


Module manual

Sustainable Civil Engineering

Bachelor full time

Study and examination regulations: SPO 2023

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1 Overview

The module handbook describes the individual [modules](#) of the Sustainable Civil Engineering course for the 1st semester. It contains all-important explanations about the requirements and types of module examinations. In addition to the course content, the objectives of the course, career profiles and opportunities that arise from studying sustainable civil engineering are described.

In addition to the content of the degree program, the module handbook also contains the study guidelines that lead to successful studies at THI.

The modules of the 4 to 7 semesters are listed as examples because we are in the first study cycle.

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2 Introduction

2.1 Objective

Construction includes all underground and above-ground structures - tunnels, bridges, buildings and much more. What they all have in common is that they influence CO₂ emissions during the construction and operation of the buildings. The construction industry in Germany alone causes 40% of CO₂ emissions. Legal requirements initiated by the EU aim to reduce the climate impact of construction, particularly through CO₂ reduction.

The bachelor's degree program in Sustainable Civil Engineering is designed to address and address this problem. Among other things, the course includes resource-saving construction and building in the life cycle. This means that climate-friendly planning and construction, which covers everything from use to dismantling of the structure. Other sectors that play a role in the construction industry are shown in Figure 1.



Figure 1.: Sectors of sustainable building

The goal is to be able to deal with society sustainably and responsibly, so that students can put their knowledge and way of thinking into practice and incorporate it.

2.2 Admission requirements

For the bachelor's degree program, the general admission requirements for studying at universities of applied sciences must be met.

The binding regulations for this study plan can be found in:

- Study and examination regulations for the bachelor's degree program in Sustainable Civil Engineering in the version dated December 13, 2021
- General examination regulations (APO) of the Ingolstadt University of Technology
- Matriculation regulations of the Ingolstadt University of Technology. The relevant provisions of the study and examination regulations influence the course of study.

Applicants who have not undergone any practical training (e.g. high school graduates) must provide evidence of practical work (=preliminary practice). Relevant technical vocational training or corresponding practical training from technical and vocational high schools (technology) will be taken into account. In other cases of previous training or professional activity, an application for recognition must be submitted.

According to §9 of the enrollment statutes, the preliminary internship in the Bachelor's degree program in Sustainable Civil Engineering lasts six weeks.

It must be completed by the beginning of the fourth semester of study at the latest.

The preliminary internship can be completed in an industrial, craft or construction company.

2.3 Target group

The course is aimed at young people who:

- are interested in studying that combines the **core content** of **civil engineering** with **sustainability aspects**
- later **sustainable construction carry and establish** in the company
- actively address the **challenges** of increasing urbanization and strive to develop future-proof concepts in the sense of economic, ecological and socio-cultural sustainability
- Bear responsibility for our society
- Use raw materials sustainably and promote recycling
- understand and live the overall concept of **sustainable building**

2.4 Study structure

The study of sustainable civil engineering is studied in a total of seven semesters and ends with the degree: Bachelor of Engineering.

The course is designed in such a way that it covers all components of conventional civil engineering, so that nothing stands in the way of an engineering career - the special feature of this course is that the traditional modules are designed to be sustainable. Modules that cover the sustainable and innovative construction sectors supplement the course.

In the first semester, for example, in the Sustainability module, rethinking is brought into the lecture hall by various speakers from science and practice. This way of thinking is taught technically on the economic and ecological pillar of sustainability but also on the empathetic socio-cultural pillar.

The course covers sustainability in construction and also covers the entire life cycle. The life cycle of a building begins with the construction product phase (production of building materials), the construction phase (construction and use) and the disposal phase (see Figure 2).

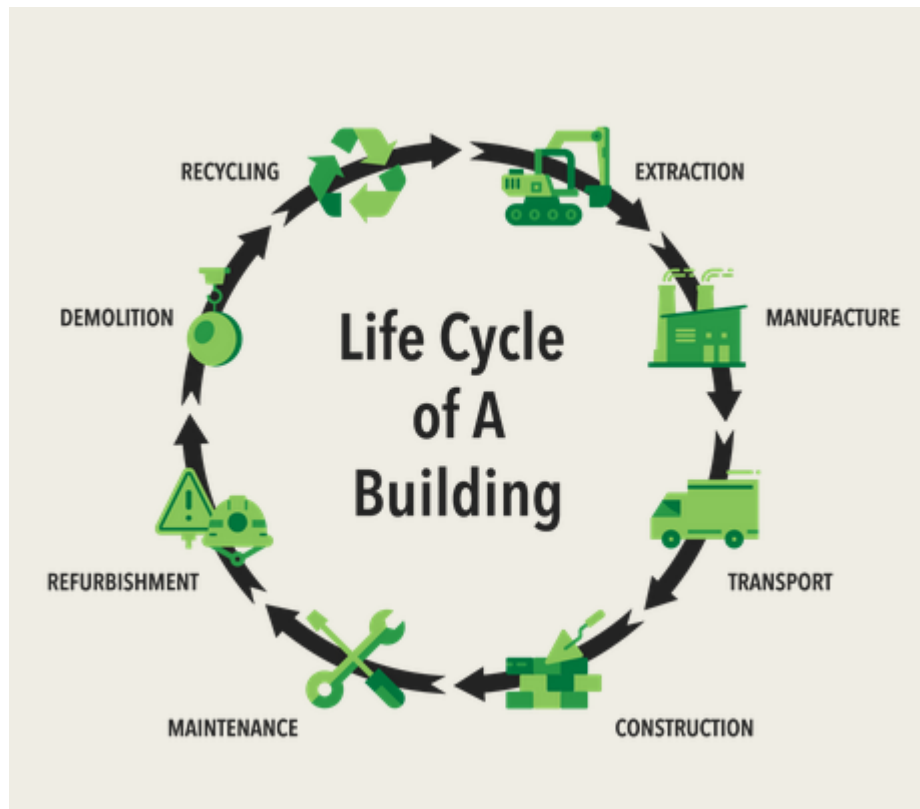


Figure 2.: Building life cycle

These sectors are incorporated into the course concept (see Figure 3), so that in addition to sustainability, traditional construction is also covered in terms of sustainability.

In particular, in the first 4 semesters, the foundations are created for the implementation and the first collaboration in the companies, so that in the fifth semester the interaction between teaching, theory and practice is created through a practical semester. The students are given the first opportunity to

develop independently by choosing appropriate practical partners and to query and apply what they have studied. In the 6th and 7th semesters, elective subjects are offered that address, for example, life cycle costs or digital appointment management, until the bachelor's thesis is completed.

7. Sem.	Bachelor Thesis 25 SWS / 8 Weeks / 12 ECTS		Sustainable Buildings and Structures 3 SWS / 3 ECTS	Elective 4 SWS / 5 ECTS	Sustainable Structural Engineering 4 SWS / 5 ECTS	Life Cycle & Climate Change Adaption Engineering 4 SWS / 5 ECTS		
6. Sem.	Digital Operation Management und BIM 4 SWS / 5 ECTS	Advanced Construction Methods 4 SWS / 5 ECTS	Digital Building Automation and Renewable Energy 4 SWS / 5 ECTS	Elective 4 SWS / 5 ECTS	Construction Project and Sustainability Management 4 SWS / 5 ECTS	Civil Engineering Project Management 4 SWS / 5 ECTS		
5. Sem.	Construction Internship (18 weeks) / Final Year Project 10 ECTS					Scientific Methods 2 SWS / 3 ECTS		
4. Sem.	Fundamentals of Civil Engineering	Reinforced Concrete Design II 4 SWS / 5 ECTS	Steel Construction 4 SWS / 5 ECTS	Law 5 SWS / 5 ECTS	Geotechnic II & Soil Mechanics 4 SWS / 5 ECTS	Sustainable Transport Technology 4 SWS / 5 ECTS	Timber Construction & Resource Management 4 SWS / 5 ECTS	Basics of Sustainability in Construction
3. Sem.		Reinforced Concrete Design I 4 SWS / 5 ECTS	Structural Analysis 4 SWS / 5 ECTS	Introduction Geotechnics and Transport Technology 4 SWS / 5 ECTS	Sanitation / Wastewater / Waste management 4 SWS / 5 ECTS	Fluid Mechanics & Hydro Mechanics/ 4 SWS / 5 ECTS	Sustainable Design and Management of Buildings and Structures 4 SWS / 5 ECTS	
2. Sem.		Mathematics II 5 SWS / 5 ECTS	Mechanics II 5 SWS / 5 ECTS	Surveying 5 SWS / 5 ECTS	Construction Management / Entrepreneurship 4 SWS / 4 ECTS	Low Carbon Construction 4 SWS / 5 ECTS	Sustainable Construction Materials 4 SWS / 4 ECTS	
1. Sem.		Mathematics I 5 SWS / 5 ECTS	Mechanics I 5 SWS / 5 ECTS	Computer Programming; Computer Aided Design and Calculation in Civil Engineering 5 SWS / 5 ECTS	Building Construction 5 SWS / 5 ECTS	Sustainability in Construction 2 SWS / 2 ECTS	Chemistry & Building Materials 4 SWS / 4 ECTS	

Figure 3.: Construction course concept

(Description: red=sustainable construction; gray=interface modules)

2.5 Advancement requirements

Only those who have completed at least 42 ECTS credit points from the modules of the first study period are eligible to enter the third semester of study. Only those who have achieved at least the grade “sufficient” in all examinations and relevant course-related proof of achievements in the first phase of study and have completed at least 20 ECTS credit points from the compulsory modules in the second phase of study are entitled to enter the internship.

