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Technische Universität Dresden
Faculty of Civil Engineering

Study Regulations for the consecutive Master's degree program Advanced Computational and Civil Engineering Structural Studies – ACCESS

as of 17th August 2022

On the basis of § 36 para. 1 of the Act on the Autonomy of Institutions of Higher Education in the Free State of Saxony (SächsHSFG) in the version published on January 15, 2013 (SächsGVBl. p. 3), Technische Universität Dresden issues the following Study Regulations as statutes.

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§ 1
Scope

On the basis of the Act on the Autonomy of Institutions of Higher Education in the Free State of Saxony (SächsHSFG) and the examination regulations, these Study Regulations stipulate the objectives, content, structure and organization of the consecutive Master's program Advanced Computational and Civil Engineering Structural Studies – ACCESS at Technische Universität Dresden.

§ 2
Objectives of the degree program

(1) Upon completion of the consecutive Master's program Advanced Computational and Civil Engineering Structural Studies – ACCESS, students will have gained sound theoretical, practical as well as fundamental knowledge and skills in this field required for professional life. In particular, they are proficient in innovative computer-aided methods for modeling, analysis, and retrofitting, as well as for the design of structures in civil engineering and diverse areas of mechanical engineering in which structural calculations and dimensioning are relevant. Students will be supported in developing a sense of responsibility and in their personal growth. They will also be able to critically self-reflect and engage with society. Moreover, students will be able to reflect on topics relevant to a pluralistic and open society and put them into context. The program imparts the rules of good scientific practice in both academia and professional life.

(2) Due to their knowledge and command of current concepts and scientific methods, and following an initial training period, graduates will be qualified to handle diverse and complex tasks in all engineering fields in which load-bearing structures and field problems for solids, in the broadest sense, are needed. Potential areas of employment include planning and monitoring, dimensioning and sizing of components and systems, as well as production, operation and dismantling of structural facilities. The areas of activity comprise civil engineering and structural engineering, road construction, the building materials and construction supply industry, as well as software development. The main occupational fields are planning offices, construction companies and project development. Other professional fields include teaching, scientific institutions, testing and assessment centers, and freelance work both in Germany and abroad.

§ 3
Admission requirements

(1) Requirements to be admitted to the degree program:

1. completion of a first degree in a a field of engineering, preferably civil engineering, at a university or vocational academy that is officially recognized in Germany and qualifies the degree holder for a profession,
2. proficiency in English at the advanced B2 level of the Common European Framework of Reference for Languages, and
3. a special aptitude.

(2) Proof of the required English language skills pursuant to para. 1 no. 2 is provided by examination certificates or language certificates. This includes in particular a certificate for a university degree completed entirely in English, or a language certificate on the basis of the result of an internationally offered test (preferably IELTS: level 6.5, TOEFL 79 points (internet-based test, iBT), or UNIcert II). Proof of this special aptitude pursuant to para. 1 no. 3 is provided by an aptitude assessment in accordance with the aptitude assessment regulations.

§ 4
Start and duration of the degree program

(1) The program can be started each winter semester.

(2) The standard period of study is four semesters and includes on-site attendance, independent study and the final thesis.

§ 5
Teaching and learning methods

(1) The curriculum is structured in modules. In the individual modules, the course content is taught, consolidated and deepened through lectures, practicals, mentoring, seminars, projects and independent study.

(2) The individual teaching and learning forms according to para. 1 sentence 2 are defined as follows:

1. Lectures serve to impart fundamental knowledge and to introduce the subject matter of the modules.
2. Practicals allow to apply the subject matter in exemplary sub-areas.
3. Mentoring is done in individual and group settings and enhances the procedural skills in the use of the various forms of teaching and learning, it serves as guidance in the elective compulsory field and improves the students' capacities to find solutions in a team.
4. Seminars enable students to familiarize themselves under supervision in a selected subject area on the basis of specialist literature, documentation, and other material, to report on the results of their work, to discuss them within the group and to present them in writing.
5. Projects serve to apply the subject matter taught and to acquire practical skills in potential areas of employment.
6. Independent study allows students to deepen and expand the knowledge and skills they have acquired and to independently relate them to adjacent applications and research areas.

§ 6
Structure and organization of the degree program

(1) The program is organized in modules. The curriculum is divided into three semesters. The fourth semester is dedicated to the preparation of the final thesis including the colloquium. The third semester is particularly suitable for a temporary stay at another university (mobility window). Part-time study is possible in accordance with the regulations on part-time study.

(2) The degree program comprises nine compulsory modules and five elective compulsory modules, which allows students to choose their concentration. The selection is binding. The modules can be re-selected twice in total; the student must submit a written request to the Examination Office stating the module to be replaced and the newly selected module.

(3) Learning goals, content, teaching and learning methods included, requirements, applicability, frequency, workload, and duration of the individual modules are all listed in the module descriptions (Annex 1).

(4) The courses are held in English.

(5) The appropriate allocation of the modules to the individual semester, the observance of which makes it possible to complete the program within the standard period of study, as well as the type and scope of the respective courses included, and the number and standard time of the required study achievements and examined assessments are defined in the study schedule attached (Annex 2), or in an individual study schedule for part-time studies approved by the faculty.

(6) Upon proposal of the Academic Affairs Committee, the Faculty Board may change the range of elective compulsory modules as well as the study schedule. The current selection of elective compulsory modules available will be announced in the usual manner at the beginning of the semester . The amended study schedule shall apply to all students who have been informed about this in the usual manner at the beginning of their studies. The Examination Committee shall decide, upon application by the student, on any exceptions to sentence 3.

§ 7
Content of the degree program

(1) Advanced Computational and Civil Engineering Structural Studies – ACCESS is a research-oriented Master's program.

(2) The degree program comprises the fundamentals of computational mechanics, materials science, numerical mathematics, and software engineering, as well as advanced issues in civil engineering, materials science, and computational mechanics. Moreover, it includes numerical modeling and analysis of the load-bearing behavior and durability of engineering structures, focusing in particular on the structural systems of civil engineering.

§ 8
Credit points

(1) ECTS credits document the average workload of the students and their individual study progress. One credit point corresponds to a 30-hour workload. Normally, 60 credit points are awarded per academic year, i.e. 30 credit points per semester. The total workload for the program corresponds to 120 credit points and comprises the teaching and learning methods according to type and scope stipulated in the module descriptions, the study achievements and examined assessments, the final thesis and the colloquium.

(2) The module descriptions indicate the number of credits that can be earned by each module. Credits are awarded upon passing the module examination. § 34 of the examination regulations shall remain unaffected.

