des Fachbereiches Mathematik der UHH
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M0613: Reinforced Concrete I

Courses

Title	Typ	Hrs/wk	CP
Project Seminar Concrete I (L0896)	Seminar	1	2
Reinforced Concrete Design I (L0303)	Lecture	2	2
Reinforced Concrete Design I (L0305)	Recitation Section (large)	2	2

Module Responsible	Prof. Günter Rombach
Admission Requirements	none
Recommended Previous Knowledge	Basic knowledge in structural analysis and building materials.
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students can outline the history of concrete construction and explain the basics of structural engineering, including usual load combinations and safety concepts. They are able to draft and dimension simple structures, as well as to evaluate and discuss the behaviour of the materials and of structural members.
Skills	The students are able to apply basic procedures of the conception and dimensioning to practical cases. They are capable to draft simple concrete structures and to design them for bending and bending with axial force, and to plan their detailing and execution. Moreover, they can make design and construction sketches and draw up technical descriptions.
Personal Competence	
Social Competence	
Autonomy	The students are able to carry out simple tasks in the conception and dimensioning of structures and to critically reflect the results.
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 Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Compulsory

Course L0896: Project Seminar Concrete I

Typ	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	SoSe
Content	In the course of the project seminar, a simple structure is drafted and dimensioned.
Literature	

Course L0303: Reinforced Concrete Design I

Typ	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	SoSe
Content	The following subjects/contents are treated: • history of concrete construction • mechanical and physical-chemical properties od concrete and steel • bond between concrete and reinforcement • concepts for dimensioning, limit state models, structural safety • design of linear members for tension and bending with and without axial force
Literature	Download der Unterlagen zur Vorlesung über Stud.IP!

Course L0305: Reinforced Concrete Design I	
Typ	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 M0660: Civil- and Enviromental Management

Courses

Title	Typ	Hrs/wk	CP
Construction Management (L0396)	Lecture	2	2
Construction Management (L0397)	Recitation Section (large)	1	2
Law of Building Contracts (L0408)	Lecture	1	1
Environmental Law (L0346)	Lecture	1	1

Module Responsible	Prof. Jürgen Grabe
Admission Requirements	none
Recommended Previous Knowledge	none
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	After successful completion of the module, students are able to • understand basic knowledge of construction management, • choose appropiate methodes of construction project management to solve problems, • capture basic structures and antagonisms of European enviromental legislation, • locate and apply relevant enviromental regulations • implement any enviromental regulation to the realisation of an construction project and to capture the signifiacance for the civil engineer • recognize basic structures of general civil and construction law as well as standards for construction works • capture the content of contracts which are important for building design and execution.
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	100 Minuten
Assignment for the Following Curricula	Civil- and Environmental Engineering: Core qualification: Compulsory

Course L0396: Construction Management

Typ	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	SoSe
Content	• Project development • Project management • Announcement • Order acquisition • Project execution • Project supervision
Literature	• Vorlesungsskript, s. www.tuhh.de/gbt • Baugeräteliste BGL • Honorarordnung für Architekten und Ingenieure HOAI • Verdingungsordnung im Bauwesen VOB mit Kommentaren

Course L0397: Construction Management

Typ	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	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0408: Law of Building Contracts	
Typ	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Günter Schmeel
Language	DE
Cycle	SoSe
Content	• Detecting the legal foundations and connections of construction law • Awareness of legal "Control points" in the construction contract and the construction process • Construction contract law according to the BGB and VOB • public procurement according to national and EU laws • Engineers law
Literature	• Axel Maser, Baurecht nach BGB und VOB/B Grundlagenwissen für Architekten und Ingenieure, Id Verlag 1., Auflage 2005, 28,00 € • Schmeel ATB Baurecht, Auflage 2002, 34,80 € • Werner / Pastor, Der Bauprozess 11. Auflage 2005, 149,00 €