2.6 Conception and expert advisory board

The course was designed by THI experts with the involvement of practitioners and is continually being developed further.

3 Qualification profil

3.1 Mission statement

3.1.1 THI's mission statement

The course of study directly addresses the general mission statement of the THI “Personalities and innovations – for a future worth living.” and its concept is aimed at the individual focal points:

- We develop personalities for the professional world of the future.
- We create innovations and live sustainability – technology and business are our focus.
- We shape the transfer in the economy and society.
- We teach, research and work internationally and in an interdisciplinary manner.
- We act humanely, passionately and open to the world.

3.2 Study objectives

The aim of the study is to prepare civil engineers for their future professional field so that they can design, plan, build and operate our infrastructure sustainably, innovatively, creatively and with a high sense of responsibility. The course content is adapted to constantly advancing technical developments. This increases the career prospects of our graduates, and not just at the national level.

During their studies, students should be trained to become independent personalities who are characterized in practice by their strong communication skills, grit and perseverance. You take on responsibility and have social skills.

3.2.1 Subject-specific competencies of the course of study

The graduates of the course have

- a very great technical understanding of the calculation, construction and dimensioning of buildings
- an expanded understanding of building material technology
- a strong mindset for implementing sustainability processes in construction
- the ability to implement new technologies, models and integrate them into construction projects
- Application knowledge of digital methods in civil engineering
- the ability to develop holistic and sustainable solutions in the design, planning and implementation of construction projects

Interdisciplinary competencies of the course

The graduates of the course have

- the know-how to work scientifically
- High level of expertise to see construction projects as a whole and to communicate with the relevant construction planners and construction partners
- Strong communication between sustainability managers and energy consultants
- the ability to analyze problems , recognize overarching connections , implement engineering findings when solving problems, find technical, ecological and economic solutions to evaluate and prepare decision templates
- the ability to solve complex tasks independently
- the ability to work in a team
- Possibility to apply physical-mathematical models to practice-oriented structures that lead to lean and sustainable structures
- the ability to appear confident and respectful towards one another
- a convincing and assertive demeanor
- analytical and solution-oriented thinking skills

Examination concept of the course of study

The forms of examination enable the assessment of the transfer of knowledge in addition to the seminar form of teaching

Application relevance of the course of study

The course was designed in close coordination with practice, relies on teaching staff with practical experience, conveys practice-oriented content and enables students to gain their own practical experience at a high level of intensity.

Contribution of individual modules to the course objectives

The modules are organized under sustainability aspects linked to the traditional modules of civil engineering in order to achieve the study goals.

3.3 Possible career fields

Graduates of the course are prepared for specialist and management positions in the following areas:

- Expert in structural engineering, geotechnics, traffic planner
- Expert in resource-poor construction, recycling
- Expert in energy efficient construction
- Lead management of projects in the areas of existing construction, new construction projects, etc.
- **Management** of medium-sized construction companies
- **Control** of sustainability processes in the construction industry

Graduates' professional areas of focus will be in the following areas:

- **Engineering offices** for specialist services
- **Large companies** in the construction and building materials industries
- **Companies in the recycling industry**
- **Large transport companies**
- **Civil engineering offices**
- **Real estate companies**
- public institutions such as **municipalities** and **building authorities**
- **Start up Company**

4 Description of Modules

4.1 General Compulsory Subjects

Introduction Project			
Module abbreviation:	SCE_IP	Reg.no.:	1
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	1
Responsible for module:	Bochert, Jana Sue		
Lecturer:	Bochert, Jana Sue		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	2 ECTS / 1 SWS		
Workload:	Contact hours:		12 h
	Self-study:		38 h
	Total:		50 h
Subjects of the module:	1: Introduction Project		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
LN - colloquium before exam period			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The Students are able to apply the necessary processes as part of a practical project for their studies. By working on a real renovation project, you explain the needs of the builders and thereby learn about renovation options. In addition the first structural implementations and insights into building material technology are created as well as the first hand sketches and rough cost estimates. the students learn to translate the accumulated know how and extended literature research into first drafts and present them.</p>			
Content:			
<p>Introductory event to the course</p> <ul style="list-style-type: none"> • overview of the university organization <ul style="list-style-type: none"> ○ library ○ student council ○ student associations ○ international office • learning and working techniques • networking with BayKa • First contact with the construction industry working on a real practical project 			

Literature:
Will be specified at the beginning
Additional remarks:
None

Mathematics I			
Module abbreviation:	SCE_Ma	Reg.no.:	2
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Responsible for module:	Müller, Marvin		
Lecturer:	Müller, Marvin (SCE_Ma) Müller, Marvin (SCE_Ma_AR)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 5 SWS		
Workload:	Contact hours:		57 h
	Self-study:		68 h
	Total:		125 h
Subjects of the module:	2: Mathematics I 2: Mathematics I (admission requirement)		
Lecture types:	Mathematics I: SU/Ü - lecture with integrated exercises Mathematics I (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Mathematics I: schrP120 - written exam, 120 minutes Mathematics I (admission requirement): Student research project without presentation Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The students know the essential mathematical terms and procedures relevant to technical studies. They understand the underlying concepts and solve mathematical problems self-dependently using suitable procedures, so that these procedures can contribute solving mechanical problems and setting up programming algorithms. Engineering mathematics therefore is the foundation of engineering studies, especially in the subjects of computer science and structural engineering. The students are particularly able to:</p> <ul style="list-style-type: none"> • know the different number systems and to deal with real numbers. • deal with functions and know basic limit theorems. • solve equations and inequalities with one variable. • calculate the first and higher order derivatives of basic and special functions. • know methods of Integration and solve problems in integral calculus. 			

Content:

The mathematics I module conveys the typical mathematics content for an economically and technically experienced course of study. Vector algebra, matrices and linear equation systems are used to create the basis for structural engineering, especially the decomposition of forces and the equilibrium conditions. Furthermore, basics in differential and integral calculus are considered in order to then convert them into programmable algorithms. In addition, analytical geometry teaches the breakdown of forces and descriptive geometry teaches spatial thinking about engineering problems.

The module includes:

- Linear Algebra: matrices, systems of linear equations
- Geometry & Vector algebra
- Basic functions and their properties, limits of functions and sequences
- Differential calculus (differentiable functions, derivatives of special functions, higher order derivatives)
- Integral calculus (Riemann integrals, primitive functions, definite and indefinite integrals, basic integration methods)

Literature:

- RILEY, Kenneth F., Michael P. HOBSON and Stephen J. BENICE, 2006. *Mathematical methods for physics and engineering*. 3. edition. Cambridge [u.a.]: Cambridge Univ. Press. ISBN 978-0-521-86153-3, 0-521-86153-5
- FRIEDMAN, Menahem, KANDEL, Abraham, 2011. *Calculus light* [online]. Berlin [u.a.]: Springer PDF e-Book. ISBN 978-3-642-17848-1. Available via: <https://doi.org/10.1007/978-3-642-17848-1>.
- RAHMANI-ANDEBILI, Mehdi, 2021. *Calculus: Practice Problems, Methods, and Solutions* [online]. Cham: Springer International Publishing PDF e-Book. ISBN 978-3-030-64980-7. Available via: <https://doi.org/10.1007/978-3-030-64980-7>.

Additional remarks:

None

Mechanics I			
Module abbreviation:	SCE_Mech	Reg.no.:	3
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	1
Responsible for module:	Bochert, Jana Sue		
Lecturer:	Al Hanoun, Hisham		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 5 SWS		
Workload:	Contact hours:		59 h
	Self-study:		66 h
	Total:		125 h
Subjects of the module:	3: Mechanics I		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
schrP90 - written exam, 90 minutes			
Mechanics I (admission requirement): Student research project without presentation			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The students master the handling of force systems and can statically calculate simple structural models. Here, modelling and reality are brought into harmony so that theory is combined with practice. The focus of this module is on support calculation, center of gravity calculation and internal force determination. The students develop analytical skills so that they can apply them in plausibility checks of computer-aided structural analyses.</p>			
Content:			
<p>The module Structural Analysis teaches the basics of mechanics. The contents of the 1st semester deal with Newton's axioms in advance, building on this, the basics of free cutting, forces and their decomposition, the elements as well as the setting up of equilibrium conditions, calculations of support reactions and internal forces of statically determined systems are dealt with. With this knowledge, computer-aided structural analysis is introduced. In the context of this module, the basics of mechanical understanding and structural analysis are given:- Static basics: Forces, moments and their composition or decomposition.- Equilibrium on structural elements- Sectional principle- Calculation of the center of gravity- Support reactions and internal forces of statically determined systems,- Area moments of inertia - Statically determinate and indeterminate structures- Introduction to computer-aided structural analysis</p>			

Literature:
<ul style="list-style-type: none">• GROSS, D., W. HAUGER and W. SCHNELL, . <i>Engineering Mechanics 1</i>.• GROSS, Dietmar, EHLERS, Wolfgang, WRIGGERS, Peter, SCHRÖDER, Jörg, MÜLLER, Ralf, 2017. <i>Statics – formulas and problems: engineering mechanics 1</i> [online]. Berlin ; Heidelberg: Springer PDF e-Book. ISBN 978-3-662-53854-8. Available via: https://doi.org/10.1007/978-3-662-53854-8.
Additional remarks:
None