§ 9
Academic advisory and counseling service

(1) General advice will be provided by the Central Student Information and Counseling Service at TU Dresden. It covers questions regarding study options, enrollment modalities and general student affairs. Subject-specific advice during studies will be provided by the Academic Advisory Service of the Faculty of Civil Engineering. This subject-specific advisory service assists students with regard to the design of their studies.

(2) At the beginning of the third semester, each student who has not yet provided proof of academic performance must make use of the subject-specific advisory services.

§ 10
Amendments to module descriptions

(1) In order to amend to changed conditions, module descriptions may be changed in a simplified procedure in order to optimize study organization, with the exemption of the fields “Module name”, “Learning goals”, “Content”, “Teaching and learning methods”, “Requirements for earning credit points”, “Credit points and grades” and “Module duration”.

(2) In a simplified procedure, the Faculty Board will adopt the amendments to the module descriptions upon proposal of the Academic Affairs Committee. The amendments must be published in the usual manner.

§ 11
Entry into force, publication and interim arrangements

(1) These Study Regulations shall enter into force on the day following their publication in the Official Announcements of TU Dresden.

(2) They apply to all students newly enrolled in the consecutive Master's program Advanced Computational and Civil Engineering Structural Studies – ACCESS in the 2022/2023 winter semester or later.

(3) For students enrolled earlier than the 2022/2023 winter semester, the version of the Study Regulations for the consecutive Master's Advanced Computational and Civil Engineering Structural Studies – ACCESS previously valid for them continues to apply.

(4) From the 2023/24 winter semester, these Study Regulations apply to all students enrolled in the consecutive Master's program Advanced Computational and Civil Engineering Structural Studies – ACCESS. In this process, primarily the module examinations already taken including the grades, and subordinately also individual examination achievements will be transferred ex officio on the basis of equivalence tables which have been determined by the Examination Committee and announced in the usual manner. With the exception of § 21 para. 5 of the Examination Regulations for the Master’s program in Advanced Computational and Civil Engineering Structural Studies – ACCESS, module examinations and examined assessments not graded with at least “pass” (4.0) or not assessed as “passed” will not be transferred. The module grade is generally not recalculated based on exclusively transferred examined assessments; exceptions are listed in the equivalence tables.

Issued based on the resolution of the Faculty Board of the Faculty of Civil Engineering as of July 20, 2022, and the approval of the University Executive Board as of 09th August 2022.

Dresden, 17th August 2022

The Rector
of Technische Universität Dresden

Prof. Dr. Ursula M. Staudinger

Appendix 1:
Module descriptions

Module number	**Module name**	**Module coordinator**
BIW-MA-AC-O-01	Building Materials	Prof. Dr. Viktor Mechtcherine i.baustoffe@tu-dresden.de
Learning goals	The students know the structure, composition and properties of different building materials and are able to evaluate repair materials and structures. They can apply methods for material modelling and numerical simulation.	
Content	Contents of the module are microstructure and chemical composition of building materials, physical and mechanical properties of building/construction materials, especially timber, steel, concrete, masonry, durability of building/construction materials, materials for strengthening and repair, polymer-modified mortars/concretes, polymer-based fibre-reinforced composites, shotcrete, cementitious high-performance composites for new structures and repair such as self-compacting concrete, fibre-reinforced concrete, textile-reinforced concrete, ultra-high strength concrete, modelling and numerical simulation of concrete-like materials in the fresh state, including numerical simulation of mixing, transporting, placing and compacting, theoretical modelling of deformation and fracture behaviour of cementitious construction materials, fracture mechanics of concrete and numerical simulation of crack initiation/development due to thermal and hygric changes.	
Teaching and learning methods	4 SWS lectures, 2 SWS exercises, self-study.	
Prerequisites	Basic knowledge about building materials and their physical, chemical and mechanical properties at a level of a Bachelor's degree is required.	
Applicability	The module is a compulsory module in the master's program Advanced Computational and Civil Engineering Structural Studies – ACCESS. It creates the prerequisites for the modules Design of Reinforced Concrete Structures, Form Finding of Lightweight Structures, Timber and Lightweight Structures, Multiscale Mechanics as well as Modeling and Simulation in Pavement Engineering.	
Requirements for earning credit points	The credit points are acquired when the module examination is passed. The module examination consists of a written exam lasting 180 minutes. The examination language is English.	
Credit points and grades	Eight credit points can be acquired through the module. The module grade corresponds to the grade of the examination.	
Module frequency	The module is offered every winter semester.	

Workload	The total workload is 240 hours.
Module duration	The duration of the module is one semester.

Module number	**Module name**	**Module coordinator**
BIW-MA-AC-O-02	Continuum Mechanics, Tensor Calculus	Prof. Dr. Stefan Löhnert imf@mailbox.tu-dresden.de
Learning goals	The students master the applied tensor calculus and know the basics of continuum mechanics. The students have an overview of the central topics, work and application fields of continuum mechanics and tensor calculus.	
Content	Contents of the module are topics on linear algebra, tensor algebra and analysis as well as topics on the basics of continuum mechanics. Topics covered include vector calculus, matrix algebra, vector spaces with and without an inner product, normalized spaces, linear mappings/tensors, products of tensors, eigenvalue problems, tensor-valued tensor functions and their derivatives, tensor fields and differential operators, and the kinematics of deformations, stress tensors, conservation and balance equations, and elastic material models.	
Teaching and learning methods	4 hours of lectures, 2 hour of exercise per week, and self-study.	
Prerequisites	Basic knowledge in the fields of linear algebra and multidimensional analysis as well as knowledge of engineering mechanics, especially in the fields of linear elasticity theory and strength of materials theory at the bachelor's level are required.	
Applicability	The module is a compulsory module in the Master's program Advanced Computational and Civil Engineering Structural Studies - ACCESS. It provides the prerequisites for the modules Form Finding of Lightweight Structures, Constitutive Modeling of Soils, Multiscale Mechanics and Computational Dynamics.	
Requirements for earning credit points	The credit points are awarded if the module examination is successfully passed. The module examination consists of a written exam of 90 minutes and an ungraded portfolio of 60 hours. The examination language is English.	
Credit points and grades	Eight credit points can be acquired for this module. The module grade results from the weighted average of the grades of the written exam and the portfolio, taking into account § 15 paragraph 1 clauses 5 and 6 of the examination regulations. The written exam is weighted twice and the portfolio is weighted once.	
Module frequency	The module is offered every academic year in winter semester.	
Workload	The total workload is 240 hours.	
Module duration	The module lasts one semester.	

