Technische Hochschule Ingolstadt

Module Handbook

B.Eng. SUSTAINABLE CIVIL ENGINEERING (SPO WS 23/24)

Faculty of Sustainable Infrastructure

Study and examination regulation WS 23/24

Created on 23.07.2026

Content

1 Overview

The module handbook describes the individual modules of the degree programme Sustainable Civil Engineering. It describes the course contents, the intended learning outcomes and the examination requirements of the modules. In addition, the objectives of the degree programme and possible professional profiles resulting from studying Sustainable Civil Engineering are described.

Name of the Study Programme	Sustainable Civil Engineering
Type of Study Programme & Degree	Undergraduate programme, Bachelor of Engineering (B.Eng.), full-time
Profile §12 (6)BayStudAkkV:	Full-time (also available as a dual study programme)
Initial Start Date	Winter term 2023, start summer term and winter term Last start in winter term 2025
Standard Period of Study	8 Semester (210 ECTS)
Place of Study	THI Sustainability Campus Neuburg
Language(s) of Instruction	English
Cooperation according to §§19–20 BayStudAkkV	None
Admission Requirement	University entrance qualification

Head of Study Programme:

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2 Introduction

2.1 Objective

The objective of the Bachelor's degree programme Sustainable Civil Engineering is to educate students as practice-oriented engineers. The programme provides students with a strong foundation in civil engineering and practical competencies that enable graduates to address the wide range of challenges in civil engineering practice with a particular focus on sustainability.

Civil engineers are responsible for the planning, design, calculation, construction and safe operation of structures. They ensure the safety, serviceability, economic efficiency and sustainability of both new and existing buildings and infrastructure. With its transdisciplinary approach, the programme combines core disciplines of civil engineering with principles of sustainability, environmental sciences and social aspects.

In addition to technical competencies, students acquire social and methodological skills that enable them to address civil engineering tasks responsibly and to integrate sustainability principles into engineering practice.

2.2 Admission and Language Requirements

Admission to the Bachelor's degree programme requires that applicants meet the general admission requirements for universities of applied sciences.

The programme is governed by the following regulations:

- Studienprüfungsordnung (SPO): Study and Examination Regulations for the Bachelor's degree programme Sustainable Civil Engineering (23 January 2023) including the appendix (23 January 2023)
- Allgemeine Prüfungsordnung (APO): General Examination Regulations of Technische Hochschule Ingolstadt (as amended)
- Immatrikulationssatzung: Enrolment Regulations of Technische Hochschule Ingolstadt (as amended)

A pre-study internship (Vorpraxis) is not required for admission to the Bachelor's degree programme.

2.3 Target Group

The degree programme is aimed at:

- students with a strong interest in STEM (Science, Technology, Engineering and Mathematics) subjects who wish to shape an individual study profile within a defined academic framework.
- individuals interested in technology and processes who want to understand how infrastructure and buildings are planned, constructed and operated.
- future professionals who aim to contribute to sustainable development in the construction sector and who consider economic, ecological and socio-cultural aspects in planning and construction processes.

2.4 Structure of the Programme

The standard period of study is seven semesters. The programme consists of two study phases. The first study phase (Semester 1 to Semester 2) comprises two theoretical semesters. The second study phase (Semester 3 to Semester 7) comprises four theoretical semesters and one practical semester in the fifth semester.

The following diagram illustrates the structure of the programme for the start of studies in the winter semester.

Study Programme SCE – SPO 2023 (Start of Studies in the Winter Semester)

7. Semester	Bachelor Thesis (8 weeks) 25 SWS / 12 ECTS		Sustainable Buildings and Structures 2 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. Semester	Digital Operation Management and 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. Semester	Construction Internship (18 weeks) 24 ECTS					Scientific Methods 2 SWS / 3 ECTS
4. Semester	Reinforced Concrete Design II 4 SWS / 5 ECTS	Steel Construction 4 SWS / 5 ECTS	Law 5 SWS / 5 ECTS	Geotechnics II and Soil Mechanics 5 SWS / 5 ECTS	Sustainable Transport Technology 4 SWS / 5 ECTS	Timber Construction & Resource Management 4 SWS / 5 ECTS
3. Semester	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. Semester	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. Semester	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 4 SWS / 5 ECTS	Sustainability in Construction 2 SWS / 2 ECTS Chemistry & Building Materials 4 SWS / 4 ECTS	Building Physics / Energy Efficiency 3 SWS / 3 ECTS

2.5 Advancement requirements

Second Study Phase

Students may enter the fourth semester only after having obtained at least 42 ECTS credits from the modules of the first study phase.

Internship

Students may begin the internship only after having passed all examinations and assessments of the first study phase and having obtained at least 20 ECTS credits from the compulsory modules of the second study phase.

2.6 Programme Design and Advisory Board

The degree programme was designed by subject experts at Technische Hochschule Ingolstadt in collaboration with representatives from professional practice and is continuously being further developed.

3 Qualification Profile

3.1 Mission Statement

The degree programme directly reflects the general mission statement of Technische Hochschule Ingolstadt: “Personalities and innovations – for a future worth living.” The programme concept addresses the following key principles:

- We develop personalities for the professional world of the future.
- We create innovations and live sustainability – technology and business are our focus.
- We promote knowledge transfer to industry and society.
- We teach, conduct research and work in an international and interdisciplinary environment.
- We act with humanity, passion and openness to the world.

3.2 Programme Objectives

Students acquire a solid foundation in all core fields of civil engineering, complemented by topics related to digitalisation and sustainability.

3.2.1 Discipline-specific Knowledge and Skills of the Programme

Upon completion of the programme, students are able to:

- classify and understand procedures, processes and methods used in civil engineering
- apply common tools used in civil engineering practice
- identify engineering problems in civil engineering and develop appropriate solutions
- develop sustainable construction projects while considering technical, economic and socio-economic aspects

3.2.2 Interdisciplinary Knowledge and Skills of the Programme

Upon completion of the programme, students are able to:

- communicate results clearly and precisely
- apply their analytical skills and technical reasoning in teamwork to develop sustainable solutions
- evaluate solutions from different perspectives and balance ecological, economic, ethical and social considerations in collaborative decision-making
- apply their theoretical knowledge and practical experience in professional engineering practice

3.2.3 Examination Concept of the Programme

Many modules include admission requirements in order to encourage continuous engagement with the course content throughout the semester.

The forms of assessment allow the evaluation of the intended learning outcomes and complement the seminar-style teaching approach employed throughout the programme.

3.2.4 Practical Orientation of the Programme

The degree programme was developed in close cooperation with industry and is taught by academic staff with professional experience. It provides practice-oriented content and enables students to gain practical experience.

Laboratory exercises and tutorials link theoretical foundations with practical applications. Interdisciplinary project work brings together the knowledge acquired by students and provides opportunities to collaborate in small teams.

3.2.5 Contribution of Individual Modules to the Programme Objectives

The degree programme provides fundamental knowledge in mathematics, engineering, scientific methods and business management through its compulsory modules. These foundations are complemented by topics related to digitalisation and sustainability.

These foundations are complemented by content related to digitalisation and sustainability.

The following diagram presents the competence matrix of the compulsory modules.

	Technical knowledge and skills					Personal and interpersonal skills			
	classify and understand procedures, processes and methods used in civil engineering	apply commonly used tools in civil engineering practice	identify engineering problems in civil engineering and develop appropriate solutions	develop sustainable construction projects while considering technical, economic and socio-economic aspects	critically analyse data using established scientific methods	communicate results clearly and precisely	apply analytical skills and technical reasoning in teamwork to develop sustainable solutions	evaluate solutions from different perspectives and balance ecological, economic, ethical and social considerations in team-based decision-making	apply theoretical knowledge and practical experience effectively in professional engineering practice
Introduction Project	x	x		x		x		x	
Mathematics I		x			x				
Mechanics I	x	x	x						
Chemistry & Building Materials	x	x	x						
Building Constructions I	x	x					x		
Computer Programming; Computer Aided Design and Calculation in Civil Engineering	x	x				x	x		
Building Physics/Energy Efficiency	x	x		x					
Sustainability in Construction	x	x			x			x	
Mathematics II		x			x				
Mechanics II	x	x	x				x		
Sustainable Construction Materials	x	x	x		x	x			
Low Carbon Construction		x	x	x		x			
Surveying	x	x	x			x			
Construction Management/Entrepreneurship	x	x	x	x		x		x	
Structural Analysis	x	x	x				x		
Introduction Geotechnics and Transport Technology	x	x	x		x	x	x		x
Sustainable Transport Technology	x	x	x		x	x	x		x
Reinforced Concrete Design I	x	x	x		x	x	x		
Fluid Mechanics & Hydro Mechanics	x	x	x			x	x		
Sustainable Design and Management of Buildings and Structures	x	x	x	x		x	x	x	
Reinforced Concrete Design II	x	x	x		x	x		x	

	Technical knowledge and skills					Personal and interpersonal skills			
	classify and understand procedures, processes and methods used in civil engineering	apply commonly used tools in civil engineering practice	identify engineering problems in civil engineering and develop appropriate solutions	develop sustainable construction projects while considering technical, economic and socio-economic aspects	critically analyse data using established scientific methods	communicate results clearly and precisely	apply analytical skills and technical reasoning in teamwork to develop sustainable solutions	evaluate solutions from different perspectives and balance ecological, economic, ethical and social considerations in team-based decision-making	apply theoretical knowledge and practical experience effectively in professional engineering practice
Steel Construction	x	x	x			x			
Law	x					x		x	
Geotechnics & Soil Mechanics	x	x	x			x			
Timber Construction & Ressource Management	x	x	x			x			
Construction Project and Sustainability Management	x	x	x	x		x		x	x
Digital Building Automation and Renewable Energy	x	x		x		x	x	x	x
Civil Engineering Project			x	x	x	x	x	x	
Advanced Construction Methods		x	x			x	x	x	x
Sustainable Structural Engineering	x	x	x	x	x		x	x	
Life Cycle & Climate Change Adaption Engineering		x	x	x	x			x	x
Sustainable Buildings and Structures		x	x	x	x		x	x	x

3.3 Possible Career Fields

Graduates of the programme are qualified for a wide range of professional activities in the civil engineering sector and are prepared for both technical and managerial responsibilities.