Building Constructions I			
Module abbreviation:	SCE_BuildCon	Reg.no.:	4
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	1
Responsible for module:	Haese, Andreas		
Lecturer:	Haese, Andreas		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	4: Building Constructions I		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
schrP120 - written exam, 120 minutes			
Building Construction (admission requirement): Student research project without presentation			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
Students understand how buildings function in terms of supporting structure, bracing, foundation, building envelope, building physics and fire protection for different construction types and materials. Simple buildings can be represented in plans using CAD, taking into account the basic rules of architectural drawings and 3-dimensional planning. With an introduction to building regulations, students learn the basics of applying building legislation and design standards.			
Content:			
The students get to know the basic elements of structures and buildings and also the functionality and interaction of the individual components, in particular the elements of the supporting structure for various material-dependent construction methods.			
In addition, essential elements of the building envelope, the sealing and the finishing work are explained.			
Through exercises in descriptive geometry and the basics of architectural drawing, students learn to create simple construction drawings themselves.			
As a basis for the application of design standards, an introduction to building regulations is given.			
The module also includes the contents:			

<ul style="list-style-type: none"> - Functions of a building; Construction methods, structural elements - Load transfer and bracing of buildings, excavation pits, foundations, seals, drawing technics in construction, masonry, mortar - Constructive geometry - Basics of design, technical drawings - Introduction to technical regulations, design codes, building regulations - Fire protection
Literature:
<ul style="list-style-type: none"> • ALLEN, Edward and Joseph IANO, 2019. <i>Fundamentals of building construction: materials and methods</i>. S. edition. Hoboken, New Jersey: Wiley. ISBN 978-1-119-44619-4 • MERRITT, Frederick S. and Jonathan T. RICKETTS, 2001. <i>Building design and construction handbook</i>. S. edition. New York: McGraw-Hill. ISBN 0-07-041999-X, 9780070419995 • ALBERT, Andrej, Klaus-Jürgen SCHNEIDER and Alfons GORIS, 2022. <i>Bautabellen für Ingenieure: mit Berechnungshinweisen und Beispielen</i>. 25. edition. Köln: Reguvis. ISBN 978-3-8462-1316-2 • NEUFERT, Ernst and others, 2022. <i>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</i>. 43. edition. Wiesbaden: Springer Vieweg. ISBN 978-3-658-34236-4, 3-658-34236-6 • , . Frick, Knöll, Neumann, Weinbrenner: <i>Baukonstruktionslehre, Teil 1 und 2, Ver-lag B.G. Teubner Vieweg +Teubner, 2018..</i>
Additional remarks:
None

Computer Programming; Computer Aided Design and Calculation in Civil Engineering			
Module abbreviation:	SCE_CPCADC	Reg.no.:	5
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Responsible for module:	Bochert, Jana Sue		
Lecturer:	Al Hanoun, Hisham; Biberger, Alexander; Bochert, Daniel; Bochert, Jana Sue		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 5 SWS		
Workload:	Contact hours:	59 h	
	Self-study:	66 h	
	Total:	125 h	
Subjects of the module:	5: Computer Programming; Computer Aided Design and Calculation in Civil Engineering		
Lecture types:	SU/Ü/PR - seminar based teaching/Exercise course/laboratory		
Availability of the module:	None		
Examinations:			
schrP90 - written exam, 90 minutes			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
students are shown the spectrum of computer aided calculations in the construction and business sectors. This includes the areas of structural analysis for load bearing structures, construction planning with CAD software and planning and construction with BIM systems. By learning a programming language, mathematical algorithms and data structures are applied and transferred to construction specific or general EDP tasks.			
Content:			
The students get to know construction-specific application software for static verifications and carry out plausibility checks especially with regard to the calculation of load bearing structures. Structures are drawn using CAD programmes and recorded in building information Modelling (BIM) systems. Different programming languages with algorithms and data structures, are introduced which contribute to finding construction specific solutions. Similarly computer algebra systems are introduced that contribute to the handling of numerical and analytical calculations. Practically relevant techniques of data storage data exchange via networks complete the module			
<ul style="list-style-type: none"> • functionality of a high level programming language 			

<ul style="list-style-type: none">• techniques for data exchange via networks• building specific application software for special fields of civil engineering• computer algebra systems and their possible applications• algorithms and data structures• object oriented programming• data security
Literature:
Will be specified at the beginning
Additional remarks:
None

Chemistry & Building Materials			
Module abbreviation:	SCE_C&BM	Reg.no.:	6
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Responsible for module:	Blask, Oliver		
Lecturer:	Blask, Oliver		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		60 h
	Self-study:		65 h
	Total:		125 h
Subjects of the module:	6: Chemistry & Building Materials		
Lecture types:	SU/Ü/PR - seminar based teaching/Exercise course/laboratory		
Availability of the module:	None		
Examinations:			
schrP90 - written exam, 90 minutes			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The students learn the basic principles of chemistry and chemical reactions. They know the structure of materials and its connection to material properties. They know the manufacturing processes of important building materials and the impact on the environment. They know the mechanical and physical properties of important building materials. They can select building materials for an application based on their properties and estimate their durability. They know the challenges of recycling of building materials and the use of secondary materials.</p>			
Content:			
<ul style="list-style-type: none"> Basics of general and inorganic chemistry: chemistry of aqueous solutions, pH value and reactions of acids and bases, REDOX reactions, electrochemical processes, metal corrosion and corrosion protection Raw materials, production and properties of building materials: physical states, microstructure, atoms and bonding types and the resulting macroscopic properties. Production processes with reference to their ecological impact. Durability of building materials: Corrosion resistance of mineral building materials, corrosion resistance of metallic building materials. Recycling of building materials and use of secondary materials Practical experiments: Production of sustainable concrete 			

Literature:

- TIMBERLAKE, Karen C., 2019. *Chemistry: an introduction to general, organic, and biological chemistry*. t. edition. New York: Pearson. ISBN 978-1-292-22886-0, 1-292-22886-5
- PAULING, Linus, 2011?. *General chemistry*. [Place of publication not identified]: BN Pub.. ISBN 978-1-60796-298-4, 1607962985
- HUHEEY, J.E., 2008. *Inorganic Chemistry: Principles of Structure and Reactivity*. 4. edition. Boston: Pearson. ISBN 978-8177581300
- KULTERMANN, Eva and William P. SPENCE, 2022. *Construction, materials, methods, and techniques: building for a sustainable future*. F. edition. Boston, MA: Cengage. ISBN 978-0-357-51383-5
- TAYLOR, G.D., 2013. *Materials in Construction: an introduction* [online]. New York: Routledge PDF e-Book. ISBN 978-1-315-83915-8. Available via: <https://doi.org/10.4324/9781315839158>.

Additional remarks:

None

Building Physics/Energy Efficiency			
Module abbreviation:	SCE_BP/EE	Reg.no.:	7
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Responsible for module:	Blask, Oliver		
Lecturer:	Blask, Oliver		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	3 ECTS / 3 SWS		
Workload:	Contact hours:		45 h
	Self-study:		30 h
	Total:		75 h
Subjects of the module:	7: Building Physics/Energy Efficiency		
Lecture types:	SU/Ü/PR - seminar based teaching/Exercise course/laboratory		
Availability of the module:	None		
Examinations:			
LN - written exam, 90 minutes			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
The students know the basic principles of building physics and their connection with indoor climate and deterioration of structures. In addition, they are able to carry out calculations on heat transfer and moisture content and use computer programs to create a simple energy certificate in accordance with the GEG.			
Content:			
<ul style="list-style-type: none"> • Basics of building physics • Basics of thermal insulation: Principles of heat transfer, temperature profile in the section, thermal conductivity, U-value • Thermal protection in summer: the meaning of heat capacity, identify thermal connections • Create a certificate according to GEG • Aims of moisture protection in buildings, determining the saturation pressure of water vapor depending on the temperature, specify criteria for mold formation, humidity, condensation in segments and on surfaces. • practical exercises: <ul style="list-style-type: none"> ○ Excursion to a passive house ○ Air tightness measurement (blower door test) and thermography 			

<ul style="list-style-type: none">○ Software exercises: Creating GEG certificates○ Thermal Bridges, calculation by software
Literature:
<ul style="list-style-type: none">• PINTERIĆ, Marko, 2021. <i>Building Physics: From physical principles to international standards</i> [online]. Cham: Springer International Publishing PDF e-Book. ISBN 978-3-030-67372-7. Available via: https://doi.org/10.1007/978-3-030-67372-7.
Additional remarks:
None

Sustainability in Construction			
Module abbreviation:	SCE_SiC	Reg.no.:	8
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	1
Responsible for module:	Bochert, Jana Sue		
Lecturer:	Blask, Oliver; Bochert, Jana Sue		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	2 ECTS / 2 SWS		
Workload:	Contact hours:		24 h
	Self-study:		26 h
	Total:		50 h
Subjects of the module:	8: Sustainability in Construction		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
mdIP - oral exam, 15-20 minutes			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>the students learn how to rethink which is essential in the construction industry, through lectures by experts from science and business. the experts talk about their experiences and the need for sustainable construction. The students discuss with the experts and are made aware of the paradigm shift so that the way of thinking they gain can be transferred and applied to the other modules. In this way you will recognize the problems whose solutions will be discussed in the course of your studies.</p>			
Content:			
<p>The sustainability in construction module conveys new content that has only become more important in recent years. Under the term sustainable construction, guidelines and standards, responsibility goals and methods are discussed so that these tools and procedures are used accordingly and a rethinking of sustainable construction is required. This rethinking requires know how, which must be fed into the companies. Listed individually, the module includes lectures by experts:</p> <ul style="list-style-type: none"> • introduction to sustainability models • sustainable buildings and their guidelines • sustainability in the planning and construction process • practical design energy efficiency climatic design, increasing resource efficiency 			