Module number	Module name	Module coordinator
BIW-MA-AC-O-03	Energy Methods, Finite Element Method	Prof. Dr. Michael Kaliske statik@mailbox.tu-dresden.de
Learning goals	The students have a deep knowledge about energy methods, the basis of the Finite-Element-Method (FEM) as well as the modelling of linear and non-linear FEM. They are able to apply the theoretical knowledge of the methods on their own.	
Content	Contents of the module are themes with respect to variational calculus, tensor computations, principles of minimization of the potential energy, approximate solutions according to Ritz and Galerkin, energetic stability criteria and their applications, displacement modes of the FEM, general variational principle and hybrid finite elements, geometrical non-linear FEM, physical non-linear FEM and numerical simulations of crack propagation.	
Teaching and learning methods	4 SWS lectures, 2 SWS exercises, self studies.	
Prerequisites	Prerequisites are knowledge in the field of algebra, analysis, numerical-mathematical approaches as well as the modelling in the field of solid mechanics on the level of a bachelor study.	
Applicability	The module is mandatory within the Master Program Advanced Computational and Civil Engineering Structural Studies (ACCESS). The module provides the preliminaries of the module Form finding of lightweight structures, Timber and lightweight structures, Computational Dynamics as well as the module Building Information Modeling: Methods and Concepts	
Requirements for earning credit points	Credit points are earned if the examination of the module is successfully passed. The examination is an exam with a duration of 120 minutes and an ungraded portfolio with a scope of 40 hours. The language of the exam is English.	
Credit points and grades	Eight (8) credit points are achievable by this module. The grade of the module is determined under consideration of §15 paragraph 1 sentence 5 and 6 of the examination regulations by the weighted average of the grades of the exam and the portfolio. The exam is weighted doubled and the portfolio is weighted single.	
Module frequency	The module is taught every winter term.	
Workload	The workload is 240 hours in total.	
Module duration	The module duration is one semester.	
Recommended reading list	Chandrupatla, Belegundu: Introduction to Finite Elements in Engineering, Prentice-Hall; Zienkiewicz, Taylor: The Finite Element Method, Butterworth-Heinemann.	

Module number	Module name	Module coordinator
BIW-MA-AC-O-04	Numerical Methods	Prof. Dr. Uwe Reuter uwe.reuter@tu-dresden.de
Learning goals	Students are able to apply basic and advanced numerical methods to solve engineering and scientific issues of civil engineering. Students will have the necessary programming knowledge to implement the numerical methods. They are able to apply their knowledge to questions in their field and critically evaluate the results.	
Content	Contents of the module are design and analysis of algorithms for the numerical solution of continuous mathematical problems, direct methods that give the exact solution to a problem in a finite number of steps and for an infinite computer accuracy, iterative methods to compute approximations that converge to the exact solution of a problem, linear algebra and analytical geometry, solutions for linear and nonlinear equations, systems of equations, extremum and eigenvalue problems, numerical integration, interpolation, regression and implementation of the algorithms in software solutions.	
Teaching and learning methods	2 SWS lecture, 2 SWS tutorial, self-study.	
Prerequisites	Knowledge of differential and integral calculus and linear algebra at Bachelor level are assumed.	
Applicability	The module is a required module in the Master's program Advanced Computational and Civil Engineering Structural Studies – ACCESS. It is a prerequisite for the module Safety Concepts and the module Building Information Modeling: Methods and Concepts.	
Requirements for earning credit points	The credit points are acquired when the module examination is passed The module examination comprises a 90-minute written test. Prerequisite is an assignment about 40 hours. The examination language is English.	
Credit points and grades	Five credit points can be acquired through the module. The module grade is equivalent to the examination grade.	
Module frequency	The module is offered in each winter semester.	
Workload	The total workload is 150 hours.	
Module duration	The duration of the module is one semester.	

Module number	Module name	Module coordinator
BIW-MA-AC-O-05	Mentoring Program for Study Skills and Methodological Skill	Prof. Dr. Michael Kaliske statik@mailbox.tu-dresden.de
Learning goals	The students possess knowledge of early diagnosis and management of learning barriers and know methods to prevent abandoning a study program. They are capable of upholding the planned duration of study and have a command of the practice of the scientific method, through which they are capable of presenting results in appropriate verbal and written form, as well as discussing them. They are exceptionally capable of completing assigned tasks on time and self critically assessing and evaluating mistakes and problems. The students know the rules of scientific conduct and are sensitive to recognizing and handling scientific misconduct. The students are empowered towards personal development as well as societal engagement, and understand their meanings.	
Content	Contents of the module are topics of individual and personalized design of studies, of personal studying and learning strategies, problem management in their field, and general study and learning competence.	
Teaching and learning methods	5 credit hours of mentoring, self-study	
Prerequisites	Required is fundamental knowledge in the scientific method at the bachelor level.	
Applicability	The module is compulsory for the Master's program Advanced Computational and Civil Engineering Structural Studies – ACCESS. The first semester of the module prepares the prerequisites for the modules Form Finding of Lightweight Structures, Timber and Lightweight Structures, Constitutive Modeling of Soils, Safety Concepts, Building Physics, Computational Dynamics, Modeling and Simulation in Pavement Engineering, Building Information Modelling: Methods and Concepts, Applications of Computational Engineering Methods and ACCESS Application-Based Science Project.	
Requirements for earning credit points	The credit points are earned upon passing the module examination. The module examination consists of an ungraded portfolio of at most 20 hours. The language of the examination is English.	
Credit points and grades	Five credit points are available through the module. The module examination grades are „pass" and „fail".	
Module frequency	The module is offered every academic year, starting in the winter semester.	
Workload	The workload is 150 hours.	
Module duration	2 semesters	

Module number	**Module name**	**Module coordinator**
BIW-MA-AC-O-06	Building Information Modeling: Methods and Concepts	Prof. Dr. Karsten Menzel bauinformatik@tu-dresden.de
Learning goals	Students understand the concepts of Building Information Modeling (BIM). They are able to professionally structure and model complex engineering projects. They can specify the dependencies of processes and associated sub-models. Furthermore, students can specify, configure and manage integrated hardware-software architectures for Building Information Modeling. Students are capable to use suitable software tools for specifying information requirements in BIM. Finally, students are capable to check and evaluate the quality of information shared in complex BIM projects. They can critically evaluate the scope, consistency and completeness of BIM models and are able to lead a team project group.	
Content	The teaching and learning content emphasizes on: (i) Concepts of BIM, (ii) Strategies and methods for process and team management in BIM, (iii) Concepts and methods for quality management in BIM.	
Teaching and learning methods	2 SWS Lectures, 2 SWS Project, self-directed studies. (SWS…contact hour)	
Prerequisites	Knowledge and expertise in „*Bauinformatik*“ at the level of Bachelor degree programs. Knowledge and skills acquired in the „Mentoring Program“.	
Applicability	Compulsory Module of the ACCESS MSc-degree program (‘*Advanced Computational and Civil Engineering Structural Studies*’).	
Requirements for earning credit points	Credit points are awarded after successful completion of the examination. Written examination of 90 minutes’ duration. Language of instruction: English.	
Credit points and grades	5 ECTS Grading: 100% written examination.	
Module frequency	The module is exclusively offered in the Winter Term.	
Workload	Total workload is: 150 hours.	
Module duration	The module is delivered over one term.	
Recommended reading list	André Borrmann, Markus König, Christian Koch, Jakob Beetz: Building Information Modeling: Technology Foundations and Industry Practice; Springer; 1. Ausgabe. 2018.	