Possible professional fields include:

- structural and building engineering
- infrastructure engineering and construction
- project and construction management
- engineering consulting and planning
- construction materials industry

Typical areas of professional activity for graduates include:

- planning and design of buildings and infrastructure
- management and supervision of construction projects
- technical design and engineering analysis
- consulting and advisory services in engineering projects
- development and implementation of sustainable construction solutions

3.4 Dual Study Programme

In cooperation with selected industry partners, the degree programme can also be completed as a dual study programme. The dual study programme is offered in two formats:

I. as a combined study programme, in which university studies are combined with regular vocational training (apprenticeship), and

II. as a study programme with extended practical phases, in which the regular studies are complemented by intensive practical experience in a partner company.

In both dual study models, university and practical phases alternate regularly throughout the programme, particularly during semester breaks, the practical semester and the preparation of the Bachelor's thesis. Lecture periods in the dual study models correspond to the regular lecture periods at THI.

Due to the extended practical phases, the integration of company-related topics into selected modules and the inclusion of specially designed modules for dual study programmes, students develop strong practical skills as well as company-, discipline- and industry-specific skills. In addition to technical skills, elements of personal development, such as presentation and communication skills, teamwork and work organisation are also promoted. As a result, graduates can be integrated more quickly into departments, projects and processes within construction companies.

The curriculum of the two dual study models differs from the regular study programme as follows:

- In both dual study models, the practical semester is completed in the partner company.
- In both dual study models, the Bachelor's thesis is written in cooperation with the partner company, usually on a practice-oriented topic related to the chosen focus area.

In terms of organisation, the two dual study programme models are characterised by the following components:

- The central contact person for dual students within the faculty is the programme director who organises an annual mentoring meeting with the dual students of the programme.
- Evaluations and surveys conducted at THI for quality assurance of the dual study programme include separate question sections for dual students.
- The event ‘Forum dual’ is organised once a year by the Career Service and Student Advisory Service (CSS). The ‘Forum dual’ promotes professional and organisational exchange between partner companies and the faculty and supports the quality assurance of the dual study programmes. All partner companies, faculty representatives and dual students are invited to participate.

The formal regulations governing dual study programmes at THI are defined in the General Examination Regulations (APO) (§17) and the Enrolment Regulations (§13 (1) sentence 18, §14 (5), §21 (3) sentence 5, §23 (10)).

4 Description of Modules

4.1 Compulsory modules

Introduction Project			
Module abbreviation	SCE_IP	**Reg.-Nr.**	1
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Blask, Oliver		
Lecturer(s)	Blask, Oliver		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	2 ECTS / 1 SWS		
Workload	Contact hours		12 h
	Self-study		38 h
	Total		50 h
Subjects of the module	Introduction Project		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

LN - colloquium before exam period

Additional explanations regarding examinations

Colloquium: Students must defend the results of their work in an oral examination or a presentation lasting 10-15 minutes.

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing the module, students will be able to...

- apply basic principles of civil engineering in a practical project.
- develop creative concepts in terms of sustainable construction.
- reflect on the concepts they have developed on the basis of framework conditions.
- present the results of their work to a specialist audience.

Content

- Learning and working techniques
- Fundamentals of graphic design
- Fundamentals of building construction
- Successful presentations

Literature

Will be specified at the beginning

Additional remarks

None

Mathematics I			
Module abbreviation	SCE_Math_I	**Reg.-Nr.**	2
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Müller, Marvin		
Lecturer(s)	Müller, Marvin (SCE_Math_I) Müller, Marvin (SCE_Math_I_AR)		
Language of instruction	English	**Language of exams**	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		

Examinations

2: schrP120 - written exam, 120 minutes
2: LN - participation without/with success

Additional explanations regarding examinations

Applies only to the Study and Examination Regulations for the Winter Semester 2023/24:

Students must achieve 50% of the possible points on a homework assignment (submitted individually). The deadline will be announced during the course.

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

Professional competence - Students will be able to:

- work confidently with real and complex numbers.
- solve equations and inequalities with one variable.
- identify function types relevant to engineering.
- apply methods of differential and integral calculus of one variable to engineering problems.
- perform basic matrix and vector operations.
- determine solution sets of linear systems of equations.

Personal and social skills - Students are able to:

- discuss and evaluating mathematical solution strategies in a team.

- give constructive feedback on solutions to fellow students.
- present complex mathematical concepts clearly to the group.

Content

- Fundamentals of mathematics (sets and functions, properties of important number systems, introduction to complex numbers)
- Elementary functions and their properties, limits of functions and sequences
- Differential calculus (differentiability, differentiation rules, applications of differential calculus)
- Integral calculus (antiderivatives, definite and indefinite integrals, basic integration rules)
- Fundamentals of linear algebra
  - Vector algebra and matrices
  - Linear mappings and linear systems of equations

Literature

- RILEY, Kenneth F., Michael P. HOBSON und Stephen J. BENCE, 2006. *Mathematical methods for physics and engineering*. 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. Verfügbar unter: 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. Verfügbar unter: https://doi.org/10.1007/978-3-030-64980-7.

Additional remarks

Bonus points: none

Mechanics I			
Module abbreviation	SCE_Mech_I	**Reg.-Nr.**	3
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Bochert, Jana Sue		
Lecturer(s)	Bochert, Jana Sue		
Language of instruction	English	**Language of exams**	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 - seminar-based teaching with exercise		

Examinations

3: schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

Professional competence - Students will be able to:

- Set up and calculate force systems.
- Perform static calculations on simple structural models.
- Translate reality into static systems in order to combine practice with theory.
- Determine support reactions, the centre of gravity and internal forces.

Personal and social skills – Students will be able to:

- develop analytical skills so that they can apply them in plausibility checks of computer-aided structural analyses.

Content

- Static basics: Forces, moments and their composition or decomposition
- Equilibrium on structures
- Section principle
- Center of gravity calculation
- Support reactions and internal forces of statically determinate systems,
- Area moments of inertia
- Statically determinate and indeterminate structures

• Introduction to computer-aided structural analysis
Literature
• GROSS, D., W. HAUGER und W. SCHNELL, . *Engineering Mechanics 1*. [s.l.]: Statics Springer Verlag. • GROSS, Dietmar, EHLERS, Wolfgang, WRIGGERS, Peter, SCHRÖDER, Jörg, MÜLLER, Ralf, 2017. *Statics – formulas and problems: engineering mechanics 1* [online]. Berlin ; Heidelberg: Springer. PDF e-Book. ISBN 978-3-662-53854-8. Verfügbar unter: https://doi.org/10.1007/978-3-662-53854-8.
Additional remarks
Bonus points: none

Building Constructions I

Module abbreviation	SCE_BuildCon	**Reg.-Nr.**	4
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Angerer, Ludwig		
Lecturer(s)	Weiss, Daniel (SCE_BuildCon) Weiss, Daniel (SCE_BuildCon_AR)		
Language of instruction	English	**Language of exams**	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 4: Building Constructions I (admission requirement)		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

4: schrP120 - written exam, 120 minutes
4: LN - participation without/with success

Additional explanations regarding examinations

Students must pass a homework assignment (submitted individually). The requirements will be announced during the course.

Prerequisites according examination regulation

none

Recommended prerequisites

Successful completion of the module Building Physics/Energy Efficiency

Objectives

After completing the module, students will be able to...

- understand the functioning of buildings in terms of supporting structure, bracing, foundation, building envelope, building physics and fire protection.
- be able to draw simple buildings in plans using CAD.
- apply the basic rules of architectural drawing and 3-dimensional planning.
- apply the basics of building law and planning standards.

Content

- 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

- ALLEN, Edward und Joseph IANO, 2019. *Fundamentals of building construction: materials and methods*. Hoboken, New Jersey: Wiley. ISBN 978-1-119-44619-4
- MERRITT, Frederick S. und Jonathan T. RICKETTS, 2001. *Building design and construction handbook*. New York: McGraw-Hill. ISBN 0-07-041999-X, 9780070419995
- ALBERT, Andrej, Klaus-Jürgen SCHNEIDER und Alfons GORIS, 2022. *Bautabellen für Ingenieure: mit Berechnungshinweisen und Beispielen*. 25. Auflage. Köln: Reguvis. ISBN 978-3-8462-1316-2
- NEUFERT, Ernst und andere, 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. Auflage. Wiesbaden: Springer Vieweg. ISBN 978-3-658-34236-4, 3-658-34236-6
- HESTERMANN, Ulf und andere, 2025. *Frick/Knöll Baukonstruktionslehre 1*. 37. Auflage. Wiesbaden: Springer Fachmedien Wiesbaden. ISBN 978-3-658-42178-6
- HESTERMANN, Ulf und Ludwig RONGEN, 2018. *Frick/Knöll Baukonstruktionslehre 2*. 35. Auflage. Wiesbaden: Springer Vieweg. ISBN 978-3-658-21912-3
- METTLER, Daniel, SCHEIDT, Paula, STUDER, Daniel, 2021. *Construction: Manual* [online]. Basel: Birkhäuser. PDF e-Book. ISBN 978-3-0356-2229-4. Verfügbar unter: https://doi.org/10.1515/9783035622294.

Additional remarks

None

Computer Programming; Computer Aided Design and Calculation in Civil Engineering

Module abbreviation	SCE_CPCADC	**Reg.-Nr.**	5
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Bochert, Jana Sue		
Lecturer(s)	Davis, Alicia; Pichlmeier, Franziska		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 5 SWS		
Workload	Contact hours		59 h
	Self-study		66 h
	Total		125 h
Subjects of the module	Computer Programming; Computer Aided Design and Calculation in Civil Engineering		
Lecture types	SU/Ü/Pr - seminar-based teaching with exercise and practical training		

Examinations

schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing the module, students will be able to ...

- apply the spectrum of computer-aided calculations in the construction and business sector, for example in the areas of
  - Structural analysis for structural analyses
  - Construction planning with CAD programs
  - Planning and construction with BIM systems
- implementing mathematical algorithms and data structures by learning a programming language and transferring them to construction-specific or general IT tasks.
- interpret the coding of information, binary data, numbers
- define circuit networks, computer architecture, machine language

Content

- Basic disciplines of building informatics
- Building-specific application software for structural analysis and carrying out plausibility checks
- Structures are modeled using CAD programs and recorded in Building Information Modeling (BIM) systems

• Techniques for data exchange via networks • Building-specific application software for specialist areas of civil engineering • Functionality of a higher programming language • Computer algebra systems and their possible applications • Algorithms and data structures • Object-oriented programming • Binary data, numbers
Literature
Will be specified at the beginning
Additional remarks
None

Chemistry & Building Materials			
Module abbreviation	SCE_C&BM	**Reg.-Nr.**	6
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Blask, Oliver		
Lecturer(s)	Blask, Oliver		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		47 h
	Self-study		78 h
	Total		125 h
Subjects of the module	Chemistry & Building Materials		
Lecture types	SU/Ü/Pr - seminar-based teaching with exercise and practical training		

Examinations

schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

Professional competence - Students will be able to:

- assess how important substances react with each other.
- assess the environmental impact of the production of important building materials.
- select building materials based on their mechanical and physical properties.
- Derive the mechanical properties of building materials from their structure.
- Use building materials in such a way that high-quality building elements are created.