Course L0346: Environmental Law	
Typ	Lecture
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Dr. Friederike Mechel
Language	DE
Cycle	SoSe
Content	The lecture focusses on: • Structure of Environmental Legislation in Europe and Germany • Important international, European and German laws/legal regulations (Water Framework Directive, IED, etc.) • Interactions between Environmental Laws and Technical Standards
Literature	• Erbguth, Wilfried; Schlacke, Sabine, Umweltrecht, 6. Auflage 2016 • Gesetzessammlung Umweltrecht, 26. Auflage 2016 (Beck Texte im dtv)

Module M0706: Geotechnics I

Courses

Title	Typ	Hrs/wk	CP
Soil Mechanics (L0550)	Lecture	2	2
Soil Mechanics (L0551)	Recitation Section (large)	2	2
Soil Mechanics (L1493)	Recitation Section (small)	2	2

Module Responsible	Prof. Jürgen Grabe
Admission Requirements	none
Recommended Previous Knowledge	Modules : • Mechanics I-II
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students know the basics of soil mechanics as the structure and characteristics of soil, stress distribution due to weight, water or structures, consolidation and settlement calculations, as well as failure of the soil due to ground- or slope failure.
Skills	After the successful completion of the module the students should be able to describe the mechanical properties and to evaluate them with the help of geotechnical standard tests. They can calculate stresses and deformation in the soils due to weight or influence of structures. They are are able to prove the usability (settlements) for shallow foundations.
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	60 Minuten
Assignment for the Following Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Compulsory

Course L0550: Soil Mechanics

Typ	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	SoSe
Content	• Structure of the soil • Ground surveying • Compsitition and properties of the soil • Groundwater • One-dimensional compression • Spreading of stresses • Settlement calculation • Consolidation • Shear strength • Earth pressure • Slope failure • Ground failure • Suspension based earth tenches
Literature	• Vorlesungsumdruck, s. ww.tu-harburg.de/gbt • Grabe, J. (2004): Bodenmechanik und Grundbau • Gudehus, G. (1981): Bodenmechanik • Kolymbas, D. (1998): Geotechnik - Bodenmechanik und Grundbau • Grundbau-Taschenbuch, Teil 1, aktuelle Auflage

Course L0551: Soil Mechanics	
Typ	Recitation Section (large)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L1493: Soil Mechanics	
Typ	Recitation Section (small)
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Jürgen Grabe
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0744: Structural Analysis II

Courses

Title	Typ	Hrs/wk	CP
Structural Analysis II (L0673)	Lecture	2	3
Structural Analysis II (L0674)	Recitation Section (large)	2	3

Module Responsible	Prof. Uwe Starossek
Admission Requirements	None
Recommended Previous Knowledge	• Mechanics I/II • Mathematics I/II • Differential Equations I • Structural Analysis I
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	After successful completion of this module, students can express the basic aspects of linear frame analysis of statically indeterminate systems.
Skills	After successful completion of this module, the students are able to analyze state variables and to construct influence lines of statically inderminate plane and spatial frame and truss structures.
Personal Competence	
Social Competence	Students can • participate in subject-specific and interdisciplinary discussions, • defend their own work results in front of others • promote the scientific development of colleagues • Furthermore, they can give and accept professional constructive criticism
Autonomy	The students are able to work in-term homework assignments. Due to the in-term feedback, they are enabled to self-assess their learning progress during the lecture period, already.
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Examination	Written exam
Examination duration and scale	90 Minuten
Assignment for the Following Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Compulsory

Course L0673: Structural Analysis II

Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Uwe Starossek
Language	DE
Cycle	SoSe
Content	• Linear structural analysis: statically indeterminate systems • force method • slope-deflection method for sway and non-sway frames • general displacement method and finite element method
Literature	Krätzig, W. B.; Harte, R.; Meskouris, K.; Wittek, U.: Tragwerke 2 - Theorie und Berechnungsmethoden statisch unbestimmter Stabtragwerke, 4. Auflage, Berlin, 2004

Course L0674: Structural Analysis II	
Typ	Recitation Section (large)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Uwe Starossek
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0869: Hydraulic Engineering II

Courses

Title	Typ	Hrs/wk	CP
Hydraulics (L0957)	Lecture	1	1
Hydraulics (L0958)	Recitation Section (large)	1	1
Hydraulic Engineering (L0959)	Lecture	2	2
Hydraulic Engineering (L0960)	Recitation Section (large)	1	2