Module number	Module name	Module coordinator
BIW-MA-AC-O-07	Applications of Computational Engineering Methods	Prof. Dr. Michael Kaliske statik@mailbox.tu-dresden.de
Learning goals	The students know the application of computer-aided modelling for structural analysis in general and structural detailing in particular. They are ready to deepen their field-specific knowledge and capabilities in a chosen area and are capable of formulating scientific inquiries.	
Content	Contents of the module are current topics relevant to application and research in civil engineering, material science, and computer-oriented mechanics.	
Teaching and learning methods	4 credit hours lecture, self-study	
Prerequisites	Prerequisites include knowledge in the areas of algebra and calculus, numerical procedures, model forming and solution procedures in the fields of solid body, fluid, and fracture mechanics, and a bachelor level understanding of research methods specific to civil engineering.	
Applicability	The module is compulsory for the Masters program Advanced Computational and Civil Engineering Structural Studies – ACCESS.	
Requirements for earning credit points	The credit points are earned upon passing the module examination. The module examination consists of a test lasting 120 minutes. The language of the examination is English.	
Credit points and grades	5 credits are available in this module. The module grade is the examination grade.	
Module frequency	The module is offered every winter semester.	
Workload	The workload is 150 hours.	
Module duration	1 semester	

Module number	Module name	Module coordinator
BIW-MA-AC-O-08	ACCESS Application-Based Science Project	Prof. Dr. Michael Kaliske statik@mailbox.tu-dresden.de
Learning goals	The students are able to apply their acquired knowledge, abilities and scientific method and work skills independently or in a team to a concrete task formulation, are able to clearly document their work progress and know the rules for good scientific practice. They can develop concepts for the production of project results and present the results to an audience through a discussion. The students are strengthened in their personality development; their social commitment is empowered along with their understanding of the importance of these attributes. The students are reinforced in their abilities through group work, task organization, research, the preparation and presentation of results, the critical discussion of such results and their communicative and social skills through team work. They are equipped to appropriately present and discuss results in word and writing.	
Content	Contents of the module are concrete task formulations from civil engineering, material science and computational mechanics, especially tasks which require interdisciplinary solution approaches. The task formulations can focus either on research or on application. Further contents include scientific writing, the preparation of presentations and carrying out critical discussions.	
Teaching and learning methods	2 SWS Seminar, self-study.	
Prerequisites	Knowledge and technical applications of scientific fields in civil engineering chosen by the students as well as study and methodical competence skills obtained in the mentoring program are requirements.	
Applicability	The module is a required module in the master studies Advanced Computational and Civil Engineering Structural Studies – ACCESS.	
Requirements for earning credit points	The credit points are obtained if the module exam is passed. The module exam consists of a complex task with a duration of 300 hours. English is the examination language.	
Credit points and grades	Fifteen credit points can be obtained from the module. The module grade corresponds to the grade of the exam.	
Module frequency	The module is offered every winter semester.	
Workload	The workload consists of a total of 450 hours.	
Module duration	The duration of the module is one semester.	

Module number	Module name	Module coordinator
BIW-MA-AC-O-09	ACCESS Application-Based Science Project Presentation	Prof. Dr. Michael Kaliske statik@mailbox.tu-dresden.de
Learning goals	The students are able to clearly document their acquired knowledge, work progress, abilities and scientific method and work skills independently or in a team and are able to present the results to an audience through a discussion. In addition, they can present application based scientific project results. The students are reinforced in their abilities through group work, task organization, research, the preparation and presentation of results, the critical discussion of such results and their communicative and social skills through team work. They are equipped to appropriately present and discuss results in word and writing.	
Content	Contents of the module are the written and oral presentation of concrete task formulations from civil engineering, material science and computational mechanics, especially tasks which require interdisciplinary solution approaches. Further contents include scientific writing, the preparation of presentations and carrying out critical discussions.	
Teaching and learning methods	2 SWS Seminar, self-study.	
Prerequisites	Knowledge and technical applications of scientific fields in civil engineering chosen by the students as well as study and methodical competence skills obtained in the mentoring program are requirements.	
Applicability	The module is a required module in the master studies Advanced Computational and Civil Engineering Structural Studies – ACCESS.	
Requirements for earning credit points	The credit points are obtained if the module exam is passed. The module exam consists of a complex task with a duration of 110 hours. English is the examination language.	
Credit points and grades	Six credit points can be obtained from the module. The module grade corresponds to the grade of the exam.	
Module frequency	The module is offered every winter semester.	
Workload	The workload consists of a total of 180 hours.	
Module duration	The duration of the module is one semester.	

Module number	Module name	Module coordinator
BIW-MA-AC-E-01	Design of reinforced concrete structures	Prof. Dr. Steffen Marx concrete@tu-dresden.de
Learning goals	Students can assess the load-bearing capacity of existing structures, determine the necessary rehabilitation and strengthening measures, and calculate related design parameters. They understand and are capable of implementing basic calculation methods relevant to the knowledge acquired during the course and interpreting the measured values obtained through tests, calculations, and examinations. The content of the course enables them to analyze and evaluate complex problems in the subject, as well as to weigh up options for action and assess consequences. Through the course, the students are given the means to conduct safe and responsible designs.	
Content	Contents of the module are topics on maintenance principles of bridges and buildings such as inspection, examination, testing and condition assessment of existing reinforced concrete structures, load tests and the monitoring of structures made of reinforced concrete, calculation of the load-bearing capacity and load reserves of existing buildings and bridges utilizing specific calculation methods, reinforcement methods for solid structures and their computational verification for shotcrete, steel lamellae, lamellae made of carbon fiber-reinforced plastic, textile-reinforced concrete and external prestressing.	
Teaching and learning methods	2 SWS lectures, 1 SWS exercise, and self-study.	
Prerequisites	The knowledge to be acquired in the Building Materials module is assumed, particularly about the material and load-bearing behavior of reinforced concrete structures, internal forces analysis, and the different design methods of reinforced concrete.	
Applicability	The module is one of twelve elective modules in the master's program Advanced Computational and Civil Engineering Structural Studies - ACCESS, five of which must be chosen.	
Requirements for earning credit points	The credit points are acquired if the module examination is passed. The module examination consists of a written paper of 90 minutes duration. The language of the examination is English.	
Credit points and grades	Five credit points can be acquired through the module. The module grade corresponds to the grade of the examination performance.	
Module frequency	The module is offered every summer semester.	
Workload	The total workload is 150 hours.	
Module duration	The module covers one semester.	