Content

- Fundamentals of general and inorganic chemistry
- Composition and structure of building materials
- Raw materials and production of building materials
- Mechanical and physical properties of building materials
- Practical experiment: production of concrete

Literature

- TAYLOR, G.D., 2013. *Materials in Construction: an introduction* [online]. New York: Routledge. PDF e-Book. ISBN 978-1-315-83915-8. Verfügbar unter: https://doi.org/10.4324/9781315839158.

- BENVENUTO, Mark Anthony. *Materials Chemistry* [online]. Berlin/Boston: de Gruyter. PDF e-Book. ISBN e-ISBN (PDF) 978-3-11-065677-0. Verfügbar unter: https://doi.org/10.1515/9783110656770-202.
- TIMBERLAKE, Karen C., 2019. *Chemistry: an introduction to general, organic, and biological chemistry*. 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*. Boston: Pearson. ISBN 978-8177581300
- KULTERMANN, Eva und William P. SPENCE, 2022. *Construction, materials, methods, and techniques: building for a sustainable future*. Boston, MA: Cengage. ISBN 978-0-357-51383-5

Additional remarks

Bonus points: none

Building Physics/Energy Efficiency			
Module abbreviation	SCE_BP/EE	**Reg.-Nr.**	7
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Blask, Oliver		
Lecturer(s)	Blask, Oliver; Davis, Alicia; Pichlmeier, Franziska		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	3 ECTS / 3 SWS		
Workload	Contact hours		35 h
	Self-study		40 h
	Total		75 h
Subjects of the module	Building Physics/Energy Efficiency		
Lecture types	SU/Ü/Pr - seminar-based teaching with exercise and practical training		

Examinations

LN - written exam, 90 minutes

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing the module, students will be able to...

- Calculate U-values of building elements.
- Calculate heat losses through flat wall elements.
- Calculate if and where condensation forms in a building element.
- Take measures to prevent mold growth.
- Recognize thermal bridges and take measures to avoid them.

Content

- Physical fundamentals of building physics
- Fundamentals of thermal insulation
- Fundamentals of moisture protection in buildings

Literature

- PINTERIĆ, Marko, 2021. *Building Physics: From physical principles to international standards* [online]. Cham: Springer International Publishing. PDF e-Book. ISBN 978-3-030-67372-7. Verfügbar unter: https://doi.org/10.1007/978-3-030-67372-7.

Additional remarks
None

Sustainability in Construction

Module abbreviation	SCE_SiC	**Reg.-Nr.**	8
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	1
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Blask, Oliver		
Lecturer(s)	Bergmann, Daniela; Blask, Oliver		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	2 ECTS / 2 SWS		
Workload	Contact hours		24 h
	Self-study		26 h
	Total		50 h
Subjects of the module	Sustainability in Construction		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

mdlP - oral exam, 15-20 minutes

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing the module, students are able to ...

- to realize the rethinking in the construction industry through lectures by experts from science and industry.
- assess the necessity of sustainable construction through the experts' presentations.
- discuss with the experts and are sensitized to the paradigm shift so that the new way of thinking can be transferred and applied to the other modules.

Content

- 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
- raising awareness of current topics in sustainable building

Literature

Will be specified at the beginning

Additional remarks
None

Mathematics II			
Module abbreviation	SCE_Math_II	**Reg.-Nr.**	9
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	2
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Müller, Marvin		
Lecturer(s)	Müller, Marvin (SCE_Math_II) Müller, Marvin (SCE_Math_II_AR)		
Language of instruction	English	**Language of exams**	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	9: SU/Ü - lecture with integrated exercises 9: SU/Ü - lecture with integrated exercises		

Examinations

9: schrP90 - written exam, 90 minutes
9: LN - participation without/with success

Additional explanations regarding examinations

Applies only to the Study and Examination Regulations for the Winter Semester 2023/24:

Students must achieve 50% of the possible points on a homework assignment (submitted individually). The deadline will be announced during the course.

Prerequisites according examination regulation

none

Recommended prerequisites

Successful completion of the module Mathematics I

Objectives

Professional competence - Students will be able to:

- apply methods of differential and integral calculus for multiple variables to engineering problems.
- solve problems in the field of differential and integral calculus.
- solve first-order differential equations and corresponding initial value problems, including:
  - Linear differential equations.
  - Differential equations with separable variables.
- Determine fundamental systems for linear differential equations with constant coefficients (up to second order).

Personal and social skills - Students are able to:

- discuss and evaluating mathematical solution strategies in a team.

- give constructive feedback on solutions to fellow students.
- present complex mathematical concepts clearly to the group.

Content

- Functions of Several Variables
- Differential and integral calculus of functions of several variables
  - Differentiation: Partial derivatives (first-order and second-order), total differentials, linearization, local extrema and saddle points, optimization problems
  - Multiple integrals: Double integrals, triple integrals (applications such as volume, center of mass, moments)
  - Line integrals
- Differential Equations
  - Fundamental concepts (initial value problems)
  - First-order differential equations: Homogeneous and inhomogeneous linear differential equations
  - Second-order differential equations: Homogeneous and inhomogeneous linear differential equations with constant coefficients (applications to mechanical oscillations)

Literature

- RILEY , K. F. , HOBSON , M. P., BENCE , S. J., 2006. *Mathematical Methods for Physics and Engineering: A Comprehensive Guide* [online]. [s.l.]: Cambridge University Press. PDF e-Book. ISBN 978-0-511-16842-0 .
- FRIEDMAN, M., KANDEL , A., 2011. *Calculus light* [online]. Berlin: Springer. PDF e-Book. ISBN 978-3-642-17848-1. Verfügbar unter: https://doi.org/10.1007/978-3-642 17848-1 .
- RAHMANI-ANDEBILI , M., 2021. *Calculus: Practice Problems* [online]. [s.l.]: Springer International Publishing. PDF e-Book. ISBN 978-3-030-64980-7. Verfügbar unter: https://doi.org/10.1007/978-3-030-64980-7.

Additional remarks

Bonus points: none

Mechanics II			
Module abbreviation	SCE_Mech_II	**Reg.-Nr.**	10
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	2
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Bochert, Jana Sue		
Lecturer(s)	Bochert, Jana Sue; Spannaus, Paul (SCE_Mech_II) Bochert, Jana Sue (SCE_Mech_II_AR)		
Language of instruction	English	**Language of exams**	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	SU/Ü - seminar-based teaching with exercise		

Examinations

10: schrP90 - written exam, 90 minutes
10: Student research project without presentation

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

Successful completion of the module Mechanics I

Objectives

Professional competence - Students will be able to:

- master the fundamentals of the design and dimensioning of structures and components.
- apply basic knowledge of strength of materials and the associated theoretical background.
- analyse more complex but statically determined systems.
- outline how to deal with deformation and stress calculations.

Personal and social skills – Students will be able to:

- verbalise questions relating to mechanics
- discuss and classify the task, the solution and the results with fellow students and lecturers.

Content

- Terms and basic relationships in elastostatics
- One- and multidimensional stress and strain states
- Transformation of stresses and strains
- Material law of linear elasticity theory

- Elementary elastostatics of rods and beams
- Shear stresses, centre of shear
- Differential equation of the bending line
- Dimensioning of compression bars (torsion of circular profiles)

Literature

- GROSS, D. und W. HAUGER, 2021. *Engineering Mechanics: Vol.2 Elastostatics* . 14. Auflage.

Additional remarks

Bonus points: none

SCE_Surveying			
Module abbreviation	SCE_Survey	**Reg.-Nr.**	11
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	2
Module frequency	only summer term	**Module duration**	1 semester

Responsible for module	Liepert, Tobias		
Lecturer(s)	Liepert, Tobias (SCE_Survey) Liepert, Tobias (SCE_Survey_AR)		
Language of instruction	English	**Language of exams**	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	SU/Ü/Pr - seminar-based teaching with exercise and practical training		

Examinations

11: schrP90 - written exam, 90 minutes
11: Student research project without presentation

Additional explanations regarding examinations

In six hands-on sessions, practical handling of the various surveying techniques is learned in small groups. The survey results of the hands-on sessions are to be compiled and evaluated by the students.

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

The students are able to:

- explain the functionalities of measurement methods.
- apply selected surveying methods for length, angle, and height measurements.
- organize surveying data from different sources in a georeferenced overall project.
- incorporate surveying information into existing projects or derive from them.
- differentiate survey data in terms of their origin and quality.

Upon completion of the module, the students:

- are trained in practical handling of surveying equipment.
- have improved their teamwork skills.

Content

- Coordinate systems: Reference systems for altitude and position
- Measurements fundamentals: Measurement principles and methods, measurement tolerances Handheld

- Measuring devices: Creation of a simple dimension using a tape measure and meter stick
- Total station: staking out and surveying of buildings
- Laser scanner: Generation and processing of point clouds
- GNSS: Surveying of objects
- Leveling: Transfer and verification of height benchmarks for the establishment of a height reference
- Photogrammetry: Object reconstruction using the example of a facade

Literature

- GILLINS, Daniel T., Michael L. DENNIS und Allan Y. NG, 2022. *Surveying and geomatics engineering: principles, technologies, and applications*. Reston, Virginia: American Society of Civil Engineers. ISBN 978-0-7844-8400-5, 978-0-7844-8422-7
- JAROSCH, Monika, 2023. *Vermessung im Bauwesen: eine Einführung für Bauingenieure und Architekten* [online]. Wiesbaden: Springer Vieweg. PDF e-Book. ISBN 978-3-8348-2118-8. Verfügbar unter: https://doi.org/10.1007/978-3-8348-2118-8.
- KADEN, Robert, 2023. *Leitfaden Geodäsie und BIM: Version 3.2 (2023)*. Augsburg: Wißner-Verlag. ISBN 978-3-95786-346-1, 3-95786-346-5
- PIMPI, Julian, 2023. *Rapid Prototyping für Anwendungen in der Ingenieurgeodäsie*. Neubiberg: Institut für Geodäsie der Universität der Bundeswehr München.