<ul style="list-style-type: none">• raising awareness of current topics in sustainable building
Literature:
Will be specified at the beginning
Additional remarks:
None

Mathematics II			
Module abbreviation:	SCE_Ma_II	Reg.no.:	9
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	2
Responsible for module:	Müller, Marvin		
Lecturer:	Müller, Marvin (SCE_Ma_II) Müller, Marvin (SCE_Mech_II_AR)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 5 SWS		
Workload:	Contact hours:		57 h
	Self-study:		68 h
	Total:		125 h
Subjects of the module:	9: Mathematics II 9: Mathematics II (admission requirement)		
Lecture types:	Mathematics II: SU/Ü - lecture with integrated exercises Mathematics II (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Mathematics II: schrP90 - written exam, 90 minutes Mathematics II (admission requirement): Student research project without presentation Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The students know the essential mathematical terms and procedures relevant to technical studies. They understand the underlying concepts and solve mathematical problems self-dependently using suitable procedures, so that these procedures can contribute solving mechanical problems and setting up programming algorithms. The students know the basic concepts of statistic, can calculate position and scatter parameters and know the basic concepts of probability. Engineering mathematics therefore is the foundation of engineering studies, especially in the subjects of computer science and structural engineering. The students are particularly able to:</p> <ul style="list-style-type: none"> • Apply methods of differential and integral calculus of multiple variables to engineering tasks. • To solve problems of multiple variables in the area of differential and integral calculus. • To solve ordinary differential equations of the first order. 			

Content:

The Mathematics II module provides advanced mathematics content for a technically advanced course of study. The ability to calculate vibrations is taught using the differential and integral calculus of several variables.

- Differential and integral calculus of functions of several variables: functions of several variables, differentiation (partial derivatives of the 1st order and higher order, tangential plane, local extreme values and saddle points, extreme value problems), multiple integrals (double integrals, triple integrals, volume, center of gravity, moments)
- Differential equations: basic terms (initial value and boundary value problems), 1st order differential equations (homogeneous and inhomogeneous linear differential equations with constant coefficients), 2nd order differential equations (homogeneous and inhomogeneous linear differential equations with constant coefficients (mechanical vibrations))
- Basics of statistics and data analysis: basic concepts, mean values, measures of dispersion, correlation, elementary probability theory, statistical test.

Literature:

- RILEY , K. F. , HOBSON , M. P., BENCE , S. J., 2006. *Mathematical Methods for Physics and Engineering: A Comprehensive Guide* [online]. PDF e-Book. ISBN ISBN 978-0-511-16842-0 .
- FRIEDMAN, M., KANDEL , A., 2011. *Calculus light* [online]. Berlin: Springer PDF e-Book. ISBN ISBN 978-3-642-17848-1, 978-3-642-17847-4, . Available via: <https://doi.org/10.1007/978-3-642-17848-1> .
- RAHMANI-ANDEBILI , M., 2021. *Calculus: Practice Problems* [online]. PDF e-Book. ISBN ISBN 978-3-030-64980-7. Available via: <https://doi.org/10.1007/978-3-030-64980-7>.
- SCHIEFER, H., SCHIEFER, F., 2021. *Statistics for Engineers: An Introduction with Examples from Practice* [online]. Wiesbaden: Springer PDF e-Book. ISBN ISBN 978-3-658-32397-4. Available via: <https://doi-org.thi.idm.oclc.org/10.1007/978-3-658-32397-4> .
- EWENS, W. J. , BRUMBERG, K., 2023. *Introductory Statistics for Data Analysis* [online]. PDF e-Book. ISBN ISBN 978-3-031-28189-1. Available via: <https://doi.org.thi.idm.oclc.org/10.1007/978-3-031-28189-1> .

Additional remarks:

None

Mechanics II			
Module abbreviation:	SCE_Mech_II	Reg.no.:	10
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	2
Responsible for module:	Bochert, Jana Sue		
Lecturer:	Bochert, Jana Sue (SCE_Mech_II) Bochert, Jana Sue (SCE_Mech_II_AR)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 5 SWS		
Workload:	Contact hours:		59 h
	Self-study:		66 h
	Total:		125 h
Subjects of the module:	10: Mechanics II 10: Mechanics II (admission requirement)		
Lecture types:	Mechanics II: SU/Ü - lecture with integrated exercises Mechanics II (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Mechanics II: schrP90 - written exam, 90 minutes Mechanics II (admission requirement): Student research project without presentation Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
The Elastostatics and strength of materials theory provide the fundamentals for the design and dimensioning of structures and components within the framework of stability and serviceability verifications. The students know the basic knowledge of strength theory as well as the corresponding theoretical background. More complex, statically determined systems are analysed and the handling of deformation and stress calculations are outlined. In the group exercises, the students have acquired the ability to verbalise questions from mechanics, discuss and classify the problem, the solution and the results with fellow students and teachers and to classify the results.			
Content:			
The following contents will be developed through seminar teaching, supplemented by group work and discussion:- Terms and basic relations of elastostatics - One- and multi-dimensional state of stress and distortion- Transformation of stresses and distortions- Material law of linear elasticity theory- Elementary elastostatics			

of bars and beams- Shear stresses, shear centre,- Differential equation of the bending line- Dimensioning of compression members (torsion of circular profiles)
Literature:
<ul style="list-style-type: none">• GROSS, D. and W. HAUGER, 2021. <i>Engineering Mechanics: Vol.2 Elastostatics</i> . 14. edition.
Additional remarks:
None

SCE_Surveying			
Module abbreviation:	SCE_Survey	Reg.no.:	11
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	2
Responsible for module:	Liepert, Tobias		
Lecturer:	Liepert, Tobias (SCE_Survey) Liepert, Tobias (SCE_Survey_AR)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 5 SWS		
Workload:	Contact hours:		59 h
	Self-study:		66 h
	Total:		125 h
Subjects of the module:	11: SCE_Surveying 11: Surveying (admission requirement)		
Lecture types:	SCE_Surveying: SU/Ü - lecture with integrated exercises Surveying (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
SCE_Surveying: schrP90 - written exam, 90 minutes Surveying (admission requirement): Student research project without presentation Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
Students will be able to define engineering surveying as a specialist field and place it in the context of the geodetic disciplines. They have become familiar with the accounting methods of engineering surveying. The structure and special forms of the basic engineering geodetic networks are known to them. They have become acquainted with the methodology of project calculation and can mark out engineering projects. The students are able to carry out geodetic calculations in the plane with and without coordinates. They are able to use a programme for geodetic calculations.			
Content:			
Basics: Geodesy and geoinformation, measurands, map and plan. Electronic total stations: Direction and angle measurement, electronic distance measurement. Reference systems: Reference surfaces, coordinate systems (geographic coordinates, Gauss-Kruger coordinates, UTM coordinates) Geodetic calculations: Fixed point field and network compaction, coordinate calculation Position measurement and setting out: tachym-			

<p>etry, polar method, coordinate transformation, area calculation, setting out, building law Height measurement: reference area and height systems, geometric levelling, longitudinal and transverse profiles, area levelling, inclination data, trigonometric height determination Digital terrain model: triangular meshing, earth volume calculation Satellite surveying: GNSS system setup, position determination Routing: Route-related polygon course, circular arc calculation Practical part: Handling a levelling instrument and an electronic total station; handling geodetic calculation software.</p>
<p>Literature:</p> <ul style="list-style-type: none"> • MÖSER, Michael, 2012. <i>Handbuch Ingenieurgeodäsie Band 1 Grundlagen</i>. 4. edition. Berlin: Wichmann . ISBN 978-3-87907-504-1 • WITTE, Bertold, Peter SPARLA and Jörg BLANKENBACH, 2020. <i>Vermessungskunde für das Bauwesen mit Grundlagen des Building Information Modeling (BIM) und der Statistik</i>. 9. edition. Berlin: Wichmann. ISBN 978-3-87907-657-4, 3-87907-657-X • KNICKMEYER, E., . <i>Geodätisches Rechnen. Vorlesungsmanuskript</i>. • GRUBER, Franz Josef, JOECKEL, Rainer, 2022. <i>Formelsammlung für das Vermessungswesen</i> [online]. Wiesbaden: Springer Vieweg PDF e-Book. ISBN 978-3-658-37873-8. Available via: https://doi.org/10.1007/978-3-658-37873-8. • MÖSER, M., 2022/2023. <i>Geodäsie, Studiengang Bauingenieurwesen, Fernstudium, Technische Universität Dresden</i>. • , . <i>Weitere relevante Literatur wird in der Veranstaltung bekannt gegeben..</i>
<p>Additional remarks:</p>
<p>None</p>

Construction Management/Entrepreneurship			
Module abbreviation:	SCE_Con_Man_Eship	Reg.no.:	12
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Responsible for module:	Liepert, Tobias		
Lecturer:	Liepert, Tobias		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	4 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		53 h
	Total:		100 h
Subjects of the module:	12: Construction Management/Entrepreneurship		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
TCW-schrftl. Prüfung 120 Min.			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The students know the different perspectives as well as management and control tasks of the client or building owner and contractor. You know the processes and tasks in the various project phases (planning, tendering, awarding, billing operation) and can apply the corresponding methods in the project. In the part on entrepreneurship, students know different types of business models and different approaches to entrepreneurship and starting a business. They critically discuss the opportunities and challenges that exist for start ups.</p>			
Content:			
<p>The following content is developed through seminar style teaching, supplemented by group work and practical lectures as well as their discussion:</p> <ul style="list-style-type: none"> • project phases according to HOAI • project control methods • process and capacity planning • basics of awarding • basics of billing • basics and theory of entrepreneurship • (sustainable) entrepreneurship as a driver for innovation and sustainability 			