Recommended reading list	Eurocode 2: Design of Concrete Structures Fib bulletin 14: Externally bonded FRP-reinforcement for RC structures; Fib bulletin 17: Management, maintenance, and strengthening of concrete structures.

Module number	Module name	Module coordinator
BIW-MA-AC-E-02	Form Finding of Lightweight Structures	Prof. Dr. Matthias Beckh structural.design@tu-dresden.de
Learning goals	Students will master selected form finding methods for lightweight structures in theory and in practical application. The focus is on shell structures, cable nets and membrane structures subject to tensile stress.	
Content	The module will cover various strategies and form finding methods for lightweight structures subject to membrane forces. The course comprises an introduction to the conceptual design, static calculation and structural design of lightweight structures as well as an introduction to theoretical foundations of different form finding methods. In addition, the module contains both theoretical principles and practical applications.	
Teaching and learning methods	1 SWS lecture, 2 SWS exercise, and self-study.	
Prerequisites	The knowledge to be acquired in Building Materials, Continuum Mechanics, Tensor Calculus, Energy Methods, Finite Element Method, and the Mentoring Study Competence module in the first semester is required.	
Applicability	The module is one of twelve elective modules in the master's program Advanced Computational and Civil Engineering Structural Studies - ACCESS, five of which must be chosen.	
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination consists of a portfolio of 85 hours. The examination language is English.	
Credit points and grades	Five credit points can be acquired through the module. The module grade corresponds to the grade of the examination performance.	
Module frequency	The module is offered every summer semester.	
Workload	The workload is 150 hours in total.	
Module duration	The module covers one semester.	
Recommended reading list	Sigrid Adriaenssens, Philippe Block, Diederik Veenendaal: Shell Structures for Architecture: Form Finding and Optimization. Taylor and Francis. 2014.	

Module number	Module name	Module coordinator
BIW-MA-AC-E-03	Timber and lightweight structures	Prof. Dr. Richard Stroetmann stahlbau@tu-dresden.de
Learning goals	The students have an overview of central and fundamental topics, work and application fields of timber and lightweight structures. They are able to create designs in the field of timber and lightweight structures, carry out important calculations and evaluate constructions. Thus, they can analyse and evaluate complex problems of the subject as well as weigh up options for action and assess consequences. The students are able to act responsibly in this area.	
Content	Contents of the module are – the resource situation and processing methods of raw timber into sawn timber and hollow materials, their physical and mechanical properties as well as the resulting constructive consequences, – craftsmanship and technical connections in timber construction, – Basics of the calculation of simple components and connections, – timber modifications and composite constructions with concrete as well as fibers and textiles, – selected examples of timber buildings, – the state of the art of timber construction with its specific aspects and the historical timber construction, – the reconstruction and rehabilitation of timber construction, – the stability, material fatigue and fatigue strength of steel constructions, – different types of ropes, their manufacture and connection technology, – different areas of application as well as the dimensioning and construction of rope structures and - the special features of supporting structures made of textile membranes and foils combined with steel construction elements.	
Teaching and learning methods	2 SWS lecture, 1 SWS tutorial, Self study.	
Prerequisites	The knowledge to be acquired in the Building Materials modules and the knowledge to be acquired in the first semester of the Study and Methodological Skills Mentoring Program module are assumed.	
Applicability	The module is one of twelve elective modules in the master's program Advanced Computational and Civil Engineering Structural Studies - ACCESS, five of which must be chosen.	

Requirements for earning credit points	The credit points are acquired when the module examination is passed The module examination comprises a 150-minute written test. The examination language is English.
Credit points and grades	Five credit points can be acquired through the module. The module grade is equivalent to the examination grade.
Module frequency	The module is offered every summer semester.
Workload	The total workload is 150 hours.
Module duration	The module covers one semester.

Module number	Module name	Module coordinator
BIW-MA-AC-E-04	Constitutive Modeling of Soils	Prof. Dr. Ivo Herle ivo.herle@tu-dresden.de
Learning goals	The students have an overview in key and fundamental topics on theory and application of the constitutive models for soils. They can perform the calibration for advanced geotechnical analyses and apply their knowledge in engineering practice. They are able to analyse and evaluate complex tasks, make their own decisions and judge their consequences.	
Content	The content of the module consists of fundamental aspects of the mechanical behaviour of soils and their description using linear and nonlinear elasticity, perfect plasticity, limit stress conditions, critical states, hardening elastoplasticity and Cam clay models.	
Teaching and learning methods	2 hours of lectures, 1 hour of exercise per week, self-learning	
Prerequisites	Basic knowledge of elementary soil mechanics at the level of BSc is assumed. Moreover, basic knowledge of continuum mechanics, tensor calculus and the competence obtained from the mentoring module are expected.	
Applicability	The module is one of the twelve optional modules in the Master course Advanced Computational and Civil Engineering Structural Studies, five of which should be selected.	
Requirements for earning credit points	The credits are awarded if the module examination is successfully passed. The module examination consists of a written examination (90 min). A collection of written assignments with a total extent of 30 working hours is a prerequisite for the examination.	
Credit points and grades	5 credits can be acquired for this module. The module grade corresponds to the grade of the written examination.	
Module frequency	The module is offered every summer semester of the academic year.	
Workload	The total workload corresponds to 120 working hours	
Module duration	The module extends for 1 semester	
Recommended reading list	D. Muir Wood: Geotechnical Modeling D. Muir Wood: Soil Behaviour and Critical State Soil Mechanics	