Additional remarks

Bonuspoints for evaluation of the hands-on taks.

Construction Management/Entrepreneurship			
Module abbreviation	SCE_Con_Man_Eship	**Reg.-Nr.**	12
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	2
Module frequency	only summer term	**Module duration**	1 semester

Responsible for module	Reiter, Thomas		
Lecturer(s)	Pistora, Arthur; Reiter, Thomas		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	4 ECTS / 4 SWS		
Workload	Contact hours		45 h
	Self-study		55 h
	Total		100 h
Subjects of the module	Construction Management/Entrepreneurship		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

schrP120 - written exam, 120 minutes

Additional explanations regarding examinations

It is possible to voluntarily acquire up to 10 bonus points, which are credited towards the points achieved in the written examination.

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

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.

Content

The following content is developed through seminar style teaching, supplemented by group work and practical lectures as well as their discussion:

- 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.-Nr.**	13
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	2
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Bergmann, Daniela		
Lecturer(s)	Bergmann, Daniela (SCE_Low_CC) Dantmann, Anja (SCE_Low_CC_AR)		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 5 SWS		
Workload	Contact hours		60 h
	Self-study		65 h
	Total		125 h
Subjects of the module	13: Low Carbon Construction 13: Low Carbon Construction (admission requirement)		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

13: schrP120 - written exam, 120 minutes
13: Student research project without presentation

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

Successful completion of the module Building Construction 1.

Objectives

After completing the module, students will be able to...

- independently design simple constructions and represent them appropriately in detail.
- qualitatively determine different loads and load combinations for buildings.
- understand and apply the safety concept of the applicable design standards.
- apply the essential criteria and certification bases for assessing the sustainability of constructions for specific buildings and building types.

Content

- Functionality of buildings
- Interaction of construction, structure and building physics
- Important construction details
- Representation of buildings and details in construction drawings
- Certification of the sustainability of buildings

Literature

- COTTERELL, Janet und 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. Auflage.
- KUBBA, Sam, 2017. *Handbook of green building design and construction: LEED, BREEAM, and Green Globes*. 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. Verfügbar unter: https://doi.org/10.1007/978-3-642-38297-0.
- ALBERT, Andrej, Klaus-Jürgen SCHNEIDER und Alfons GORIS, 2022. *Bautabellen für Ingenieure: mit Berechnungshinweisen und Beispielen*. 25. Auflage. Köln: Reguvis. ISBN 978-3-8462-1316-2
- NEUFERT, Ernst und andere, 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. Auflage. 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. Verfügbar unter: https://doi.org/10.1007/978-3-658-13011-4.

Additional remarks

None

Sustainable Construction Materials

Module abbreviation	SCE_Sus_Con_Mat	**Reg.-Nr.**	14
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	2
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Blask, Oliver		
Lecturer(s)	Blask, Oliver		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	4 ECTS / 4 SWS		
Workload	Contact hours		47 h
	Self-study		53 h
	Total		100 h
Subjects of the module	Sustainable Construction Materials		
Lecture types	SU/Ü/Pr - seminar-based teaching with exercise and practical training		

Examinations

schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

PF Portfolio Exam with the following components:

- Project work: practical group work with an oral presentation (10 min), weighted at 40%
- Written exam (60 min), weighted at 60%

The date for the component prior to the exam period will be announced in class.

Alternative dates for assessment components may be offered upon request and upon presentation of a doctor's note.

If a student does not take an assessment component, it will be graded as 0 points, which will result in a lower overall grade. If a student fails an assessment component, the entire portfolio exam must be retaken.

Prerequisites according examination regulation

none

Recommended prerequisites

Successful completion of the module Chemistry & Building Materials (SCE)

Objectives

Technical competences - Students will be able to:

- assess the sustainability of building materials using objective methods.
- name and distinguish important climate-neutral building materials.
- distinguish between empirical and performance-based methods of service life assessment.
- assess the durability of building materials depending on exposure.
- Select suitable recycling processes for building materials.
- Use recycled materials.

Personal and Social competences - Students will be able to:

- prepare a topic from the lecture as part of a team.

- present a paper as part of a presentation.

Content

- Sustainable mineral building materials
- Renewable organic building materials
- Sustainable metallic building materials
- Durability and corrosion of building materials
- Recycling of building materials and use of recycled materials
- Practical experiments: Production of sustainable concrete

Literature

- GREEN, H. J. M., TAGGART, Jim, 2020. *Tall wood buildings: design, construction and performance* [online]. Basel: Birkhäuser. PDF e-Book. ISBN 978-3-0356-1886-0. Verfügbar unter: https://doi.org/10.1515/9783035618860.
- SCHROEDER, Horst, 2016. *Sustainable Building with Earth* [online]. Cham: Springer International Publishing. PDF e-Book. ISBN 978-3-319-19491-2. Verfügbar unter: https://doi.org/10.1007/978-3-319-19491-2.
- BENVENUTO, Mark, 2023. *Materials Chemistry*. Berlin/Boston: de Gruyter. ISBN e-ISBN (PDF) 978-3-11-065677-0
- TAYLOR, G.D., 2013. *Materials in Construction*. New York: Routhledge. ISBN ISBN-13: 978-0-582-36889-7 (pbk)
- MARTIRENA-HERNANDEZ, Jose Fernando, ALUJAS-DÍAZ, Adrian, AMADOR-HERNANDEZ, Meylin, 2020. *Proceedings of the International Conference of Sustainable Production and Use of Cement and Concrete: ICSPCC 2019* [online]. Cham: Springer International Publishing. PDF e-Book. ISBN 978-3-030-22034-1. Verfügbar unter: https://doi.org/10.1007/978-3-030-22034-1.
- PROVIS, John L., VAN DEVENTER, Jannie S. J., 2014. *Alkali Activated Materials: State-of-the-Art Report, RILEM TC 224-AAM* [online]. Dordrecht: Springer Netherlands. PDF e-Book. ISBN 978-94-007-7672-2. Verfügbar unter: https://doi.org/10.1007/978-94-007-7672-2.
- BLASS, H. J. und C. SANDHAAS, 2018. *Timber Engineering*. Karlsruhe: KIT Scientific Publishing. ISBN 978-3-7315-0673-7 https://doi.org/10.5445/KSP/1000069616 Kostenfrei

Additional remarks

Bonus points: none

Reinforced Concrete Design I

Module abbreviation	SCE_ReinfConcrDesignI	**Reg.-Nr.**	15
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	3
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Feucht, Thilo		
Lecturer(s)	Feucht, Thilo (SCE_ReinfConcrDesignI) Feucht, Thilo (SCE_ReinfConcrDesignI_AdRequ)		
Language of instruction	English	**Language of exams**	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	SU/Ü - seminar-based teaching with exercise		

Examinations

15: schrP120 - written exam, 120 minutes
15: LN - participation without/with success

Additional explanations regarding examinations

There are three homework exercises in the semester, in which a total of 15 points can be achieved, whereby a total of 12 points are required to pass the admission requirement. 5 points can be achieved for each homework exercise, whereby 3,5 points are required to pass the individual homework exercise. Students must successfully complete the laboratory practical.

Prerequisites according examination regulation

none

Recommended prerequisites

Building Constructions I, Mechanics

Objectives

Professional competence - After attending the module, students will be able to:

- apply the safety concept in accordance with the Eurocode.
- determine the design internal forces using load case superposition.
- design beams in building construction that are subjected to bending moments, normal forces and shear forces.
- design columns not at risk of buckling under centric loading and bending.

Personal and social skills:

- Through a laboratory practical, students gain a visual impression of the elements of a reinforced concrete component and a technical impression of their production.
- They will then be aware of the challenges and difficulties associated with the individual manufacturing activities.

Content
• Materials of reinforced concrete construction • Safety concept in structural engineering • Load bearing behaviour of reinforced concrete elements • Load case superimposition, design internal forces • Ultimate limit state due to bending and longitudinal force, transverse force • Basics of reinforcement detailing • Commonly used structural elements such as beams, single-axis slabs, columns • Laboratory exercise
Literature
• ALBERT, Andrej, Klaus-Jürgen SCHNEIDER und Alfons GORIS, 2024. *Bautabellen für Ingenieure: mit Berechnungshinweisen und Beispielen*. 26. Auflage. Köln: Reguvis. ISBN 978-3-8462-1479-4, 3-8462-1479-5
Additional remarks
None

Structural Analysis			
Module abbreviation	SCE_StructuralAnalys	**Reg.-Nr.**	16
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	3
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Bochert, Jana Sue		
Lecturer(s)	Bochert, Jana Sue (SCE_StructuralAnalys) Al Hanoun, Hisham (SCE_StructuralAnalys_AdRequ)		
Language of instruction	English	**Language of exams**	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	SU/Ü - seminar-based teaching with exercise		

Examinations

16: schrP120 - written exam, 120 minutes
16: LN - participation without/with success

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing this module, students will be able to ...

- calculate statically determinate and indeterminate structures (2D and 3D).
- apply the displacement method (displacements and rotations) and the rotation angle method under general stresses (load and deformation effects).
- calculate with virtual forces and displacements. create models of structures with their actions and loads
- calculate planar and spatial beam structures, discs and plates using various computer programs

Personal and social skills – Students will be able to:

- verbalise questions relating to structural analysis
- discuss and classify the task, the solution and the results with fellow students and lecturers.

Content

- Partial safety concept, actions and resistances
- Equivalent member method, spring models
- Spatial systems

- Beam gratings
- Working sets
- Virtual work
- Displacement method, rotation angle method
- Beam structures according to

Literature

- KAI-UWE, Bletzinger, 22. *Aufgabensammlung zur Baustatik: Übungsaufgaben zur Berechnung ebener Stabtragwerke* . München: Hanser. ISBN ISBN: 978-3-446-47356-0
- DIETER, Dinkler, 2022. *Grundlagen der Baustatik : Modelle und Berechnungsmethoden für ebene Stabtragwerke* . ISBN ISBN: 978-3-658-39265-9

Additional remarks

There is the possibility to earn bonus points.

Introduction Geotechnics and Transport Technology

Module abbreviation	SCE_IntroGeoTT	**Reg.-Nr.**	17
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	3
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Angerer, Ludwig		
Lecturer(s)	Angerer, Ludwig; Gastl, Christoph (SCE_IntroGeoTT) Denninger, Thomas; Gastl, Christoph (SCE_IntroGeoTT_AdRequ)		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		45 h
	Self-study		80 h
	Total		125 h
Subjects of the module	17: Introduction Geotechnics and Transport Technology 17: Introduction Geotechnics and Transport Technology (admission requirement)		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

17: schrP90 - written exam, 90 minutes
17: LN - participation without/with success

Additional explanations regarding examinations

Solving exercise problems and discussing the results within the lecture.