Module Responsible	Prof. Peter Fröhle
Admission Requirements	none
Recommended Previous Knowledge	Hydraulik Engineering I
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to define the basic terms of hydraulic engineering and hydraulics. They are able to explain the application of basic hydrodynamic formulations (conservation laws) to practical hydraulic engineering problems. Besides this, the students can illustrate important tasks of hydraulic engineering and give an overview over river engineering, flood protection, hydraulic power engineering and waterways engineering.
Skills	The students are able to apply hydraulic engineering methods and approaches to basic practical problems and design respective hydraulic engineering systems. Besides this, they are able to use and apply established approaches of hydraulics and determine water surfaces of channel flows, influences of constructions (weirs, etc.) on channel flows as well as flow conditions of pipe system.
Personal Competence	
Social Competence	The students are able to deploy their gained knowledge in applied problems. Additionaly, they will be able to work in team with engineers of other disciplines.
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 2 hours. The examination includes tasks with respect to the general understanding of the lecture contents and calculations tasks.
Assignment for the Following Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Elective Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Elective Compulsory

Course L0957: Hydraulics

Typ	Lecture
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	Flow of incompressible fluids in pipes and open channels
	• Hydraulics of pipes
	• Punps in hydraulic systems
	• Open channel flow
	• Regulative construction in open channel flow
	  ◦ Weirs
	  ◦ Sliding panels
	  ◦ Cross-section reduction by constructions

Literature	Zanke, Ulrich C. , Hydraulik für den WasserbauUrsprünglich erschienen unter: Schröder/Zanke "Technische Hydraulik", Springer-Verlag, 2003 Naudascher, E.: Hydraulik der Gerinne und Gerinnebauwerke, Springer, 1992

Course L0958: Hydraulics

Typ	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 L0959: Hydraulic Engineering	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Peter Fröhle
Language	DE
Cycle	SoSe

Content	Fundamentals of hydraulic engineering
	• Introduction and hydrological cycle
	• River engineering
	  ◦ Regime theory of natural rivers
	  ◦ Sediment transport
	  ◦ Regulation of rivers
	  ◦ Bank protection / protection of river bed
	  ◦ Tidal rivers
	• Flood protection
	  ◦ Dikes
	  ◦ Flood contraol basins
	• Hydraulic power
	• Inland waterways engineering
	  ◦ waterways
	  ◦ Locks and ship lifts
	  ◦ Fish passages
	• Nature-oriented hydraulic engineering

Literature	Strobl, T. & Zunic, F: Wasserbau, Springer 2006 Patt, H. & Gonsowski, P: Wasserbau, Springer 2011

Course L0960: Hydraulic Engineering	
Typ	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	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0611: Steel Structures I

Courses

Title	Typ	Hrs/wk	CP
Steel Structures I (L0299)	Lecture	2	3
Steel Structures I (L0300)	Recitation Section (large)	2	3

Module Responsible	Dr. Jürgen Priebe
Admission Requirements	none
Recommended Previous Knowledge	• Structural analysis I, Structural analysis II • Mechanics I, Mechanics II • Building Materials and Building Chemistry • Principles of Building Materials and Building Physics
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	After passing this module students are able to • give a summary of the security concept • explain the priciples of the design process • describe and illustrate the bhaviour of memers in tension, compression and bending
Skills	Students can rate and apply the material steel appropiately with respect to its properties and usage. They can use the security concept with respect to loads, forces and resistances. They can check the ultimate limit state and the serviceability of simple members in tension, compression and bending.
Personal Competence	
Social Competence	After participation of an optional course (building of a simple truss) they are able to organize themselves in groups. They will be successful in guided building a truss with bolted connections according to design drawings.
Autonomy	--
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Credit points	6
Examination	Written exam
Examination duration and scale	120 minutes
Assignment for the Following Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Compulsory