Module number	Module name	Module coordinator
BIW-MA-AC-E-05	Structural Use of Glass	Dr. Michael Engelmann bauko@mailbox.tu-dresden.de
Learning goals	The students know basic concepts in the field of glass structures and are able to apply glass as a building material in the field of structural glass and façades through design and construction detailing. They know the safety concepts and can carry out calculation procedures and modeling within the given framework of the building standards. In this way, they can analyse complex problems on the subject, evaluate and compare design options and assess consequences.	
Content	Contents of the module are aspects of glass and façade engineering, including mechanical and physical basics of processed and non-processed glass, safety concepts in glass construction, designing and building with glass, analytical description of glass as a building material, analytical description of mechanically joined and bonded connections as well as all-glass structures, calculation methods and modeling.	
Teaching and learning methods	2 SWS lectures, 1 SWS exercise, self-study.	
Prerequisites	Knowledge in the field of structural design including the load assumptions obtained at bachelor level is assumed.	
Applicability	The module is one of twelve compulsory elective modules in the Master's program Advanced Computational and Civil Engineering Structural Studies - ACCESS, five of which must be chosen.	
Requirements for earning credit points	The credits are acquired if the module examination is passed. The module examination consists of a 90-minute written examination. The examination language is English.	
Credit points and grades	Five credits can be acquired through the module. The module grade corresponds to the grade of the examination performance.	
Module frequency	The module is offered every summer semester.	
Workload	The total workload is 150 hours.	
Module duration	The module covers one semester.	
Recommended reading list	Belis, Louter, Nielsen, Schneider: Architectural Glass: Chapter in Springer Handbook of Glass, J.D. Musgraves, J. Hu, L. Calvez (Eds.), Springer Nature Switzerland AG 2019, 2019.	

Module number	Module name	Module coordinator
BIW-MA-AC-E-06	Safety Concepts	Prof. Dr. Michael Kaliske statik@mailbox.tu-dresden.de
		Other lecturers: Prof. Dr. Uwe Reuter
Learning goals	Students have an overview of central and fundamental topics and applications of safety concepts. Students are able to apply advanced computational methods in order to assess the safety of load-bearing structures. Thus, they are able to analyse and evaluate complex engineering problems as well as weigh up options for action and assess consequences. The students are empowered to act responsibly in this field.	
Content	Contents of the module are safety of load-bearing structures, forecast and risk assessment, limit states and failure structures, concepts for the description of uncertainty and safety, level 3 analysis (stochastic concepts for the assessment of structural safety, integral formulas for the probability of failure, system and element failure, series and parallel systems), level 2 analysis (approximation methods for the computation of the probability of failure, safety index, first order/ second order reliability method), level 1 analysis (semi-probabilistic safety concepts, partial safety factors, application of standards), time series and load processes, model-based and model-free analytical methods.	
Teaching and learning methods	2 SWS lecture, 1 SWS tutorial, self-study.	
Prerequisites	The competencies covered in modules Numerical Methods and Mentoring Program on Academic Competence are prerequisite to this module.	
Applicability	The module is one of twelve required elective modules in the Master's program Advanced Computational and Civil Engineering Structural Studies – ACCESS of which students must choose five.	
Requirements for earning credit points	The credit points are acquired when the module examination is passed The module examination comprises a 90-minute written test. Prerequisite is an assignment about 40 hours. The examination language is English.	
Credit points and grades	Five credit points can be acquired through the module. The module grade is equivalent to the examination grade.	
Module frequency	The module is offered in each summer semester.	
Workload	The total workload is 150 hours.	

Module duration	Students have an overview of central and fundamental topics and applications of safety concepts. Students are able to apply advanced computational methods in order to assess the safety of load-bearing structures. Thus, they are able to analyse and evaluate complex engineering problems as well as weigh up options for action and assess consequences. The students are empowered to act responsibly in this field.

Module number	Module name	Module coordinator
BIW-MA-AC-E-07	Building Physics	Prof. Dr. John Grunewald john.grunewald@tu-dresden.de
		Weitere Dozierende: Dr. Peggy Freudenberg peggy.freudenberg@tu-dresden.de
Learning goals	The students are able to apply internationally available and the institute's own software models in the subject areas of indoor climate, coupled heat, air and moisture transport (HAMT) processes in envelope constructions, integral building simulation - energy and hygrothermics. The students are made aware of ecological and related social topics and have a knowledge of environmentally relevant scientific facts.	
Content	The contents of the module include subject areas on indoor climate such as comfort and indoor air quality, pollutant emissions, external and internal climatic loads, user behaviour, overheating protection and warm climate zones, coupled heat, air and moisture transport (HAMT) processes in envelope constructions, in particular hygrothermal dimensioning of construction details, Aspects of durability, damage potential and protective measures, protection of structural cultural assets and the built environment, integral building simulation - energy and hygrothermics in the development of building physics models, passive and active measures for storing energy and moisture in structural components, energetic optimisation of buildings in relation to their environment.	
Teaching and learning methods	2 SWS lecture, 1 SWS exercise, self-study.	
Prerequisites	The knowledge acquired in the first semester in the module Mentoring Program on Study and Methodological Competence is assumed.	
Applicability	The module is one of twelve mandatory elective modules in the Master's program Advanced Computational and Civil Engineering Structural Studies - ACCESS, five of which must be chosen.	
Requirements for earning credit points	The credit points are obtained when the module examination is passed. The module examination consists of a written examination lasting 180 minutes. The exam language is English.	
Credit points and grades	Five credit points can be obtained through the module. The module grade corresponds to the grade of the exam performance.	
Module frequency	The module is offered every summer semester.	
Workload	The total workload is 150 hours.	
Module duration	The module covers one semester.	

Recommended reading list	H. Hens: Building Physics and Applied Building Physics, Ernst & Sohn; 2. Edition. 2012.

Module number	Module name	Module coordinator
BIW-MA-AC-E-08	Multiscale Mechanics	Prof. Dr. Stefan Löhnert imf@mailbox.tu-dresden.de
Learning goals	The students have an overview of the main goals, work and application areas of multiscale modeling of composite materials. They know the essential mechanical principles, approaches and methods for the homogenization of heterogeneous materials and can determine effective elastic parameters of these materials.	
Content	Contents of the module are topics on multiscale modeling of composite materials and materials with microcavities and microcracks, with special focus on the analytical determination of effective elastic parameters. In particular, the course includes the concept of representative volume elements, scale transitions by homogenization and localization, homogeneous boundary conditions, averaging methods, effective material properties, the self-consistent method, solutions based on Eshelby's results, Voigt and Reuss approximations, and micromechanical model parameters such as the microcrack density.	
Teaching and learning methods	2 hours of lectures, 1 hour of exercise per week, and self-study	
Prerequisites	Knowledge from the module Continuum Mechanics and Tensor Calculus as well as basics of fracture mechanics from the module Building Materials in the first semester are required.	
Applicability	The elective module is one out of twelve in the Master's program Advanced Computational and Civil Engineering Structural Studies, of which five have to be chosen.	
Requirements for earning credit points	The credit points are awarded if the module examination is successfully passed. The module examination consists of a written exam of 90 minutes and an ungraded portfolio of 40 hours. The examination language is English.	
Credit points and grades	Five credit points can be acquired for this module. The module grade results from the weighted average of the grades of the written exam and the portfolio, taking into account § 15 paragraph 1 clauses 5 and 6 of the examination regulations. The written exam is weighted twice and the portfolio is weighted once.	
Module frequency	The module is offered every academic year in summer semester.	
Workload	The total workload is 150 hours.	
Module duration	The module lasts one semester.	