Literature:
Will be specified at the beginning
Additional remarks:
None

Low Carbon Construction			
Module abbreviation:	SCE_Low_CC	Reg.no.:	13
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	2
Responsible for module:	Haese, Andreas		
Lecturer:	Haese, Andreas (SCE_Low_CC) Haese, Andreas (SCE_Low_CC_AR)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 5 SWS		
Workload:	Contact hours:		59 h
	Self-study:		66 h
	Total:		125 h
Subjects of the module:	13: Low Carbon Construction 13: Low Carbon Construction (admission requirement)		
Lecture types:	Low Carbon Construction: SU/Ü - lecture with integrated exercises Low Carbon Construction (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Low Carbon Construction: schrP120 - written exam, 120 minutes Low Carbon Construction (admission requirement): Student research project without presentation Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The students understand how buildings work and know the essential construction types for the building structure and the inner design. After completing the module, they will be able to independently design simple constructions and present them appropriately in detail.</p> <p>The students understand the safety concept of the applicable design standards and can determine the different loads and load combinations for buildings. They know the essential criteria and certification bases for assessing the sustainability of designs and can apply these to specific objects and types of construction.</p>			
Content:			
The students extend their knowledge of how buildings work and the interaction between construction, statics and building physics. Important construction details are discussed in detail and the students are enabled to assess them and design them themselves. As part of a coursework, the correct representation of buildings and details in construction drawings will be practiced as a basis for building applications. Through exercises			

on wind, snow and traffic loads, they learn to determine load assumptions for buildings and combine them correctly. By introducing students to the criteria and the essential principles of certification of the sustainability of buildings, students learn to take the aspect of sustainability into account in all planning steps.

Literature:

- COTTERELL, Janet and Adam DADEBY, 2012. *The passivhaus handbook: a practical guide to constructing and retrofitting buildings for ultra-low energy performance*. Totnes, Devon: Green Books. ISBN 978-0-85784-019-6
- , 2009. *Green building design and construction: LEED reference guide for green building design and construction ; for the design, construction and major renovations of commercial and institutional buildings including core & shell and K-12 school projects*. 2009. edition.
- KUBBA, Sam, 2017. *Handbook of green building design and construction: LEED, BREEAM, and Green Globes*. S. edition. Amsterdam: Elsevier. ISBN 978-0-12-810433-0
- BAUER, Michael, MÖSLE, Peter, SCHWARZ, Michael, 2013. *Green building: Leitfaden für nachhaltiges Bauen* [online]. Wiesbaden: Springer Vieweg PDF e-Book. ISBN 978-3-642-38297-0. Available via: <https://doi.org/10.1007/978-3-642-38297-0>.
- ALBERT, Andrej, Klaus-Jürgen SCHNEIDER and Alfons GORIS, 2022. *Bautabellen für Ingenieure: mit Berechnungshinweisen und Beispielen*. 25. edition. Köln: Reguvis. ISBN 978-3-8462-1316-2
- NEUFERT, Ernst and others, 2022. *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*. 43. edition. Wiesbaden: Springer Vieweg. ISBN 978-3-658-34236-4, 3-658-34236-6
- , . *Frick, Knöll, Neumann, Weinbrenner: Baukonstruktionslehre, Teil 1 und 2, Ver-lag B.G. Teubner Vieweg +Teubner, 2018.*
- WELLER, Bernhard, FAHRION, Marc-Steffen, HORN, Sebastian, NAUMANN, Thomas, NIKOLOWSKI, Johannes Nils, 2016. *Baukonstruktion im Klimawandel* [online]. Wiesbaden: Springer Fachmedien Wiesbaden PDF e-Book. ISBN 978-3-658-13011-4. Available via: <https://doi.org/10.1007/978-3-658-13011-4>.

Additional remarks:

None

Sustainable Construction Materials			
Module abbreviation:	SCE_Sus_Con_Mat	Reg.no.:	14
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	2
Responsible for module:	Blask, Oliver		
Lecturer:	Blask, Oliver		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	4 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		53 h
	Total:		100 h
Subjects of the module:	14: Sustainable Construction Materials		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
schrP90 - written exam, 90 minutes			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
the students learn about conventional and new building materials that are characterized by their particular sustainability. Students learn to estimate the sustainability of building materials based on durability emissions and resource consumption. They know the difference between empirical and performance based concepts in lifecycle management. the students know the principles of recycling building materials and the use of secondary materials.			
Content:			
<ul style="list-style-type: none"> • sustainable mineral building materials climate friendly binders, cement substitutes, recycled materials, e.g. AAMs, geopolymers, calcined clays, clay,... • renewable organic building materials, e.g. wood, straw,... • durability of building materials as a sustainability criterion corrosion processes in mineral, metallic and organic building materials • recycling of building materials and use of secondary materials • practical exercises: production of sustainable concrete 			
Literature:			
Will be specified at the beginning			

Additional remarks:

None

Reinforced Concrete Design I			
Module abbreviation:	SCE_ReinfConcrDesignI	Reg.no.:	15
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	3
Responsible for module:	Haese, Andreas		
Lecturer:	Haese, Andreas (SCE_ReinfConcrDesignI) (SCE_ReinfConcrDesignI_AdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	15: Reinforced Concrete Design I 15: Reinforced Concrete Design I (admission requirement)		
Lecture types:	Reinforced Concrete Design I: SU/Ü - lecture with integrated exercises Reinforced Concrete Design I (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Reinforced Concrete Design I: schrP120 - written exam, 120 minutes Reinforced Concrete Design I (admission requirement): LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
Students gain a basic understanding of the load bearing behavior of reinforced concrete structures. The design methods for bending and shear force in the limit state of the load bearing capacity for simple load bearing systems in solid construction are dealt with on flat static systems. In addition, the basics of reinforcement routing and construction in reinforced concrete construction are taught. Upon completion of the course, students will be able to dimension common single axis structural components in building construction, as well as prepare or read corresponding construction plans.			
Content:			
In the "Concrete-Construction" module, the theoretical basics are covered with practical examples of the components that regularly appear in general building construction. the following subject areas are dealt with <ul style="list-style-type: none"> • materials of reinforced concrete construction • impacts on structures 			

<ul style="list-style-type: none">• safety concept in structural engineering• load bearing behavior of reinforced concrete elements• load case superimposition, design internal forces• ultimate limit state due to bending and longitudinal force, transverse force• basics of reinforcement management and structural training• commonly used structural elements such as beams single-axis slabs, unreinforced foundations
Literature:
Will be specified at the beginning
Additional remarks:
None

Structural Analysis			
Module abbreviation:	SCE_StructuralAnalys	Reg.no.:	16
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	3
Responsible for module:	Bochert, Jana Sue		
Lecturer:	Bochert, Jana Sue (SCE_StructuralAnalys) (SCE_StructuralAnalys_AdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	16: Structural Analysis 16: Structural Analysis (admission requirement)		
Lecture types:	Structural Analysis: SU/Ü - lecture with integrated exercises Structural Analysis (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Structural Analysis: schrP120 - written exam, 120 minutes Structural Analysis (admission requirement): LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
Structural statics provides the future civil engineer with the necessary tools to be able to calculate general structures. Particular attention is paid to matrix methods, which are the basis of modern computer programs. Traditional methods of structural analysis, which were developed before IT for calculations with the classic slide rule, are also treated, as they are necessary for checking computer calculations and for understanding structural analysis.			
Content:			
In the compulsory module "Structural Analysis" students are given... based on the knowledge of mathematics and Mechanics the calculation of statically determinate and indeterminate structures (2D and 3D). There are path sizes (displacements and twists) and the rotation angle method under general stresses (load and deformation effects) in the center. Other contents of the lecture include, for example: Modeling of supporting structures, safety concept in structural engineering, limit states, Partial safety concept, modeling of Impacts			

and loads, as well as the calculation of flat and spatial bar structures, disks and Disks with various computer programs.