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing the module, students will be able to:

Geotechnics

- explain the fundamentals of soil mechanics and soil as a construction material, including soil classification and soil properties;
- determine soil properties using laboratory testing and in-situ investigation methods, and describe multi-phase soil behavior and groundwater effects;
- analyze stresses in soils, shear strength, earth pressure, and stress distribution in the subsoil;
- perform basic settlement and consolidation analyses and apply them to problems in earthworks and foundation engineering.

Transport technology

- explain the fundamentals of traffic planning, accident parameters, and key factors influencing route alignment;

- assess traffic quality using basic verification methods and explain theoretical principles of road pavement design;
- apply standardized pavement design methods and requirements for durable, load-bearing road structures;
- explain road drainage principles and select appropriate materials for asphalt, concrete, and paving road constructions.

Content

Geotechnics

- Introduction to engineering geology
- Soil classification: fundamentals, grain size distribution, sedimentation analysis, consistency limits, classification and naming according to DIN EN ISO 14688 and DIN 18196
- Geotechnical field and laboratory testing: uniaxial compression test, density determination, direct shear test, triaxial test, Proctor test, permeability test, dynamic probing (ram sounding), plate load test, pressuremeter (balloon) test, soil exposures
- Water in soils and dewatering methods
- Shear strength of soils: friction and cohesion, Mohr–Coulomb failure criterion
- Stresses in the ground: total and effective stresses in the half-space, settlement calculations, deformation properties, soil consolidation

Transportation technology:

- Introduction to road construction: development and significance, requirements for roads (design objectives, traffic safety, environmental compatibility)
- Road and traffic planning: legal framework, fundamentals of road planning, planning process in road construction, traffic loads
- Road alignment and design: horizontal alignment (site plan), vertical alignment (profile), cross-section design, basic verification of traffic quality
- Road renewal and rehabilitation: assessment of existing pavements, design of frost-protected pavement structures, construction of new roads
- Pavement structures: traffic loading, pavement composition, stresses in pavements, load classes
- Earthworks and drainage: soil investigation, soil classification, subsoil requirements, soil improvement measures, road drainage systems
- Pavement layers and materials: frost protection layers, unbound and bound base layers, asphalt pavements (mix types, pavement layers, construction methods), concrete pavements, and block paving roads

Literature

- ALBERT , Andrej , . *Schneider - Bautabellen für Ingenieure* . 26. Auflage. [s.l.]: Reguvis.

Additional remarks

None

Sanitation/Wastewater/Waste Management			
Module abbreviation	SCE_SWWMgm.	**Reg.-Nr.**	18
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	3
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Liepert, Tobias		
Lecturer(s)	Hagl, Mathilde; Liepert, Tobias		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		45 h
	Self-study		80 h
	Total		125 h
Subjects of the module	Sanitation/Wastewater/Waste Management		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

Project report and oral presentation 15 min.

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

Professional competence - Students will be able to:

- To describe the basic principles of technical systems for water supply and wastewater treatment.
- explain the collection, transport and disposal for municipal and construction waste.
- summarise the interaction and dependencies of the different cleaning stages of a sewage treatment plant.
- prepare a preliminary design for a water treatment plant.

Personal and social skills - Students are able to:

- to identify the ethical and social implications of waste(water) treatment
- to raise these issues in public debate and to incorporate them responsibly into decision-making processes

Content

- Wastewater treatment:
  - mechanical, biological and chemical treatment stages
  - elimination of micropollutants
  - sludge treatment
- Stormwater and wastewater management:

- sewer construction
- general drainage plan
- drainage systems

- Waste management
  - waste prevention
  - collection and transport
  - treatment of waste and recyclables
  - disposal of waste and waste management in the construction industry

Literature

- BRAULT, Jean-Martin, BUCHAUER, Konrad, GAMBRILL, Martin, 2022. *Wastewater Treatment and Reuse: A Guide to Help Small Towns Select Appropriate Options* [online]. Washington, D.C: The World Bank. PDF e-Book. Verfügbar unter: https://doi.org/10.1596/37317.
- SPELLMAN, Frank R., 2020. *Handbook of water and wastewater treatment plant operations* [online]. Boca Raton, Fla. ; London ; New York: Taylor & Francis. PDF e-Book. ISBN 978-1-003-03835-1. Verfügbar unter: https://doi.org/10.1201/9781003038351.

Additional remarks

None

Fluid Mechancis & Hydro Mechanics			
Module abbreviation	SCE_FluidMechanicsHydro	**Reg.-Nr.**	19
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	3
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Liepert, Tobias		
Lecturer(s)	Liepert, Tobias		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		47 h
	Self-study		78 h
	Total		125 h
Subjects of the module	Fluid Mechancis & Hydro Mechanics		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

The students are capable

- 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

- formation of precipitation and runoff (water cycle)
- hydropower
- methods for estimating the formation of floods
- basics of hydrostatics, mechanics, as well as pipe and channel hydraulics.
- hydraulic construction like dams and river barriers, as well as flood retention basins
- river engineering with the areas of flow calculation, bedload problems and natural measures.
- legal basis, regulations and standards

Literature
• RAPP, Christoph, 2024. *Hydraulics in civil engineering: a course with experiments and open-source-codes* [online]. Cham, Switzerland: Springer. PDF e-Book. ISBN 978-3-031-54860-4. Verfügbar unter: https://doi.org/10.1007/978-3-031-54860-4. • POTTER, Merle C., WIGGERT, David C., 2025. *Applied Fluid Mechanics: Sixth Edition* [online]. Cham: Springer International Publishing. PDF e-Book. ISBN 978-3-031-65276-9. Verfügbar unter: https://doi.org/10.1007/978-3-031-65276-9.
Additional remarks
None

Sustainable Design and Management of Buildings an Structures

Module abbreviation	SCE_SustDesignManagBuild-Struc	**Reg.-Nr.**	20
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	3
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Reiter, Thomas		
Lecturer(s)	Reiter, Thomas		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		45 h
	Self-study		80 h
	Total		125 h
Subjects of the module	Sustainable Design and Management of Buildings an Structures		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

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

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.

Using an example project, variants are examined and compared with regard to sustainability criteria.

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.

Content

- Key sustainability aspects
- Interaction between sustainability aspects and conflicting goals
- Life cycle assessment
- Rating systems
- Certification systems
- Funding landscape and criteria

• EU taxonomy
Literature
Will be specified at the beginning
Additional remarks
None

Reinforced Concrete Design II

Module abbreviation	SCE_ReinforcedConcrDesig-nII	**Reg.-Nr.**	21
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	4
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Feucht, Thilo		
Lecturer(s)	Feucht, Thilo (SCE_ReinforcedConcrDesignII) Liepert, Tobias (SCE_ReinforcedConcrDesignI_AdRequ)		
Language of instruction	English	**Language of exams**	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	SU/Ü - seminar-based teaching with exercise		

Examinations

21: schrP90 - written exam, 90 minutes
21: LN - participation without/with success

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

Successful participation in the module Reinforced Concrete Design 1 (SCE)

Objectives

Professional expertise - After completing the module, students will be able to:

- calculate, design and construct typical reinforced concrete structures independently, even for more complex boundary conditions.
- deal with the serviceability limit states.
- limit the deformations of reinforced concrete components in accordance with standards.
- apply the general reinforcement rules and the design rules for typical components.
- derive suitable reinforcement verifications from the design results and describe them.

Personal and social skills - After completing the module, students will be able to:

- reflect on the results of their own calculations and discuss them in the auditorium.

Content

- Design of flanged and profiled sections (T-beam)
- Anchorage length

• Laps • Slabs: deflection control • Bending and shear design of one-way and two-way slabs • Torsion • Punching • Torsion
Literature
Will be specified at the beginning
Additional remarks
None

Steel Construction

Module abbreviation	SCE_SteelConstr	**Reg.-Nr.**	22
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	4
Module frequency	only summer term	**Module duration**	1 semester

Responsible for module	Feucht, Thilo		
Lecturer(s)	Feucht, Thilo (SCE_SteelConstr) Feucht, Thilo (SCE_SteelConstr_AdRequ)		
Language of instruction	English	**Language of exams**	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	SU/Ü - seminar-based teaching with exercise		

Examinations

22: schrP120 - written exam, 120 minutes
22: LN - participation without/with success

Additional explanations regarding examinations

For SPO 2026 and 2026/2026:

The portfolio assessment comprises five components:

- As part of a compulsory laboratory practical (during the 3rd to 5th week of lectures), students carry out practical work on the manufacture of a steel structure. The knowledge acquired is tested in an oral examination (duration 15 minutes) immediately after the practical course.
- Three written examinations (4th/5th, 7th/8th and 10th/11th week of lectures) with a duration of 25 minutes each are held during the semester.
- A written examination lasting 90 minutes will take place during the examination period.

The overall grade is weighted according to the duration of the individual components.

Participation in the practical course and passing the subsequent oral examination is mandatory. In the event of non-attendance at one of the four written partial assessments, zero points will be awarded for the respective partial assessment, which will correspondingly contribute to a deterioration in the overall grade. The exact examination dates will be published on Moodle at the beginning of the semester. No alternative exam dates will be offered. The resit exam in the following semester may be organised differently and will be specified in the module handbook.

For SPO 23:

There are three homework exercises in the semester, in which a total of 15 points can be achieved, whereby a total of 12 points are required to pass the admission requirement. 5 points can be achieved for each homework exercise, whereby 3,5 points are required to pass the individual homework exercise. Students must successfully complete the laboratory practical.

Prerequisites according examination regulation

none

Recommended prerequisites

Successful completion of the modules Building Constructions I, Mechanics I

Objectives

Professional competence - Students will be able to:

- to name the properties of steel as a material.
- to perform load-bearing capacity analyses of beams, bolts and welds in accordance with the Eurocode, taking into account the applicable safety concepts.
- to recognise stability cases and calculate the load-bearing capacity of beam steel components, taking into account buckling and lateral-torsional buckling.
- to know the relevance of the deformation of steel components.
- to independently design steel cross-sections by determining the shape, dimensions and material for given systems.

Personal and social skills - Students will be able to:

- Through a laboratory exercise, students gain a visual impression of the elements of a steel structure and a manual impression of its manufacture.
- They will then be aware of the challenges and difficulties associated with the individual production activities.