Course L0299: Steel Structures I

Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dozenten des SD B, Prof. Uwe Starossek
Language	DE
Cycle	WiSe
Content	• Introduction to steel constructions • Materials • Design and security model • Tension rods • Beams (elsatic and plastic design • Column design • Bolted connections
Literature	Petersen, C.: Stahlbau, 4. Auflage 2013, Springer-Vieweg Verlag Wagenknecht, G.: Stahlbau-Praxis nach Eurocode 3, Bauwerk-Verlag 2011 • Band 1 Tragwerksplanung, Grundlagen • Band 2 Verbindungen und Konstruktionen

Course L0300: Steel Structures I	
Typ	Recitation Section (large)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dozenten des SD B
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M0628: Water Management

Courses

Title	Typ	Hrs/wk	CP
Groundwater Hydrology (L0251)	Lecture	1	1
Groundwater Hydrology (L0252)	Recitation Section (large)	1	2
Water Management and Water Quality (L0366)	Lecture	2	3

Module Responsible	Prof. Wilfried Schneider
Admission Requirements	none
Recommended Previous Knowledge	Mathemaics I to III; Water Engineering I, Chemistry
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to define terms of the hydrologic cycle and also parameters to identify the water quality. Typical aquifer types and the occuring flow and storage processes can be explained technically. They are able to derive the Darcy law and the mathematical description of flow processes as well as their solution. They are in a position to explain the physical background of well hydraulics. Fundamentals of solute transport can be reflected.
Skills	Students are able to use fundamental relationships of hydrology and water management for the solution of practical issues. They are in a position to rate water quality data and to set up hydrological water balances. They are able to construct ground water contour lines and streamlines on the basis of head data. They have the ability to analyse data of hydraulic field and lab tests to determine hydraulic conductivities and storage coefficients.
Personal Competence	
Social Competence	Students are able to help each other solving case studies.
Autonomy	Are not imparted in this module.
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 Curricula	General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Elective Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Elective Compulsory

Course L0251: Groundwater Hydrology

Typ	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	Hydrologic water bilance, aquifertyps, groundwater velocities, Darcy law, groundwater contour lines, storage capacity, flow equation, pumping tests, method of Beyer, solute transport 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 L0252: Groundwater Hydrology

Typ	Recitation Section (large)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Prof. Wilfried Schneider
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Course L0366: Water Management and Water Quality	
Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Prof. Mathias Ernst
Language	DE
Cycle	WiSe
Content	The lecture water Management and water quality provides knowledge on the local and global water cycle. Content overview: • Water balance, water availability , water scarcity, water recycling • Water quality parameter (organic, inorganic), assessment and decision support tools.
Literature	Teil Wasserwirtschaft: • Wasserwirtschaft, Maniak, Ulrich., Berlin [u.a.]: Springer, 2001 • Wasser; Grohmann, Andreas N. . Berlin [u.a.]: de Gruyter, 2011 • Pdf der Vorlesung

Module M0631: Concrete Structures II

Courses

Title	Typ	Hrs/wk	CP
Project Concrete Structures II (L0894)	Project Seminar	1	1
Concrete Structures II (L0348)	Lecture	3	4
Concrete Structures II (L0349)	Recitation Section (large)	1	1

Module Responsible	Prof. Günter Rombach
Admission Requirements	none
Recommended Previous Knowledge	• Knowledge of loads on structures and combination of actions • Basics of safety format are required. • Knowledge in design of beams and columns for ultimate limit state • Lecture 'Concrete Structures I'
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students know the basic principles which arev required for design of reinforced concrete structures. They know the various methods to estimate the member forces in simple one and two-way slabs.
Skills	• The students can design reinforced concrete structure in the ultimate limit state (shear, bending, torsion) and in the serviceability limit state (crack and deflection control) including detailing (anchorage and links etc.). • The students can estimate the member forces of simple slabs. • The students know the content and the layout of a structural analysis
Personal Competence	
Social Competence	Cooperation in a project work, where they design in a team a real concrete building and present the results at the end.
Autonomy	
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 Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Elective Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Elective Compulsory

Course L0894: Project Concrete Structures II

Typ	Project Seminar
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	WiSe
Content	Design of a truss structure
Literature	Skript zur Lehrveranstaltung "Stahlbetonbau II"