- Partial safety concept, influences and resistances
- replacement rod method, spring models,
- Spatial systems
- Support gratings
- Working sets
- Virtual work
- Path size method, angle of rotation method
- Bar structures according to second order theory
- load method

Literature:

Will be specified at the beginning

Additional remarks:

None

Introduction Geotechnics and Transport Technology			
Module abbreviation:	SCE_IntroGeoTT	Reg.no.:	17
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	3
Responsible for module:	Gastl, Christoph		
Lecturer:	Gastl, Christoph; Lerch, Maximilian (SCE_IntroGeoTT) Gastl, Christoph; Lerch, Maximilian (SCE_IntroGeoTT_AdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		59 h
	Self-study:		66 h
	Total:		125 h
Subjects of the module:	17: Introduction Geotechnics and Transport Technology 17: Introduction Geotechnics and Transport Technology (admission requirement)		
Lecture types:	Introduction Geotechnics and Transport Technology: SU/Ü - lecture with integrated exercises Introduction Geotechnics and Transport Technology (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Introduction Geotechnics and Transport Technology: schrP90 - written exam, 90 minutes Introduction Geotechnics and Transport Technology (admission requirement): LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>Geotechnics:</p> <p>The students are taught the basics of geology and the special features of soil as a building material. The students gain knowledge about the characteristics and properties of soils, as well as the determination in the laboratory and in situ. In addition, knowledge about the multi-phase building material soil and the effects of water in the soil is conveyed. The students gain knowledge about the determination of the total and effective stresses in the half-space and about the shear strength of soils. The students should be able to apply the teaching content to problems in earthworks and foundation engineering.</p> <p>Transport technology:</p>			

Content:
<p>Geotechnics:</p> <ul style="list-style-type: none"> • Introduction to engineering geology: formation, naming and description of soils • Classification of soils: basics, grain size distribution, sludge analysis, consistency limits, classification of soils according to ATV • Geotechnical field and laboratory tests: Uniaxial compression test, density determination, direct shear test, triaxial test, Proctor test, permeability test, ram sounding, load plate pressure test, balloon method, soil exposures • Water in the soil and dewatering • Shear strength of soils: friction and cohesion, Mohr-Coulomb limit criterion, consolidation of soils • Stresses in the ground: Determination of total and effective stresses in the half-space, settlement calculation, deformation properties <p>Transportation technology</p> <ul style="list-style-type: none"> • Introduction: <ul style="list-style-type: none"> ○ Development and importance of road construction, requirements for the road (objectives, traffic safety, environmental compatibility) • Road and traffic planning: <ul style="list-style-type: none"> ○ Legal basics, basics of road planning, planning process in road construction, traffic loads • Routing of roads: site plan, profile plan, cross-sectional design, proof of traffic quality (only very rough) • Renewal of roadways: assessment of the existing paving, construction of the frost-proof superstructure, new construction of other roads • Roadway constructions: <ul style="list-style-type: none"> ○ Traffic loads, road structure, stress on the road, load classes, etc. • Earthworks and drainage: <ul style="list-style-type: none"> ○ Soil exploration, soil classification, subsoil requirements, soil improvement measures, road drainage
Literature:
Will be specified at the beginning
Additional remarks:
None

Sanitation/Wastewater/Waste Management			
Module abbreviation:	SCE_SWWMgm.	Reg.no.:	18
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	3
Responsible for module:	Liepert, Tobias		
Lecturer:	Hagl, Mathilde; Liepert, Tobias; Senner, Sebastian		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	18: Sanitation/Wastewater/Waste Management		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Project report and oral presentation 15 min.			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<ul style="list-style-type: none"> • Imparting basics, specialist knowledge and methods • practical implementation and application based on examples • Application of calculation methods and models • sharpening understanding of complex relationships 			
Content:			
Habitat settlement water supply with demand, extraction, conveyance, storage, distribution and structural aspects urban drainage with drainage processes, wastewater, infiltration systems, sewers, rain relief and sewer maintenance waste management with waste avoidance, collection and transport, waste and recyclable material treatment, disposal of waste and waste management in the construction industry			
Literature:			
Will be specified at the beginning			

Additional remarks:

None

Fluid Mechancis & Hydro Mechanics			
Module abbreviation:	SCE_FluidMechanicsHydro	Reg.no.:	19
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	3
Responsible for module:	Liepert, Tobias		
Lecturer:	Liepert, Tobias		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	19: Fluid Mechancis & Hydro Mechanics		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
schrP90 - written exam, 90 minutes			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
The students are capable			
<ul style="list-style-type: none"> • to understand planning and construction tasks in the field of hydraulic engineering and water management. • to independently develop and evaluate simple measures in the area of river and dam construction. • Understand the basics of hydrostatics and hydromechanics. • to dimension and plan simpler hydraulic engineering systems mathematically. 			
Content:			
<p>A comprehensive overview of the fundamental areas of hydraulic engineering and water management is provided (river barriers, dams, operating facilities, hydroelectric power plants, river engineering, flow conditions and sediment transport). The formation of precipitation and runoff (water cycle) is explained, as are stochastic methods for estimating the formation of floods. Introduction / basics of hydrostatics, mechanics, as well as pipe and channel hydraulics. Hydraulic engineering measures such as the construction of dams and river barriers, as well as flood retention basins, dikes and flood polders as flood protection measures are also discussed, as well as river engineering with the areas of flow calculation, bedload problems and natural measures. The legal basis, regulations and standards are also presented.</p>			

Literature:
Will be specified at the beginning
Additional remarks:
None

Sustainable Design and Management of Buildings an Structures			
Module abbreviation:	SCE_SustDesignManagBuildStruc	Reg.no.:	20
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	3
Responsible for module:	Reiter, Thomas		
Lecturer:	Reiter, Thomas		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	20: Sustainable Design and Management of Buildings an Structures		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
schrP90 - written exam, 90 minutes			
Additional Explanation:			
There is the possibility to voluntarily acquire up to 10 bonus points, which are credited to the points achieved in the written examination.			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>In the module sustainable planning and sustainable construction operations, the essential criteria for sustainable construction methods are discussed and deepened and the basis for the planning phase and the execution phase is derived from them.</p> <p>Using an example project, variants are examined and compared with regard to sustainability criteria.</p> <p>By completing the module, students will be able to recognize and evaluate the interrelationships between sustainability aspects and possible conflicting goals in building construction projects and develop solution strategies.</p>			
Content:			
<ul style="list-style-type: none"> • Key sustainability aspects • Interaction between sustainability aspects and conflicting goals • Life cycle assessment • Rating systems • Certification systems • Funding landscape and criteria 			

<ul style="list-style-type: none">• EU taxonomy
Literature:
Will be specified at the beginning
Additional remarks:
None

Reinforced Concrete Design II			
Module abbreviation:	SCE_ReinforcedConcrDesignII	Reg.no.:	21
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	4
Responsible for module:			
Lecturer:	(SCE_ReinforcedConcrDesignII) (SCE_ReinforcedConcrDesignI_AdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	21: Reinforced Concrete Design II 21: Reinforced Concrete Design II (admission requirement)		
Lecture types:	Reinforced Concrete Design II: SU/Ü - lecture with integrated exercises Reinforced Concrete Design II (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Reinforced Concrete Design II: schrP90 - written exam, 90 minutes Reinforced Concrete Design II (admission requirement): LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
Building on the Solid Construction 1 module, students deepen their knowledge in the area of reinforced concrete construction. After completing the module, students are able to independently calculate, dimension and design typical reinforced concrete structures, even for more complex boundary conditions. The students are familiar with the limit states of usability. They are able to limit the stresses, crack widths and deformations of reinforced concrete components in accordance with standards. The general reinforcement rules and the construction rules for typical components are known. The students are able to derive appropriate reinforcement designs from the design results and represent them.			
Content:			
<ul style="list-style-type: none"> • Design of common reinforced concrete components in building construction • Limiting voltages 			

<ul style="list-style-type: none">• Limitation of crack widths• Limitation of deformations• General reinforcement rules• Construction rules for typical components• Development and graphical representation of the reinforcement of reinforced concrete structures
Literature:
Will be specified at the beginning
Additional remarks:
None

Steel Construction			
Module abbreviation:	SCE_SteelConstr	Reg.no.:	22
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	4
Responsible for module:			
Lecturer:	(SCE_SteelConstr) (SCE_SteelConstr_AdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:	47 h	
	Self-study:	78 h	
	Total:	125 h	
Subjects of the module:	22: Steel Construction 22: Steel Construction (admission requirement)		
Lecture types:	Steel Construction: SU/Ü - lecture with integrated exercises Steel Construction (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Steel Construction: schrP120 - written exam, 120 minutes Steel Construction (admission requirement): LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
The students are able to name and classify the structurally relevant steel properties, analyze steel cross sections and use them for the associated calculation method. They recognize stability cases, can calculate the load-bearing capacity of rod-shaped steel components taking simple stability cases into account, know the relevance of the deformation of steel components and have knowledge of corrosion and fatigue behavior.			
Content:			
<ul style="list-style-type: none"> • Basics and areas of application of steel construction • Material properties: steel products, building material characteristics, building material tests • Safety concept and elementary load-bearing safety evidence • Cross-sectional analysis and calculation methods • Design and proof of simple connection details. 			

<ul style="list-style-type: none">• Basic principles of stability and durability
Literature:
Will be specified at the beginning
Additional remarks:
None

Law			
Module abbreviation:	SCE_Law	Reg.no.:	23
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	4
Responsible for module:			
Lecturer:			
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 5 SWS		
Workload:	Contact hours:	59 h	
	Self-study:	66 h	
	Total:	125 h	
Subjects of the module:	23: Law		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
schrP90 - written exam, 90 minutes			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>Private construction law: Students recognize the legal problems that typically arise when carrying out construction work (from the perspective of the client and the contractor) and solve them correctly. The students know construction contract law according to the BGB and VOB/B the basics of procurement law, the law of architects and engineers, and legal protection.</p> <p>Public building law: Students learn the basics of building planning and building regulations law. They are proficient in assessing whether a specific project can be approved based on public law provisions. The students are prepared for the tasks associated with the building permit authorization.</p> <p>Environmental law: the students master the basic principles of environmental law. They will be sensitized to environmental law issues in their future professional activities and will become familiar with environmental law problems in construction projects. The central provisions of environmental procedural law and the most important legal areas of special environmental law are explained.</p>			