Module number	Module name	Module coordinator
BIW-MA-AC-E-09	Computational Dynamics	Prof. Dr. Michael Kaliske statik@mailbox.tu-dresden.de
Learning goals	The students have an overview about the central and basic themes, fields of work as well as applications of computational dynamics. They are able to solve dynamical problems of structures by applying enhanced numerical methods. Thus, they are able to analyze and evaluate difficult as well as complex problems of this subject. They are also able to weigh options of action and estimate consequences. The students are enabled to act carefully in this subject.	
Content	Content of this module are computational methods for dynamic structural analysis, such as analysis of single-mass-oscillator within time and frequency domain, analysis of multi degrees of freedom systems, eigen-oscillations, modal analysis, modal superposition, damping-models, deformation-method, linear dynamics, element formulations, transformation relations, sub-structural and condensational techniques, numerical computations within time domain, central-difference-method, analysis of time-integration-methods, continuous systems, applications, earthquake-analysis and loads due to linear momentum.	
Teaching and learning methods	2 SWS lecture, 1 SWS exercise, self studies.	
Prerequisites	The knowledge of the modules of basics of continuum mechanics, tensor calculation as well as energy methods and finite-element-methods are the prerequisites of this module. Especially solution strategies for engineering and scientific problems by numerical-mathematical methods, by the application of fundamental concepts of continuum mechanics and related variational principles are required. Within the first semester, study and methodological competences of the mentoring program are basis for this module, in order to achieve the expected knowledge as well as for its scientific application.	
Applicability	The module is one of the 12 elective modules within the Master's Program Advanced Computational and Civil Engineering Structural Studies – ACCESS. Five of them have to be chosen.	
Requirements for earning credit points	The credit points are gained, if the examination of the module is successful. The examination is an exam with a duration of 120 minutes. The language of the exam is English.	
Credit points and grades	5 credit points are to be gained from this module. The grade of the module is the grade of the exam.	
Module frequency	The module is taught every summer semester.	

Workload	The workload is 150h in total.
Module duration	The module duration is one semester.
Recommended reading list	Clough, Penzien: Dynamics of Structures, McGraw-Hill. Argyris, Mlejnek: Dynamics of Structures, North-Holland. Meskouris: Structural Dynamics, Ernst & Sohn.

Module number	Module name	Module coordinator
BIW-MA-AC-E-10	Modeling and Simulation in Pavement Engineering	Prof. Dr. Frohmut Wellner strassenbau@tu-dresden.de
		Further lecturer: Dr. Sabine Leischner
Learning goals	The students have insight into central and fundamental topics, work and application fields of modeling of pavements for the design and prognosis calculations. The students are able to apply analytical and numerical methods for modeling and simulating the behavior of pavements. They will be able to analyze, model and evaluate problems in the field, as well as develop solutions and assess consequences. Students will be able to work responsibly in this area.	
Content	Contents of the module are fundamentals of loading such as temperature and traffic loading, development of numerical simulation models (FEM), simulation of stresses, comparison with in-situ measurements, modeling of the pavement-tire interaction, modeling of the tire contact stress, material modeling such as soil, unbound granular materials, bitumen, mastic, asphalt, concrete, modeling of the layer bond, performance-oriented laboratory tests to evaluate the behavior of the pavement materials and validation using large-scale tests.	
Teaching and learning methods	2 SWS lecture, 1 SWS tutorial, self-study.	
Prerequisites	The knowledge to be acquired in the Building Materials modules and the knowledge to be acquired in the first semester of the Study and Methodological Skills Mentoring Program module are assumed.	
Applicability	The module is one of twelve elective modules in the master's program Advanced Computational and Civil Engineering Structural Studies - ACCESS, five of which must be chosen.	
Requirements for earning credit points	Die Leistungspunkte werden erworben, wenn die Modulprüfung bestanden ist. Die Modulprüfung besteht aus einer Klausurarbeit von 120 Minuten Dauer. Die Prüfungssprache ist Englisch.	
Credit points and grades	Durch das Modul können fünf Leistungspunkte erworben werden. Die Modulnote entspricht der Note der Prüfungsleistung.	
Module frequency	The module is offered every summer semester.	
Workload	The total workload is 150 hours.	
Module duration	The module covers one semester.	

Recommended reading list	O'Flaherty, C. A.: Highways. The location, design, construction and maintenance of road pavements, Butterworth Heinemann, 4th Edition 2002. Croney, D. and Croney P.: Design and Performance of Road Pavements, McGraw-Hill Professional, 3rd Edition, 1997.

Module number	Module name	Module coordinator
BIW-MA-AC-E-11	Bridge Design	Prof. Dr. Richard Stroetmann richard.stroetmann@tu-dresden.de
Learning goals	Students shall be able to plan and design concrete, steel and composite bridges on traffic routes and their crossings. They shall be proficient in the strategies of conceptual design and are able to develop different structural and construction variants taking into account specific boundary conditions. They can understand the assessment criteria for bridge designs. They are able to select suitable variants for realisation and justify their selection in a well-founded manner. The students are capable of modeling and calculating bridge structures. They are proficient in the computer-aided engineering (CAE) calculation of internal forces as well as the preliminary design and the construction stages of bridges.	
Content	The contents of this module include the historical development of bridge engineering, design principles in bridge constructions, conceptual bridge design, static and dynamic actions on bridges, construction methods, preliminary design of bridge structures, different types of structures, such as slab, beam, frame, truss and arch bridges. Types of prestressing, such as external/internal or bonded/without bond, substructures such as piers and abutments, equipment elements, such as transition constructions and bearings. Fatigue problems, modeling, calculation of bridges with CAE and preparation of design documents are other contents of the module.	
Teaching and learning methods	2 hours of lectures, 1 hour of exercise per week and self-study	
Prerequisites	Knowledge of the material and load-bearing behaviour of steel and reinforced concrete structures, the internal force analysis of statically indeterminate systems and the different design methods for reinforced concrete, steel and composite structures at the bachelor level is required.	
Applicability	The module is one of twelve optional modules in the Master's program Advanced Computational and Civil Engineering Structural Studies - ACCESS, five of which have to be chosen.	
Requirements for earning credit points	The credit points are acquired if the module examination is passed. The module examination consists of a complex effort of 60 hours. The examination language is English.	
Credit points and grades	Five credit points can be acquired through the module. The module grade is calculated from the grade of the examination result.	
Module frequency	The module is offered every summer semester.	