Course L0348: Concrete Structures II	
Typ	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	WiSe
Content	• Design of concrete members for shear, punching and torsion • Design for serviceability limit state (durability): crack- and deflection control • Detailing • Introduction in the design of plates • Layout and content of a structural design
Literature	• Vorlesungsumdrucke • König G., Tue N.: Grundlagen des Stahlbetonbaus. Teubner Verlag, Stuttgart 1998 • Zilch K., Zehetmaier G.: Bemessung im konstruktiven Betonbau. Springer Verlag, 2010 • Deutscher Beton- und Bautechnikverein E.V.: Beispiele zur Bemessung von Betontragwerken nach Eurocode 2. Band 1: Hochbau, Bauverlag GmbH, Wiesbaden 2011 • Dahms K.-H.: Rohbauzeichnungen, Bewehrungszeichnungen. Bauverlag, Wiesbaden 1997 • Grasser E. ,Thielen G.: Hilfsmittel zur Berechnung der Schnittgrößen und Formänderungen von Stahlbetontragwerken. Deutscher Ausschuss für Stahlbeton, Heft 240, Verlag Ernst & Sohn, Berlin 1978 • DIN EN 1992-1-1:2011: Bemessung und Konstruktion von Stahlbeton- und Spannbetontragwerken – Teil 1: Allgemeine Bemessungsregeln für den Hochbau.

Course L0349: Concrete Structures II	
Typ	Recitation Section (large)
Hrs/wk	1
CP	1
Workload in Hours	Independent Study Time 16, Study Time in Lecture 14
Lecturer	Prof. Günter Rombach
Language	DE
Cycle	WiSe
Content	See interlocking course
Literature	See interlocking course

Module M0755: Geotechnics II

Courses

Title	Typ	Hrs/wk	CP
Foundation Engineering (L0552)	Lecture	2	2
Foundation Engineering (L0553)	Recitation Section (large)	2	2
Foundation Engineering (L1494)	Recitation Section (small)	2	2

Module Responsible	Prof. Jürgen Grabe
Admission Requirements	none
Recommended Previous Knowledge	Modules: • Mechanics I-II • Geotechnics I
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students know the basic principles and methods which are required to verificate the stability of geotechnical structures.
Skills	After successful completion of the module the students are able to: • verificate the stability and usability of foundations, • know individual methods of ground improvement and apply them in their range of application, • design retaining walls.
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	60 Minuten
Assignment for the Following Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Elective Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Elective Compulsory

Course L0552: Foundation Engineering

Typ	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	• Shallow foundations • Pile foundations • Ground improvement • Retaining walls • Underpinning • Groundwater Conservation • Cut-off Walls
Literature	• Vorlesung/Übung s. www.tu-harburg.de/gbt • Grabe, J. (2004): Bodenmechanik und Grundbau • Kolymbas, D. (1998): Geotechnik - Bodenmechanik und Grundbau • Grundbau-Taschenbuch, neueste Auflage

Course L0553: Foundation Engineering

Typ	Recitation Section (large)
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	See interlocking course
Literature	See interlocking course

Course L1494: Foundation Engineering	
Typ	Recitation Section (small)
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	See interlocking course
Literature	See interlocking course

Module M0887: Transportation Planning and Traffic Engineering

Courses

Title	Typ	Hrs/wk	CP
Transport Planning and Traffic Engineering (L0997)	Problem-based Learning	4	6

Module Responsible	Prof. Carsten Gertz
Admission Requirements	None
Recommended Previous Knowledge	None
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	Students are able to • understand the facts, contexts and objectives of transport planning. • correctly apply definitions and concepts of transport planning. • reproduce basic concepts of transport modelling. • explain the fundamentals of traffic engineering and transport infrastructure construction.
Skills	Students are able to • analyse transport supply based on key metrics. • estimate transport demand using key metrics. • design transport networks, links and junctions. • calculate traffic signal plans. • assess transport concepts.
Personal Competence	
Social Competence	Students are able to • get together in groups and constructively discuss and analyse set problems. • in a group agree on solutions and document them.
Autonomy	Students are able to • produce reports on group work. • structure the tasks and timing for working out a set problem.
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 Curricula	Civil- and Environmental Engineering: Core qualification: Compulsory Logistics and Mobility: Core qualification: Compulsory