Content

- Basics and applications of steel construction
- Steel as a material: origin and laws
- Safety concept
- Design of solid wall and truss girders for ultimate limit state
- Design of bolts and weld seams for ultimate limit state
- Basics of stability theory and stability analyses
- Cross-section classes, buckling, lateral torsional-buckling
- Laboratory exercise

Literature

- GARDNER, Leroy und David A. NETHERCOT, 2011. *Designers' guide to Eurocode 3: design of steel buildings: EN 1993-1-1, -1-3 and -1-8*. London: Telford. ISBN 978-0-7277-4172-1
- ALBERT, Andrej, Klaus-Jürgen SCHNEIDER und Alfons GORIS, 2024. *Bautabellen für Ingenieure: mit Berechnungshinweisen und Beispielen*. 26. Auflage. Köln: Reguvis. ISBN 978-3-8462-1479-4, 3-8462-1479-5

Additional remarks

Bonus points: none

Law			
Module abbreviation	SCE_Law	**Reg.-Nr.**	23
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	4
Module frequency	only summer term	**Module duration**	1 semester

Responsible for module	Blask, Oliver		
Lecturer(s)	Heeschen, Matthias		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 5 SWS		
Workload	Contact hours		58 h
	Self-study		67 h
	Total		125 h
Subjects of the module	Law		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing the module, students will be able to...

- recognize the legal problems that typically arise when executing construction work.
- observe construction contract law according to BGB and VOB/B, the basics of public procurement law, architectural and engineering law.
- assess whether a specific project is eligible for approval according to public law regulations.
- assess environmental law problems in construction projects.

Content

- Private construction law
- Public construction law
- Environmental law
- Legal protection

Literature

Will be specified at the beginning

Additional remarks
None

Geotechnic & Soil Mechanics			
Module abbreviation	SCE_GeotechSoilMech	**Reg.-Nr.**	24
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	4
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Angerer, Ludwig		
Lecturer(s)	Angerer, Ludwig (SCE_GeotechSoilMech) Schorr, Joshua (SCE_GeotechSoilMech_AdRequ)		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		45 h
	Self-study		80 h
	Total		125 h
Subjects of the module	24: Geotechnic & Soil Mechanics 24: Geotechnic & Soil Mechanics		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

24: schrP120 - written exam, 120 minutes
24: LN - participation without/with success

Additional explanations regarding examinations

Solving exercise problems and discussing the results within the lecture.

Solving exercise problems and discussing the results within the lecture.

Prerequisites according examination regulation

none

Recommended prerequisites

Successful completion of the module Introduction to Geotechnic and Transportation Technology

Objectives

After completing the module, students will be able to:

- explain the fundamental principles of geotechnical engineering,
- perform basic slope stability assessments,
- carry out settlement calculations for shallow and deep foundations,
- apply basic design principles for shallow and deep foundations,
- describe the fundamentals of retaining structures and ground anchors,
- explain basic methods of groundwater control,
- describe common soil improvement techniques and their applications.

Content

- Fundamentals of geotechnical engineering
- Slope stability analysis
- Settlement analysis of shallow and deep foundations

- Design principles of shallow foundations
- Design principles of deep foundations
- Design principles of retaining structures and ground anchors
- Groundwater control methods
- Soil improvement techniques

Literature

- TERZAGHI, Karl, Ralph B. PECK und Gholamreza MESRI, 1996. *Soil Mechanics in Engineering Practice*. [s.l.]: Wiley.
- MANUSHEV, Rashid, Askar ZHUSSUPBEKOV und Yoshinori ISWASAKI, . *Geotechnics Fundamentals and Applications in Construction*. [s.l.]: CRC Press.

Additional remarks

None

Sustainable Transport Technology			
Module abbreviation	SCE_SustTranspTechn	**Reg.-Nr.**	25
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	4
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Angerer, Ludwig		
Lecturer(s)	Angerer, Ludwig (SCE_SustTranspTechn)		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		45 h
	Self-study		80 h
	Total		125 h
Subjects of the module	25: Sustainable Transport Technology 25: Sustainable Transprot Technology (admission requirement)		
Lecture types	SU/Ü - seminar-based teaching with exercises		

Examinations

25: schrP90 - written exam, 90 minutes
25: LN - participation without/with success

Additional explanations regarding examinations

Solving exercise problems and discussing the results within the lecture.

Solving exercise problems and discussing the results within the lecture.

Prerequisites according examination regulation

none

Recommended prerequisites

Successful participation in the module Introduction Geotechnics and Transport Technology (SCE) and Geotechnics and Soil Mechanics (SCE)

Objectives

After completing the module, students will be able to...

- carry out basic design and dimensioning of road and railway infrastructure,
- apply pavement and earthworks principles in road and railway engineering,
- assess ground–structure interaction in transport infrastructure projects,
- classify trenchless construction methods (microtunnelling, pipe jacking) for crossings,
- understand the fundamentals of port, airport, and inland waterway engineering,
- evaluate construction methods, maintenance strategies, and safety aspects of transport infrastructure,
- contextualize sustainability aspects in transport infrastructure engineering.

Content

- Alignment and geometric design in road and railway engineering
- Fundamentals of pavement and track superstructure and substructure

• Earthworks, underground construction, and special geotechnical engineering • Tunnelling and crossings using trenchless construction methods • Introduction to additional transport infrastructure such as ports, airports, and inland waterways
Literature
• ROGER L. BROCKENBROUGH, . *Highway engineering handbook*. [s.l.]: The McGraw-Hill Companies, Inc. • MARCO GUERRIERI, . *Fundamentals of Railway Design*. [s.l.]: Springer.
Additional remarks
None

Timber Construction & Ressource Management

Module abbreviation	SCE_TimbConstruc&RessMa-nagm	**Reg.-Nr.**	26
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	4
Module frequency	only summer term	**Module duration**	1 semester

Responsible for module	Feucht, Thilo		
Lecturer(s)	Feucht, Thilo; Paringer, Bernhard; Sendtner, Thomas (SCE_TimbConstruc&RessManagm) Al Hanoun, Hisham (SCE_TimbConstruc&RessManagmAdRequ)		
Language of instruction	English	**Language of exams**	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	SU/Ü - seminar-based teaching with exercise		

Examinations

26: schrP90 - written exam, 90 minutes
26: LN - participation without/with success

Additional explanations regarding examinations

During the semester, a homework assignment is to be completed, the written elaboration of which must be certified in order to fulfil the admission requirement.

Prerequisites according examination regulation

none

Recommended prerequisites

Successful participation in the module Structural Analysis (SCE)

Objectives

Professional competence - Students will be able to:

- name and classify the properties of wood.
- determine the modification values in accordance with EC5 depending on the situation.
- recognise stability cases.
- calculate the load-bearing capacity of bar-shaped timber components with normal force and bending stress, taking stability into account.
- analyse the serviceability of bending beams.
- model and statically analyse a simple timber structure with RFEM.

Personal and social skills – Students are able to:

- carry out and document a project on schedule.

Content
• Fundamentals and areas of application of timber construction • Properties of the material: wood products, structure and composition, building material tests • Safety concepts in timber construction • Ultimate limit state • Serviceability limit state • Stability of individual components • Connections in timber construction • Wood preservation: influence on load-bearing capacity, service classes, structural wood preservation • Introduction to digital modelling of timber structures using RFEM structural analysis software
Literature
Will be specified at the beginning
Additional remarks
None

Digital Operation Management in Building Information Modeling			
Module abbreviation	SCE_DigitOperationMa-nagm_BIM	**Reg.-Nr.**	27
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	6
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Feucht, Thilo		
Lecturer(s)	Feucht, Thilo; Reiter, Thomas; Tosi, Anne; Zikeli, Ludwig		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		47 h
	Self-study		78 h
	Total		125 h
Subjects of the module	Digital Operation Management in Building Information Modeling		
Lecture types	SU/Ü/Pr - seminar-based teaching with exercise and practical training		

Examinations

schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing the module, students will be able to

- explain and classify the fundamentals of digital construction process management and the principles of Building Information Modelling (BIM) in a technically sound manner.
- understand digital building models and evaluate their usefulness in the planning and execution process.
- distinguish between BIM maturity levels, BIM dimensions and typical use cases on a project-specific basis and apply them in a targeted manner.
- professionally perform and interpret methods of collision detection, quality assurance and model validation.
- Analyse roles, responsibilities and organisational models in the BIM context and assign them to specific projects.
- Properly evaluate and select digital tools and platforms in the construction industry and use them in a project-specific manner.
- Professionally evaluate the potential and possible applications of AR and VR technologies in the construction industry.
- Implement digitally supported work processes in an interdisciplinary project team in a coordinated and responsible manner.

• Reflect on your own role within digital BIM project structures and contribute constructively to collaboration. • Critically question digital working methods and actively manage your own skills development in the context of the digital transformation of the construction industry.
Content
• Basics of digital construction process management • Introduction to Building Information Modelling (BIM) • Digital building models and model-based working methods • BIM maturity levels, BIM dimensions and use cases • Digital planning, coordination and review processes • Collision detection, quality assurance and model validation • Data management, common data environment (CDE) and information flows • Roles, responsibilities and organisational models in BIM • BIM execution plan • Use of digital tools • Digital tools and platforms in construction • Use of AR and VR technologies in construction
Literature
Will be specified at the beginning
Additional remarks
None

Advanced Construction Methods

Module abbreviation	SCE_AdvancedConstrMeth	**Reg.-Nr.**	28
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	6
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Angerer, Ludwig		
Lecturer(s)	Walter-Klonkowska, Aleksandra (SCE_AdvancedConstrMeth)		
Language of instruction	English	**Language of exams**	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	SU/Ü - seminar-based teaching with exercise		

Examinations

28: schrP120 - written exam, 120 minutes
28: LN - participation without/with success

Additional explanations regarding examinations

Solving exercise problems and discussing the results within the lecture.

Solving exercise problems and discussing the results within the lecture.

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing the module, students will be able to …

- identify and describe key construction methods in building construction, civil engineering, and infrastructure construction,
- select suitable construction methods based on ecological, technical, and economic criteria,
- apply ecological, technical, and economic evaluation criteria in construction-related decision-making,
- assess and compare renovation, conversion, and new construction options from a holistic perspective,
- evaluate the sustainability, feasibility, and cost-effectiveness of different construction strategies,
- justify construction-related decisions using structured, criteria-based analyses.