Content:
<p>The following content is developed through seminar-style teaching, supplemented by group work and discussion:</p> <p>Private building law:</p> <ul style="list-style-type: none"> • conclusion of the construction contract according to BGB and VOB/A • construction contract and general terms and conditions remuneration for the construction contract (unit price and flat-rate price contract, quantity deviations, changes, additional services) • delays, termination of the construction contract, billing and payment, defects and claims for defects by the client • law of architects and engineers, responsibility of several people involved in construction for defects, securities, legal protection (dispute resolution with and without court) <p>Public building law:</p> <ul style="list-style-type: none"> • Building planning law (urban development law), municipal land-use planning (plan preparation procedures, types of building land-use-plans, approval requirements), application of planning replacement regulations, procedural law (building authorities, approval requirements, building authority sovereign acts, sanctions, construction burden) • Material requirements of building regulations (distance area regulation and parking space verification) <p>Legal protection against building authority acts, environmental law, basic principles of general environmental law and environmental procedural law.</p>
Literature:
Will be specified at the beginning
Additional remarks:
None

Geotechnic & Soil Mechanics			
Module abbreviation:	SCE_GeotechSoilMech	Reg.no.:	24
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	4
Responsible for module:			
Lecturer:	(SCE_GeotechSoilMech) (SCE_GeotechSoilMech_AdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		59 h
	Self-study:		66 h
	Total:		125 h
Subjects of the module:	24: Geotechnic & Soil Mechanics 24: Geotechnic & Soil Mechanics		
Lecture types:	Geotechnic & Soil Mechanics: SU/Ü/PR - seminar based teaching/Exercise course/laboratory Geotechnic & Soil Mechanics: SU/Ü/PR - seminar based teaching/Exercise course/laboratory		
Availability of the module:	None		
Examinations:			
Geotechnic & Soil Mechanics: schrP120 - written exam, 120 minutes Geotechnic & Soil Mechanics: LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
Learning objectives <ul style="list-style-type: none"> • Determine stress propagation in the ground • Apply the safety concept in geotechnics • to prove the load-bearing capacity and usability for individual and strip foundations • using earth pressure theory to design, dimension and provide the associated verifications for shallow and deep-founded supporting structures 			
Content:			
Settlements and deformations:			

<p>Types of settlement, stress propagation, direct and indirect settlement calculation, safety concept in earthworks and foundation engineering</p> <p>Shallow foundations:</p> <p>Bedding modulus method, tension trapezoid method, simplified verification, slip resistance, foundation fracture safety</p> <p>Earth pressure:</p> <p>Active and passive earth pressure, earth pressure at rest</p> <p>Support structures:</p> <p>Heavy weight walls, angle retaining walls, measurements and verifications</p> <p>Trench shoring</p> <p>Construction pit shoring:</p> <p>Sheet pile walls, diaphragm walls, beam pile walls, bored pile walls, anchors, stiffeners,</p> <p>Dimensions and verifications, hydraulic foundation failure, verification of the deep sliding joint</p>
Literature:
Will be specified at the beginning
Additional remarks:
None

Sustainable Transport Technology			
Module abbreviation:	SCE_SustTranspTechn	Reg.no.:	25
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	4
Responsible for module:			
Lecturer:	(SCE_SustTranspTechn) (SCE_SustTranspTechn_AdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	25: Sustainable Transport Technology 25: Sustainable Transport Technology (admission requirement)		
Lecture types:	Sustainable Transport Technology: SU/Ü - lecture with integrated exercises Sustainable Transport Technology (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Sustainable Transport Technology: schrP90 - written exam, 90 minutes Sustainable Transport Technology (admission requirement): LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The Sustainable Transport Technology module aims to provide students with comprehensive knowledge and understanding of the principles and challenges of sustainable transport planning and transport technology. This includes:</p> <ul style="list-style-type: none"> • Understand the fundamentals of sustainable transport planning and technology; Understand the key concepts of sustainability in the transport sector including ecological, economic and social aspects. • To understand and apply planning and decision-making processes, with a particular understanding of the role of transport policy and planning in promoting sustainable transport solutions. • Understand and analyze technological innovations; Ability to evaluate current and future technologies and intelligent transport systems in the area of sustainable transport. • Understanding environmental impacts. 			

Content:
<p>The following content is developed through seminar-style teaching, supplemented by group work and discussion:</p> <ul style="list-style-type: none"> • Basic concepts of traffic planning and traffic engineering • Historical development of road traffic and traffic planning as well as their contributions to the sustainability of transport systems (Athens Charter, New Leipzig Charter) • Data collection systems in traffic • Traffic management • traffic flow outside of town; Traffic control outside of town (NBA, SBA, KBA) • Economic feasibility study of traffic-influencing measures on the highway (ex-ante / ex-post economic feasibility study, FMEA, SWAT analysis, ...) • Traffic effects, traffic safety parameters • Individual and collective traffic management systems • Practical example for the basic determination, preliminary planning and draft planning of a traffic system • Public transport • Inner-city streets • Nodes • Computer-assisted routing (with AutoCAD Civil 3D) • Base layers • Cover layers • Traffic noise protection
Literature:
Will be specified at the beginning
Additional remarks:
None

Timber Construction & Ressource Management			
Module abbreviation:	SCE_TimbConstruc&RessManagm	Reg.no.:	26
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	4
Responsible for module:			
Lecturer:	(SCE_TimbConstruc&RessManagm) (SCE_TimbConstruc&RessManagmAdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	26: Timber Construction & Ressource Management 26: Timber Construction & Ressource Management (admission requirement)		
Lecture types:	Timber Construction & Ressource Management: SU/Ü - lecture with integrated exercises Timber Construction & Ressource Management (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Timber Construction & Ressource Management: schrP90 - written exam, 90 minutes Timber Construction & Ressource Management (admission requirement): LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The students are able to name and classify the properties of wood, explain wood materials and determine modification values according to EC5 depending on the situation. You can recognize cases of stability, calculate the load-bearing capacity of rod-shaped wooden components with normal force and bending stress, taking stability into account, and analyze the usability of bending beams.</p> <p>You have the ability to independently carry out calculations and verifications of simple beams and supports made of wood.</p>			

Content:
<ul style="list-style-type: none">• basics and areas of application of timber construction• material properties: wood products, structure and construction, building material tests• basics of design according to Eurocode 5: Safety concepts in timber construction, limit states of load-bearing capacity, stability of individual components, deflection verifications, connections in timber construction• wood protection: influence on load-bearing capacity, usage classes, structural wood protection
Literature:
Will be specified at the beginning
Additional remarks:
None

Digital Operation Management in Building Information Modeling			
Module abbreviation:	SCE_DigitOperationManagm_BIM	Reg.no.:	27
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	6
Responsible for module:			
Lecturer:			
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:	47 h	
	Self-study:	78 h	
	Total:	125 h	
Subjects of the module:	27: Digital Operation Management in Building Information Modeling		
Lecture types:	SU/Ü/PR - seminar based teaching/Exercise course/laboratory		
Availability of the module:	None		
Examinations:			
schrP90 - written exam, 90 minutes			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>Students can apply methods of digital planning and lean design in the planning process of buildings and create a responsibility-based collaborative planning process based on the pull principle.</p> <p>The students are able to carry out essential project controlling tasks. The students can describe traditional and collaborative planning and differentiate between them.</p> <p>The students will be able to explain the application and effectiveness of Lean in planning. Students can describe, select and use digital tools to support lean planning.</p> <p>Students can apply methods of digital planning and lean design in the planning process of buildings.</p>			
Content:			
<p>The following content is developed through seminar-style teaching, supplemented by group work and discussion:</p> <ul style="list-style-type: none"> ·Use of digital tools ·How Lean works in planning · Basics of digital models of a building • Use of relevant information and data about the building throughout its entire life cycle 			

<ul style="list-style-type: none">• Modeling and coordination of building data models• Use of IT solutions for BIM processes• Application of BIM organization in the company• Implementation of model-based planning, calculation, billing and controlling
Literature:
Will be specified at the beginning
Additional remarks:
None

Advanced Construction Methods			
Module abbreviation:	SCE_AdvancedConstrMeth	Reg.no.:	28
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	6
Responsible for module:			
Lecturer:	(SCE_AdvancedConstrMeth) (SCE_AdvancedConstrMeth_AdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	28: Advanced Construction Methods 28: Advanced Construction Methods (admission requirement)		
Lecture types:	Advanced Construction Methods: SU/Ü - lecture with integrated exercises Advanced Construction Methods (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Advanced Construction Methods: schrP120 - written exam, 120 minutes Advanced Construction Methods (admission requirement): LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
The students know important construction methods in building construction, civil engineering and infrastructure construction. You can determine suitable construction methods based on ecological, technical and economic criteria. You can use ecological, technical and economic criteria to evaluate whether renovation, conversion or new construction makes sense.			
Content:			
<ul style="list-style-type: none"> • resource-saving and durable construction of buildings. • building in existing buildings • climate-neutral construction • climate-adapted building construction methods:			

wood construction techniques, masonry construction, modular construction methods, (wooden) solid construction, lightweight construction, bionic architecture, 3 D printing, half-timbered construction
Literature:
Will be specified at the beginning
Additional remarks:
None

Digital Building Automation and Renewable Energy			
Module abbreviation:	SCE_DigBuildAutom_RE	Reg.no.:	29
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	6
Responsible for module:			
Lecturer:			
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:	47 h	
	Self-study:	78 h	
	Total:	125 h	
Subjects of the module:	29: Digital Building Automation and Renewable Energy		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
schrP90 - written exam, 90 minutes			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The students know the individual trades of technical building equipment (TGA) and their dependencies as well as essential parameters of the devices and systems used. You can dimension basic TGA systems and assess interfaces between the TGA and the supporting structure. You know and avoid potential conflicts between the trades.</p> <p>You are able to carry out the planning implementation of building technology systems.</p>			
Content:			
<ul style="list-style-type: none"> • Electrical engineering (high and low current systems, lightning protection, lighting) • Building automation • Elevator systems • Structural fire protection and fire extinguishing systems • Sanitary technology: drinking water, industrial water, wastewater, protection against backflow • Air conditioning systems as well as air conditioning and refrigeration technology • Heating technology with a focus on renewable energies • Photovoltaics 			