Course L0997: Transport Planning and Traffic Engineering	
Typ	Problem-based Learning
Hrs/wk	4
CP	6
Workload in Hours	Independent Study Time 124, Study Time in Lecture 56
Lecturer	Prof. Carsten Gertz
Language	DE
Cycle	WiSe
Content	The course provides an introductory overview over the fundamentals of urban and regional transport planning, including the sub-topic traffic engineering. The following subject areas are covered: • objectives of transport planning, • key mobility metrics, • measuring and predicting demand, • designing and planning transport infrastructure, • fundamentals of traffic engineering and • an introduction to transport concepts and planning processes.
Literature	Steierwald, Gerd; Kühne, Hans Dieter; Vogt, Walter (Hrsg.) (2005) Stadtverkehrsplanung: Grundlagen, Methoden, Ziele. Springer Verlag. Berlin. Bosserhoff, Dietmar (2000) Integration von Verkehrsplanung und räumlicher Planung. Schriftenreihe der Hessischen Straßen- und Verkehrsverwaltung, Heft 42. Hessisches Landesamt für Straßen- und Verkehrswesen. Wiesbaden. Lohse, Dieter; Schnabel, Werner (2011) Grundlagen der Straßenverkehrstechnik und der Verkehrsplanung: Band 1; Straßenverkehrstechnik. Beuth Verlag. Berlin. Forschungsgesellschaft für Straßen- und Verkehrswesen (2007) Richtlinien für die Anlage von Stadtstraßen – RASt 06. FGSV-Verlag. Köln (FGSV, 200).

Module M0612: Steel Structures II

Courses

Title	Typ	Hrs/wk	CP
Steel Structures II (L0301)	Lecture	2	3
Steel Structures II (L0302)	Recitation Section (large)	2	3

Module Responsible	Dr. Jürgen Priebe
Admission Requirements	none
Recommended Previous Knowledge	Steel Structures I
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	After successful completition students can • describe and explain the behaviour of bolted and welded connections • design and check simple halls and buildings • calculate forces and stresses of simple structures (trusses, beams, frames) • illustrate and dimension he main details (framework, column base, load application points)
Skills	Students are able to design simple structures and connections, describe the load distribution and recognize the possible modes of failure. They can apply structural imperfections, calculate according to 2nd order theory and verify their results.
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	120 minutes
Assignment for the Following Curricula	Civil- and Environmental Engineering: Core qualification: Compulsory

Course L0301: Steel Structures II

Typ	Lecture
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dozenten des SD B
Language	DE
Cycle	SoSe

Content	• Welded connections
	• Simple constructions
	  ◦ Trusses
	  ◦ Plate girders
	  ◦ Frames
	  ◦ Columns
	• Buildings with several storeys
	• Halls

Literature	Petersen, C.: Stahlbau, 4. Auflage 2013, Springer-Vieweg Verlag Wagenknecht, G.: Stahlbau-Praxis nach Eurocode 3, Bauwerk-Verlag 2011 • Band 1 Tragwerksplanung, Grundlagen • Band 2 Verbindungen und Konstruktionen

Course L0302: Steel Structures II

Typ	Recitation Section (large)
Hrs/wk	2
CP	3
Workload in Hours	Independent Study Time 62, Study Time in Lecture 28
Lecturer	Dozenten des SD B
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Module M0686: Sanitary Engineering

Courses

Title	Typ	Hrs/wk	CP
Wastewater Disposal (L0276)	Lecture	2	2
Wastewater Disposal (L0278)	Recitation Section (large)	1	1
Drinking Water Supply (L0306)	Lecture	2	1
Drinking Water Supply (L0308)	Recitation Section (large)	1	2