Content

- Resource-efficient and durable construction
- Building in existing structures
- Climate-neutral construction

• Climate-adapted construction • Construction types and structural methods
Literature
• FRIEDRICHSEN, Stefanie, . *Nachhaltiges Planen, Bauen und Wohnen*. [s.l.]: Springer Vieweg. • ALLEN, Edward und Joseph IANO, . *Fundamentals of building construction: materials and Methods*. [s.l.]: Wiley.
Additional remarks
None

Digital Building Automation and Renewable Energy

Module abbreviation	SCE_DigBuildAutom_RE	**Reg.-Nr.**	29
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	6
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Angerer, Ludwig		
Lecturer(s)	Mückenheim, Mark		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		45 h
	Self-study		80 h
	Total		125 h
Subjects of the module	Digital Building Automation and Renewable Energy		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

Successful completion of the module Building Physics / Energy Efficiency (SCE) is recommended.

Objectives

After completing this module, students will be able to...

- Understanding of digital buildings as integrated technical and energy systems
- Ability to collaborate effectively in an interdisciplinary manner with building services engineering and IT specialists
- Ability to assess energy and building automation concepts from a engineering and construction perspective
- Capacity to contribute to the planning and implementation of sustainable, climate-neutral buildings

Content

- Building Automation
- Elevator and Escalator Systems
- Structural Fire Protection and Fire Suppression Systems
- Sanitary Engineering: Potable Water, Greywater, Wastewater, Backflow Prevention
- Ventilation and Air Handling Systems as well as Air Conditioning and Refrigeration Technology
- Heating Systems with a Focus on Renewable Energy
- Photovoltaic Systems

Literature
• BOLLIN, Elmar, 2023. *Using Renewable Energies in Buildings - Heating and Cooling Supply, Automation, Executed Examples*.
Additional remarks
None

Construction Project and Sustainability Management			
Module abbreviation	SCE_ConstProjSustainManag	**Reg.-Nr.**	30
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	6
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Reiter, Thomas		
Lecturer(s)	Mückenheim, Mark; Reiter, Thomas		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		47 h
	Self-study		78 h
	Total		125 h
Subjects of the module	Construction Project and Sustainability Management		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

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.

Content

The following content is developed through seminar-style teaching, supplemented by group work and practical lectures as well as their discussion:

- 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
- 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.-Nr.**	31
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	7
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Angerer, Ludwig		
Lecturer(s)	NN,		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	3 ECTS / 3 SWS		
Workload	Contact hours		24 h
	Self-study		51 h
	Total		75 h
Subjects of the module	Sustainable Buildings and Structures		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

LN - project work

Additional explanations regarding examinations

Project Work

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing this module, students will be able to...

- understand the material-ecological difference of load-bearing construction materials.
- apply strategies and tools for optimization in structural design.
- create a life cycle analysis of load-bearing structures according to ISO 14040/14044.
- 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.
- create case studies for existing structures.

Content

The following content is developed through seminar-style teaching, supplemented by group work and discussion:

- Sustainability criteria in structural planning
- Strategies and tools for optimization in structural design
- Material-ecological comparison of load-bearing construction materials
- Life cycle analysis of supporting structures according to ISO 14040/14044
- Structural Health Monitoring

Case studies for existing structures (conversion, expansion, renovation)

Literature
• BOGASCHEWSKY, Ronald, . *SustainAbility* . [s.l.]: Springer. • KANWAR, Varinder S. , Sanjay Kumar SHUKLA und Siby JOHN, . *Sustainable Civil Engineering - Principles and Applications*. [s.l.]: CEC Press.
Additional remarks
None

Sustainable Structural Engineering

Module abbreviation	SCE_SustainStructEngin	**Reg.-Nr.**	32
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	7
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Feucht, Thilo		
Lecturer(s)	Feucht, Thilo (SCE_SustainStructEngin)		
Language of instruction	English	**Language of exams**	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	SU/Ü - seminar-based teaching with exercise		

Examinations

32: schrP90 - written exam, 90 minutes
32: LN - participation without/with success

Additional explanations regarding examinations

In order to meet the entry requirements for the written examination, students must complete the project and present it in an interim and a final presentation. A 10 % bonus towards the written examination can be earned through the interim and final presentations.

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

- assess building materials in terms of their sustainability, taking into account material-specific construction methods and CO_2 equivalents.
- plan, design and construct a sustainable structural system as part of a team, within a specified CO_2,e budget.
- consistently consider the objectives of load-bearing capacity, sustainability, cost-effectiveness and adherence to deadlines when carrying out a construction project.
- understand the basics of and apply software for calculating structural systems.

Personal and social skills:

- weigh up conflicting objectives arising from the requirements of different project disciplines and reach a decision as part of a team.
- present the results of their work.

Dual-study students:

Dual-study students take on a role within the project that allows them to incorporate the tasks they are entrusted with at their partner company. They reflect on how the content covered in lectures is applied in their training company and actively contribute these insights to the lectures.

Content

- Sustainability criteria in structural engineering
- Structural design
- Planning, designing and constructing a small-scale project
- Comparison of the environmental impact of load-bearing construction materials and CO_2 equivalent assessment of building materials
- Structural design of load-bearing structures with a focus on sustainability (deconstruction, reuse, etc.)
- Strategies and tools for optimising structural design

Literature

- , 2024. *DAfStb-Richtlinie : Treibhausgasreduzierte Tragwerke aus Beton, Stahlbeton oder Spannbeton*. Ausgabe August 2024. Auflage. Berlin: DIN Media GmbH.
- ALBERT, Andrej und Klaus-Jürgen SCHNEIDER, 2026. *Bautabellen für Ingenieure: mit Berechnungshinweisen und Beispielen*. 27. Auflage. Köln: Reguvis Fachmedien. ISBN 978-3-8462-1635-4, 3-8462-1635-6

Additional remarks

None

Life Cycle & Climate Change Adaption Engineering

Module abbreviation	SCE_LifeCycleClimateChan-geAdapEng	**Reg.-Nr.**	33
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	7
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Pichlmeier, Franziska		
Lecturer(s)	Pichlmeier, Franziska (SCE_LifeCycleClimateChangeAdapEng)		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours Self-study Total		47 h 78 h 125 h
Subjects of the module	33: Life Cycle & Climate Change Adaption Engineering 33: Life Cycle & Climate Change Adaption Engineering (admission requirement)		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

33: schrP - written exam, 90 minutes
33: LN - participation without/with success

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

Subject-specific competence – Students are able to:

- assess the factors influencing the durability, life-cycle costs, and resource efficiency of buildings and evaluate trade-offs between life-cycle costs, resource use, and environmental impacts.
- design buildings to facilitate future adaptation, conversion, disassembly, and reuse, and apply renovation concepts to extend their service life.
- explain the factors influencing the local climate and evaluate the characteristics of different construction methods and materials.
- select suitable construction methods with regard to energy demand, indoor environmental quality, durability, and resource efficiency.
- identify and evaluate resource-efficient design strategies and integrate them into building design to improve environmental performance and climate resilience.

Content
• Service life and durability of buildings and building components • Resource efficiency and life-cycle thinking in the built environment • Circular economy, building reuse, and design for disassembly • Adaptation, conversion, and renovation strategies • Interaction between buildings, climate, and the environment • Sustainable construction methods and material selection
Literature
• KEENA, Naomi, FRIEDMAN, Avi, 2024. *Sustainable housing in a circular economy* [online]. London ; New York: Routledge. PDF e-Book. ISBN 978-1-003-33397-5. Verfügbar unter: https://doi.org/10.4324/9781003333975.
Additional remarks
Students may voluntarily earn up to 10 bonus points, which will be credited towards the score achieved in the written examination.

Civil Engineering Project Management

Module abbreviation	SCE_CivilEnginProjManag	**Reg.-Nr.**	34
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	6
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Reiter, Thomas		
Lecturer(s)	Reiter, Thomas		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	5 ECTS / 4 SWS		
Workload	Contact hours		47 h
	Self-study		78 h
	Total		125 h
Subjects of the module	Civil Engineering Project Management		
Lecture types	SU/Ü - seminar-based teaching with exercise		

Examinations

SA - Seminar paper with oral examination (15min) and written elaboration (8-15 pages)

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

After completing the module, students are able to...

- solve a self-contained, challenging technical task autonomously in a team.
- familiarize themselves autonomously with a topic that is new to them and successfully work on it autonomously using their basic knowledge.
- structure the task in a team, prioritize sub-steps and implement these in methodical steps.
- develop an overall solution relevant to the task autonomously in a team.
- explain and justify the overall solution verbally and present the results.
- apply project management methods in groups and solve the task within a given time frame.

Content

- Independent solution of a complex practical task from civil engineering with a direct link to sustainability in a team.
- The project tasks vary from semester to semester.
- Several different project topics are offered, from which students can choose depending on availability.

Literature

Will be specified at the beginning

Additional remarks
None

Bachelor Thesis Seminar

Module abbreviation	SCE_BachelorThesisSem	**Reg.-Nr.**	37
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	7
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Blask, Oliver		
Lecturer(s)	Blask, Oliver		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	2 ECTS / 2 SWS		
Workload	Contact hours		24 h
	Self-study		26 h
	Total		50 h
Subjects of the module	Bachelor Thesis Seminar		
Lecture types	S - Seminar		

Examinations

LN - participation without/with success

Additional explanations regarding examinations

None

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

Professional competence - Students are able to...

- present the objectives, methodology and results of their Bachelor's thesis in a structured and comprehensible manner.
- critically reflect on their research process and identify the strengths and weaknesses of their own work.
- categorise the results of their work in the current state of research and practice in civil engineering.

Personal and social skills - Students are able to...

- respond to questions and criticism in a correct manner.
- justify their arguments.
- communicate complex technical issues in an audience-oriented manner.
- present in an audience-oriented manner.

Content

- Defending your position
- Reaction to critical questions
- Critical discussion in a scientific context
- Free speech and rhetoric
- Audience-oriented language

• Dealing with nervousness and public speaking fright • Design and structure of a technical presentation • Use of presentation media (PowerPoint, CAD plans, visualizations) • Visualization of complex technical topics
Literature
Will be specified at the beginning
Additional remarks
None

Bachelor Thesis			
Module abbreviation	SCE_BachelorThesis	**Reg.-Nr.**	36
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	7
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Blask, Oliver		
Lecturer(s)			
Language of instruction	English	**Language of exams**	English
Credit points / SWS	12 ECTS / 0 SWS		
Workload	Contact hours		0 h
	Self-study		300 h
	Total		300 h
Subjects of the module	Bachelor Thesis		
Lecture types	BA - Bachelor's Thesis		

Examinations

Bachelor's Thesis

Additional explanations regarding examinations

None

Prerequisites according examination regulation

None

Recommended prerequisites

None

Objectives

Professional competence - Students are able to...