Literature:
Will be specified at the beginning
Additional remarks:
None

Construction Project and Sustainability Management			
Module abbreviation:	SCE_ConstProjSustainManag	Reg.no.:	30
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	6
Responsible for module:			
Lecturer:			
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:	47 h	
	Self-study:	78 h	
	Total:	125 h	
Subjects of the module:	30: Construction Project and Sustainability Management		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
schrP90 - written exam, 90 minutes			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The students know the different perspectives and phases of construction projects and can apply the corresponding methods of project management and project control in the project. In addition, they know the key sustainability goals and associated measures in planning and execution. After completing the module, students will be able to integrate and apply the methods for achieving sustainability goals in construction projects in all project phases, taking into account any possible funding.</p>			
Content:			
<p>The following content is developed through seminar-style teaching, supplemented by group work and practical lectures as well as their discussion:</p> <ul style="list-style-type: none"> • Project phases according to HOAI • Basics of project management • Methods of project control and management • Sustainability aspects in construction projects • Basics of DGNB and BNB • Lean Construction Management / Last Planner 			

<ul style="list-style-type: none">• Contract management, contract drafting• Project alliance, multi-party contracts• Funding landscape/funds
Literature:
Will be specified at the beginning
Additional remarks:
None

Sustainable Buildings and Structures			
Module abbreviation:	SCE_SustainBuildStruc	Reg.no.:	31
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	7
Responsible for module:			
Lecturer:			
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	3 ECTS / 3 SWS		
Workload:	Contact hours:	24 h	
	Self-study:	51 h	
	Total:	75 h	
Subjects of the module:	31: Sustainable Buildings and Structures		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
LN - project work			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The content of the module includes, among other things, building in existing buildings, building with renewable raw materials, recycling building materials and testing the load-bearing behavior of new building materials. After completing the module, students have in-depth knowledge of the material-ecological comparison of load-bearing construction materials, strategies and tools for optimization in structural design, and the life cycle analysis of load-bearing structures according to ISO 14040/14044.</p> <p>After expanding their knowledge, students can carry out condition monitoring (according to DIN ISO 17359) using Structural Health Monitoring (SHM) in order to examine the load-bearing capacity of new building materials.</p> <p>Case studies for existing structures.</p>			
Content:			
<p>The following content is developed through seminar-style teaching, supplemented by group work and discussion:</p> <ul style="list-style-type: none"> • Sustainability criteria in structural planning • Strategies and tools for optimization in structural design 			

<ul style="list-style-type: none">• Material-ecological comparison of load-bearing construction materials• Life cycle analysis of supporting structures according to ISO 14040/14044• Sustainability ductility earthquakes• SHM
Literature:
Will be specified at the beginning
Additional remarks:
None

Sustainable Structural Engineering			
Module abbreviation:	SCE_SustainStructEngin	Reg.no.:	32
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	7
Responsible for module:			
Lecturer:	(SCE_SustainStructEngin) (SCE_SustainStructEngin_AdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	32: Sustainable Structural Engineering 32: Sustainable Structural Engineering (admission requirement)		
Lecture types:	Sustainable Structural Engineering: SU/Ü - lecture with integrated exercises Sustainable Structural Engineering (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Sustainable Structural Engineering: schrP90 - written exam, 90 minutes Sustainable Structural Engineering (admission requirement): LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
Students can assess buildings and construction measures based on a wide range of criteria with regard to sustainability aspects and goals, both in building construction and civil engineering projects. You can carry out a structured investigation into the implementation of sustainability aspects in all phases of a construction project and, based on this, develop strategies for achieving sustainability goals.			
Content:			
The following content is developed through seminar-style teaching, supplemented by group work and practical lectures and case studies as well as their discussion: <ul style="list-style-type: none"> • Sustainability aspects in construction projects • Criteria according to DGNB and BNB • Dealing with conflicting goals 			

<ul style="list-style-type: none">• Sustainability strategies in planning, execution and operation• Contract management/multi-party contracts• case studies on projects in planning/construction/operation
Literature:
Will be specified at the beginning
Additional remarks:
None

Life Cycle & Climate Change Adaption Engineering			
Module abbreviation:	SCE_LifeCycleClimateChangeAdapEng	Reg.no.:	33
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	7
Responsible for module:			
Lecturer:	(SCE_LifeCycleClimateChangeAdapEng) (SCE_LifeCycleClimateChangeAdEng_AdRequ)		
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:		47 h
	Self-study:		78 h
	Total:		125 h
Subjects of the module:	33: Life Cycle & Climate Change Adaption Engineering 33: Life Cycle & Climate Change Adaption Engineering (admission requirement)		
Lecture types:	Life Cycle & Climate Change Adaption Engineering: SU/Ü - lecture with integrated exercises Life Cycle & Climate Change Adaption Engineering (admission requirement): SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
Life Cycle & Climate Change Adaption Engineering: schrP90 - written exam, 90 minutes Life Cycle & Climate Change Adaption Engineering (admission requirement): LN - participation without/with success Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
The students know the factors of durability and life cycle costs of buildings. You can weigh up and optimize life cycle costs and resource use. They can plan buildings in such a way that later conversion or reuse is easily possible, and they know renovation concepts to extend their useful life.			
Content:			
<ul style="list-style-type: none"> Life span measurement Reuse of buildings (circular economy) 			

<ul style="list-style-type: none">• Conversion and renovation concepts• Durability of components• Structural building protection
Literature:
Will be specified at the beginning
Additional remarks:
None

Civil Engineering Project Management			
Module abbreviation:	SCE_CivilEnginProjManag	Reg.no.:	34
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Sub- ject	6
Responsible for module:			
Lecturer:			
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	5 ECTS / 4 SWS		
Workload:	Contact hours:	47 h	
	Self-study:	78 h	
	Total:	125 h	
Subjects of the module:	34: Civil Engineering Project Management		
Lecture types:	SU/Ü - lecture with integrated exercises		
Availability of the module:	None		
Examinations:			
SA - Seminar paper with oral examination (15min) and written elaboration (8-15 pages)			
Additional Explanation: None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>The students work in a team to solve a self-contained, demanding technical task on their own responsibility over the course of a semester. They can independently familiarize themselves with a topic that is new to them and successfully work on it independently using their basic knowledge. You are able to structure the task in a team, prioritize sub-steps and implement them into methodical steps. As a team, you can independently develop an overall solution that is relevant to the task. Every team member is able to verbally explain the overall solution, justify it and present the results. You will master the use of project management methods to solve tasks in groups within a given time frame.</p>			
Content:			
<ul style="list-style-type: none"> Working on a semester-long project task in a team. The project tasks differ from semester to semester. Several different project topics are offered, from which students can choose one depending on availability. 			
Literature:			
Will be specified at the beginning			

Additional remarks:

None

Construction Internship (18 Weeks)			
Module abbreviation:	SCE_ConstructionInternsh	Reg.no.:	38
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	5
Responsible for module:			
Lecturer:			
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	27 ECTS / 0 SWS		
Workload:	Contact hours:	0 h	
	Self-study:	675 h	
	Total:	675 h	
Subjects of the module:	38: Construction Internship (18 Weeks)		
Lecture types:	Pr - laboratory		
Availability of the module:	None		
Examinations:			
Internship report			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
The students are introduced to the work of an engineer using specific tasks. The students get an overview of the technical and operational processes of a company with an industrial focus.			
Content:			
<ul style="list-style-type: none"> Independent collaboration on projects and problems whose topics are closely related to the completed studies or represent a valuable addition. Application and deepening of knowledge, methods and procedures that are taught and conveyed in theoretical studies 			
Literature:			
Will be specified at the beginning			
Additional remarks:			
None			

Scientific Methods			
Module abbreviation:	SCE_ScientificMethods	Reg.no.:	39
Curriculum:	Programme	Module type	Semester
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	5
Responsible for module:			
Lecturer:			
Language of instruction:	English	Language of exam:	English
Credit points / SWS:	3 ECTS / 2 SWS		
Workload:	Contact hours:		24 h
	Self-study:		51 h
	Total:		75 h
Subjects of the module:	39: Scientific Methods		
Lecture types:	S - seminar		
Availability of the module:	None		
Examinations:			
LN - project work			
Additional Explanation:			
None			
Prerequisites according examination regulation:			
None			
Recommended prerequisites:			
None			
Objectives:			
<p>After successful participation in this module, students are able to design a scientific paper on a specific question. For this purpose, they are able to carry out a literature research and weight individual literature references according to their importance for the question.</p> <p>You will be able to plan any necessary practical experiments and estimate the material and time required. They are able to prepare protocols and reports that make their work understandable for experts. They know the forms of quoting and can use them. You are able to write scientific publications about your own work or other people's work (reviews).</p> <p>You are able to design and give lectures and presentations.</p>			
Content:			
<p>The following content is developed through seminar-style teaching, supplemented by group work and discussion:</p> <ul style="list-style-type: none"> Methodical introduction to scientific work, hypothesis formation, objectivity, accuracy, logic 			

<ul style="list-style-type: none">• Literature research methods• Forms and standards of citation• Creating work plans, minutes and reports• Preparation of scientific publications
Literature:
Will be specified at the beginning
Additional remarks:
None