Module Responsible	Prof. Ralf Otterpohl
Admission Requirements	none
Recommended Previous Knowledge	• Basic knowledge on Chemistry and Biology • Hydraulics of pipe systems and open channels • Basic knowledge on water management: water quantity and water quality • Basic knowledge on Environmental Legislation: Federal Water Act
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	The students can examplify their expert knowledge on urban water infrastructures. They can present the derivation and detailed explanation of important standards for the design of drinking water supply and wastewater disposal systems in Germany and they are capable of reproducing the relevant empiricals assumptions and scientific simplifcations. The students are able to present and discuss sanitary engineering processes and the technologies used for drinking and wastewater treatment. They can also assess existing problems in the field of sanitary engineering by considering legal, risk and saftey aspects. Furthermore, they know how to draft the features and effectiveness of important technologies of the future such as high- and low-pressure membrane filtration systems and techniques for the removal of trace pollutants.
Skills	The students are able to apply the relevant standards and guidelines for the design and operation of urban water infrastructures independently. Their expertise comprises expert skills to design drinking water supply and urban drainage systems as well as the associated treatment facilities. Besides the acquirement of technical skills the students are able to address and solve biochemical problems in the filed of drinking water and wastewater treatment. The students are also able to develop ideas of their own to improve the existing water related infrastructures, systems and concepts.
Personal Competence	
Social Competence	Students are able to form concepts on their own to optimize urban water infrastructure processes. Therefore they can acquire appropriate knowledge when being given some clues or information with regard to the approach to problems (preparation and follow-up of the exercises).
Autonomy	--
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 Curricula	General Engineering Science (German program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (German program, 7 semester): Specialisation Civil Engineering: Elective Compulsory Civil- and Environmental Engineering: Core qualification: Compulsory General Engineering Science (English program): Specialisation Civil- and Enviromental Engeneering: Compulsory General Engineering Science (English program, 7 semester): Specialisation Civil Engineering: Elective Compulsory

Course L0276: Wastewater Disposal	
Typ	Lecture
Hrs/wk	2
CP	2
Workload in Hours	Independent Study Time 32, Study Time in Lecture 28
Lecturer	Prof. Ralf Otterpohl
Language	DE
Cycle	SoSe
Content	This lecture focusses on urban drainage and wastewater treatment. Urban Drainage • Design of urban drainage systems (combined and separate sewer systems) • Special structures • Rainwater management Wastewater treatement • Mechanical treatment (Screens, Grit chamber, Preliminary Sedimentation, Secondary Settlement Tanks, Membrane Filtration) • Biological Treatment (aerobic, anaerobic, anoxic) • Special Wastewater Treatment Processes (Ozonation, Adsorption)
Literature	Die hier aufgeführte Literatur ist in der Bibliothek der TUHH verfügbar. The literature listed below is available in the library of the TUHH. • Taschenbuch der Stadtentwässerung : mit 10 Tafeln und 67 Tabellen, Imhoff, K., & . (2009). (31., verbesserte Aufl.). Munchen: Oldenbourg Industrieverl. • Abwasser : Technik und Kontrolle. Neitzel, Volkmar, and. . Weinheim [u.a.]: Wiley-VCH, 1998. • Kommunale Kläranlagen : Bemessung, Erweiterung, Optimierung, Betrieb und Kosten, (2009). Gunthert, F. Wolfgang: (3., vollig neu bearb. Aufl.). Renningen: expert-Verl. • 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 L0278: Wastewater Disposal	
Typ	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	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Course L0306: Drinking Water Supply	
Typ	Lecture
Hrs/wk	2
CP	1
Workload in Hours	Independent Study Time 2, Study Time in Lecture 28
Lecturer	Dr. Klaus Johannsen, Prof. Mathias Ernst
Language	DE
Cycle	SoSe
Content	The lecture on drinking water supply provides students with a basic understanding of the entire water supply system, encompassing water catchment, water treatment including pump systems, water storage, and the distribution system that carries water to the consumer. Initially, basics in hydraulics and pump systems are presented (system curve and pump curve). Students learn how the duty point of the pump is determined. Students learn about different water resources and will be able to design groundwater wells. Students learn how to determine water demand and derive planning values for designing the different elements of a water supply system (e.g. firefighting requirements). The functions of reservoirs, their design and arrangement in the water supply system are explained. Students will be able to design simple water distribution systems. A further part of the lecture deals with the processes involved in drinking water supply. This includes a presentation of the essential mechanisms and layout parameters for sedimentation, filtration, coagulation, membrane treatment, adsorption, water softening, gas exchange, ion exchange and disinfection. The basics of process treatment technology will be built on with parallel analysis of the impacts on chemical and physical water quality parameters.
Literature	Gujer, Willi (2007): Siedlungswasserwirtschaft. 3., bearb. Aufl., Springer-Verlag. Karger, R., Cord-Landwehr, K., Hoffmann, F. (2005): Wasserversorgung. 12., vollst. überarb. Aufl., Teubner Verlag Rautenberg, J. et al. (2014): Mutschmann/Stimmelmayr Taschenbuch der Wasserversorgung. 16. Aufl., Springer-Vieweg Verlag. DVGW Lehr- und Handbuch Wasserversorgung: Wasseraufbereitung - Grundlagen und Verfahren, m. CD-ROM: Band 6 (2003).