Workload	The total workload is 150 hours.
Module duration	The module covers one semester.
Recommended reading list	Fritz Leonhardt: Bridges - Aesthetics and Design, 4. Auflage, Stuttgart, Deutsche Verlags-Anstalt, 1994. Christian Menn, Eugen Brühwiler: Stahlbetonbrücken, 3. Auflage, Heidelberg, Springer, 2003. Karsten Geißler: Handbuch Brückenbau – Entwurf, Konstruktion, Berechnung, Bewertung und Ertüchtigung, Ernst & Sohn, 2014. Svensson, H.: Cable-Stayed Bridges - 40 years of experience worldwide. Published by Ernst & Sohn, Berlin 2012.

Module number	Module name	Module coordinator
BIW-MA-AC-E-12	Zero Carbon Building Design using BIM and Digital Twins	Prof. Dr. Karsten Menzel bauinformatik@tu-dresden.de
Learning goals	Students understand the concepts of Zero Carbon Building Design and Cyber-Physical Systems in the context of the holistic application of information modeling, management and analysis. Students can use information technology to identify, model, monitor and optimize complex engineering systems and processes executed on related system's components. Students are able to link systems for building information modeling with monitoring and control systems. They can critically evaluate created simulation models and calibrate such simulation models using sensor data.	
Content	The teaching and learning content emphasizes on: (1) Concepts and methods for Zero Carbon Building Design, (2) Concepts and methods to design and implement cyber-physical systems, (iii) Methods for information modeling.	
Teaching and learning methods	2 SWS Lectures, 1 SWS Seminar, self-directed studies. (SWS…contact hour)	
Prerequisites	Knowledge and expertise in „*Bauinformatik*" at the level of Bachelor degree programs. Knowledge and skills acquired in the following Modules: Energiemethoden, Finite-Element-Methode und Numerische Methoden.	
Applicability	Elective Module of the ACCESS MSc-degree program. A total of twelve electives are offered. Students must choose five out of the twelve electives.	
Requirements for earning credit points	Credit points are awarded after successful completion of the examination. Written examination of 90 minutes' duration. Language of instruction: English.	
Credit points and grades	5 ECTS Grading: 100% written examination.	
Module frequency	The module is exclusively offered in the Summer Term.	
Workload	Total workload is: 150 hours.	
Module duration	The module is delivered over one term.	
Recommended reading list	L. Jankovic: Designing Zero Carbon Buildings Using Dynamic Simulation Methods: Routledge, 2. Ausgabe. 2017.	

Appendix 2:
Study schedule
with the type and scope of the courses in SWS as well as the required services, the type, scope and structure of which can be found in the module descriptions

Module number	Module name	1. semester	2. semester	3. semester	4. semester	cr
		V/Ü/Ment/S/P	V/Ü/Ment/S/P	V/Ü/Ment/S/P (M)	V/Ü/Ment/S/P	
Compulsory modules						
BIW-MA-AC-O-01	Building Materials	4/2/0/0/0 PL				8
BIW-MA-AC-O-02	Continuum Mechanics, Tensor Calculus	4/2/0/0/0 2xPL				8
BIW-MA-AC-O-03	Energy Methods, Finite Element Method	4/2/0/0/0 2xPL				8
BIW-MA-AC-O-04	Numerical Methods	2/2/0/0/0 PVL, PL				5
BIW-MA-AC-O-05	Mentoring Program for Study Skills and Methodological Skill	0/0/2/0/0	0/0/3/0/0 PL			5
BIW-MA-AC-O-06	Building Information Modeling: Methods and Concepts			2/0/0/0/2 PL		5
BIW-MA-AC-O-07	Applications of Computational Engineering Methods			4/0/0/0/0 PL		5
BIW-MA-AC-O-08	ACCESS Application-Based Science Project			0/0/0/2/0 PL		15

Module number	Module name	1. semester	2. semester	3. semester	4. semester	cr
		V/Ü/Ment/S/P	V/Ü/Ment/S/P	V/Ü/Ment/S/P (M)	V/Ü/Ment/S/P	
BIW-MA-AC-O-09	ACCESS Application-Based Science Project Presentation			0/0/0/2/0 PL		6
elective modules*						
BIW-MA-AC-E-01	Design of Reinforced Concrete Structures		2/1/0/0/0 PL			5
BIW-MA-AC-E-02	Form Finding of Lightweight Structures		1/0/0/2/0 PL			5
BIW-MA-AC-E-03	Timber and Lightweight Structures		2/1/0/0/0 PL			5
BIW-MA-AC-E-04	Constitutive Modeling of Soils		2/1/0/0/0 PVL, PL			5
BIW-MA-AC-E-05	Structural Use of Glas		2/1/0/0/0 PL			5
BIW-MA-AC-E-06	Safety Concepts		2/1/0/0/0 PVL, PL			5
BIW-MA-AC-E-07	Building Physics		2/1/0/0/0 PL			5
BIW-MA-AC-E-08	Multiscale Mechanics		2/1/0/0/0 2xPL			5

Module number	Module name	1. semester	2. semester	3. semester	4. semester	cr
		V/Ü/Ment/S/P	V/Ü/Ment/S/P	V/Ü/Ment/S/P (M)	V/Ü/Ment/S/P	
BIW-MA-AC-E-09	Computational Dynamics		2/1/0/0/0 PL			5
BIW-MA-AC-E-10	Modeling and Simulation in Pavement Engineering		2/1/0/0/0 PL			5
BIW-MA-AC-E-11	Bridge Design		2/1/0/0/0 PL			5
BIW-MA-AC-E-12	Zero Carbon Building Design using BIM and Digital Twins		2/1/0/0/0 PL			5
					Master's Thesis	25
					Colloquium	5
cr		**30**	**29**	**31**	**30**	**120**

* There are five elective modules to choose from.

SWS Semester hours per week
cr credit points
V lecure
Ü tutorial
Ment Mentoring
S Seminar
P Project
PL Examined Assessment(s)
PVL Preliminary examinations

M) Mobility window pursuant to § 6 para. 1 sentence 4 Study Regulations