Course L0308: Drinking Water Supply	
Typ	Recitation Section (large)
Hrs/wk	1
CP	2
Workload in Hours	Independent Study Time 46, Study Time in Lecture 14
Lecturer	Dr. Klaus Johannsen, Prof. Mathias Ernst
Language	DE
Cycle	SoSe
Content	See interlocking course
Literature	See interlocking course

Thesis

Module M-001: Bachelor Thesis

Courses

Title	Typ	Hrs/wk	CP

Module Responsible	Professoren der TUHH
Admission Requirements	• According to General Regulations §24 (1): At least 126 ECTS credit points have to be achieved in study programme. The examinations board decides on exceptions.
Recommended Previous Knowledge	
Educational Objectives	After taking part successfully, students have reached the following learning results
Professional Competence	
Knowledge	• The students can select, outline and, if need be, critically discuss the most important scientific fundamentals of their course of study (facts, theories, and methods). • On the basis of their fundamental knowledge of their subject the students are capable in relation to a specific issue of opening up and establishing links with extended specialized expertise. • The students are able to outline the state of research on a selected issue in their subject area.
Skills	• The students can make targeted use of the basic knowledge of their subject that they have acquired in their studies to solve subject-related problems. • With the aid of the methods they have learnt during their studies the students can analyze problems, make decisions on technical issues, and develop solutions. • The students can take up a critical position on the findings of their own research work from a specialized perspective.
Personal Competence	
Social Competence	• Both in writing and orally the students can outline a scientific issue for an expert audience accurately, understandably and in a structured way. • The students can deal with issues in an expert discussion and answer them in a manner that is appropriate to the addressees. In doing so they can uphold their own assessments and viewpoints convincingly.
Autonomy	• The students are capable of structuring an extensive work process in terms of time and of dealing with an issue within a specified time frame. • The students are able to identify, open up, and connect knowledge and material necessary for working on a scientific problem. • The students can apply the essential techniques of scientific work to research of their own.
Workload in Hours	Independent Study Time 360, Study Time in Lecture 0
Credit points	12
Examination	according to Subject Specific Regulations
Examination duration and scale	laut FSPO
Assignment for the Following Curricula	General Engineering Science (German program): Thesis: Compulsory General Engineering Science (German program, 7 semester): Thesis: Compulsory Civil- and Environmental Engineering: Thesis: Compulsory Bioprocess Engineering: Thesis: Compulsory Computer Science: Thesis: Compulsory Electrical Engineering: Thesis: Compulsory Energy and Environmental Engineering: Thesis: Compulsory General Engineering Science (English program): Thesis: Compulsory General Engineering Science (English program, 7 semester): Thesis: Compulsory Computational Science and Engineering: Thesis: Compulsory Logistics and Mobility: Thesis: Compulsory Mechanical Engineering: Thesis: Compulsory Mechatronics: Thesis: Compulsory Naval Architecture: Thesis: Compulsory Technomathematics: Thesis: Compulsory xx: Thesis: Compulsory Process Engineering: Thesis: Compulsory