- use the basics of scientific work.
- independently find scientific relevant information and assess its quality.
- use the rules of citing scientific sources.
- prepare a scientific paper according to scientific quality standards.

Personal and social skills - Students are able to...

- reflect different points of view and interests.
- present their assessment in a precise and correct manner.

Content

- Engineering-related research question
- For dual students, the following also applies: For dual students, the thesis must be written in cooperation with the respective dual company. The details of the content and the scientific standard are ensured in cooperation between the company's supervisor in the dual study program and the examiner at the THI.

Literature

- GRUBA, Paul, ZOBEL, Justin, 2017. *How to write your first thesis* [online]. Cham: Springer. PDF e-Book. ISBN 978-3-319-61854-8. Verfügbar unter: https://doi.org/10.1007/978-3-319-61854-8.

Additional remarks
None

Construction Internship (18 Weeks)

Module abbreviation	SCE_ConstructionInternsh	**Reg.-Nr.**	38
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	5
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module			
Lecturer(s)			
Language of instruction	English	**Language of exams**	German
Credit points / SWS	27 ECTS / 0 SWS		
Workload	Contact hours		0 h
	Self-study		675 h
	Total		675 h
Subjects of the module	Construction Internship (18 Weeks)		
Lecture types	Pr - Internship		

Examinations

Internship report

Additional explanations regarding examinations

None

Prerequisites according examination regulation

Entry to the internship of the practical semester requires at least 20 ECTS credit points from the second stage of study in addition to the full credit points from the first stage of study.

Recommended prerequisites

None

Objectives

Die Studierenden sind nach Abschluss des Moduls in der Lage...

- unter Anleitung typische Tätigkeiten eines Bauingenieurs auszuführen.
- sich in die Betriebsabläufe eines Unternehmens mit ingenieurtechnischer Ausrichtung einzufügen.
- Berichte über die ausgeübten Tätigkeiten anzufertigen.

Content

- Mitarbeit an Projekten
- Anwendung und Vertiefung von erlernten Kenntnissen
- Berichterstellung

Literature

Will be specified at the beginning

Additional remarks

None

Scientific Methods

Module abbreviation	SCE_ScientificMethods	**Reg.-Nr.**	39
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Compulsory Subject	5
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Blask, Oliver		
Lecturer(s)	Blask, Oliver		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	3 ECTS / 2 SWS		
Workload	Contact hours		24 h
	Self-study		51 h
	Total		75 h
Subjects of the module	Scientific Methods		
Lecture types	S - Seminar		

Examinations

LN - seminar paper

Additional explanations regarding examinations

Students write a short scientific article on a fictional technical topic.

Prerequisites according examination regulation

none

Recommended prerequisites

none

Objectives

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.

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).

You are able to design and give lectures and presentations.

Content

The following content is developed through seminar-style teaching, supplemented by group work and discussion:

- Methodical introduction to scientific work,hypothesis formation, objectivity, accuracy, logic
- Literature research methods
- Forms and standards of citation
- Creating work plans, minutes and reports

• Preparation of scientific publications • Conception and implementation of lectures and presentations
Literature
Will be specified at the beginning
Additional remarks
None

4.2 Electives

Applied International Challenge Seminar

Module abbreviation	AppIntCallSem_FW	**Reg.-Nr.**	35
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Einsetzungstext ist leer!	
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Großmann, Daniel		
Lecturer(s)	Großmann, Daniel		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	4 ECTS / 4 SWS		
Workload	Contact hours		47 h
	Self-study		53 h
	Total		100 h
Subjects of the module	Applied International Challenge Seminar		
Lecture types	S - seminar		

Examinations

LN - seminar paper and presentation

Additional explanations regarding examinations

None

Prerequisites according examination regulation

None

Recommended prerequisites

None

Objectives

At the end of the course, students are able to:

- successfully develop solution ideas for a complex phenomenon within a limited amount of time and based on scientific knowledge.
- work successfully and collaboratively within an international and interdisciplinary team, thereby constructively managing transcultural communication.
- conduct guided literature research on the topic in question and identify synergies for the industry.
- work mostly independently on a new, challenging topic. This includes: literature review on the topic in question, the attendance of online preparation sessions, the preparation of tasks prior to the travels, the active participation during the on-site activities, the finalization and presentation of solution propositions.
- present the results of their ideas and findings both in an academic context and in a business-style elevator pitch.
- develop methodological, social and intercultural competency in areas such as communication, idea management, international project management, and time management.

Content

The course is composed of three parts. Part one and three take place at THI in form of bi-weekly sessions. Part two includes an excursion (up to one week) and on-site activities at one of the ACE²-EU European University Alliance partners.

- **The first part** of the course at THI is the preparation phase. Here, students will be introduced to methodical approaches to e.g. international project management, literature and knowledge management as well as transcultural cooperation. At the same time, they will apply learned methods while they conduct guided literature research, strategically make use of literature management programs, and prepare for part two of the module. They will participate in online-preparation sessions for the on-site activity in question and explore areas of particular interest within the thematic focus of the on-site activity. Prior to travelling to the on-site activity, students will pitch their ideas to fellow students and the lecturer at THI or within the ACE²-EU activity.
- **The second part** includes the on-site activities. Students are expected to actively participate during the on-site program, thereby applying international project management and transcultural communication skills. They will document the progress of project development including challenges and pitfalls. Students will prepare their oral presentations primarily based on the content of on-site activities and merge them with the findings from their literature review on the topic in question. Enrolment to the on-site ACE²-EU alliance-activity (mandatory) as well as the attendance of preparatory and follow-up online activities (mandatory) in handled by the student on their own responsibility.
- **The third part** is composed of a group reflection of the on-site activity and attendance of online follow-up sessions. Here, students learn to assess the quality of their collaboration in an international team and of the content of the solutions they developed during the on-site activity critically and vis-à-vis the findings from their literature review. The conclusions drawn from the reflection and follow-up activities are fed into the oral presentation.

Please note: Students' individual trajectories might be slightly different, depending on the particular ACE²-EU activity they have enrolled in (see "Additional information" below).

Literature

- FUCHS, Manfred, 2022. *International management: the process of internationalization and market entry strategies*. Berlin: Springer Gabler. ISBN 978-3-662-65869-7, 3-662-65869-0
- DONATE, M. J., SÁNCHEZ DE PABLO, J. D., 2015. The role of knowledge-oriented leadership in knowledge management practices and innovation. In: *Journal of Business Research*. **2015**(68 (2)), S.360-370.
- THUSSU, Daya Kishan, 2019. *International communication: continuity and change*. London: Bloomsbury Academic. ISBN 978-1-7809-3265-1

Additional remarks

- Registration directly with the lecturer who will assess the relevance of the chosen activity for the student's study programme.
- To participate in this course, students must have successfully applied to an Applied Blended Challenge (ABC), a Blended Intensive Programme (BIP) or a Flavour School. For a detailed process description and enrolment, please use the information provided in the ACE²-EU-Moodle Course: https://moodle.thi.de/enrol/index.php?id=10416.
- For international students only: It is highly important for international students to check ahead of enrolment whether VISA regulations allow travel into the country of the hosting institution.

Energy Systems and Energy Economics

Module abbreviation	ESaEE_ESYS	**Reg.-Nr.**	35
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Einsetzungstext ist leer!	1
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Feuchter, Fabian		
Lecturer(s)	Feuchter, Fabian; Huber, Matthias; Jain, Rushabh Bansilal		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	4 ECTS / 4 SWS		
Workload	Contact hours		47 h
	Self-study		53 h
	Total		100 h
Subjects of the module	Energy Systems and Energy Economics		
Lecture types	SU/Ü/PR - seminar based teaching/Exercise course/laboratory		

Examinations

schrP90 - written exam, 90 minutes

Additional explanations regarding examinations

Aids in the exam: will be announced in the lecture

Prerequisites according examination regulation

None

Recommended prerequisites

None

Objectives

The students

- understand today’s energy supply (heat, electricity, and mobility) and are capable to evaluate it.
- are capable to judge the importance of the different forms of renewable energies in today's and future energy supply.
- are capable to evaluate fossil energy sources with their impact on the climate.
- understand the international and German energy and climate protection policy and the corresponding legislation.
- understand the economic aspects and market structures of the European and German energy supply.

Content

Energy Systems Today and Tomorrow

- Basics of energy and energy-related terminology
- Energy consumption and supply worldwide / in Germany
- Energy efficiency
- Fossil fuels / nuclear energy
- Energy and climate
- Overview of renewable energies worldwide / in Germany

Energy Economics, Policies and Legislation

- Energy and climate protection policies worldwide / in Europe / in Germany
- Energy legislation in Europe / in Germany
- Renewable energies as an economic factor

Literature

- QUASCHNING, Volker, EPPEL, Herbert, 2020. *Renewable energy and climate change* [online]. Chichester, West Sussex, UK: Wiley. PDF e-Book. ISBN 978-1-119-51490-9. Verfügbar unter: https://doi.org/10.1002/9781119514909.
- QUASCHNING, Volker, 2016. *Understanding renewable energy systems* [online]. London and New York: Routledge. PDF e-Book. ISBN 978-1-315-76943-1, 978-1-317-66942-5. Verfügbar unter: https://doi.org/10.4324/9781315769431.
- HOSSAIN, Eklas, PETROVIC, Slobodan, 2021. *Renewable Energy Crash Course: A Concise Introduction* [online]. Cham: Springer International Publishing. PDF e-Book. ISBN 978-3-030-70049-2. Verfügbar unter: https://doi.org/10.1007/978-3-030-70049-2.
- BIGERNA, Simona, BOLLINO, Carlo Andrea, MICHELI, Silvia, 2015. *The sustainability of renewable energy in Europe* [online]. Cham: Springer International Publishing. PDF e-Book. ISBN 978-3-319-12343-1, 978-3-319-12342-4. Verfügbar unter: https://doi.org/10.1007/978-3-319-12343-1.

Additional remarks

None

Sustainability Basics			
Module abbreviation	SCE_SustBas	**Reg.-Nr.**	35
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	General Elective Subject	
Module frequency	winter and summer term	**Module duration**	1 semester

Responsible for module	Hoppe, Holger		
Lecturer(s)	Risi, Annette		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	2 ECTS / 2 SWS		
Workload	Contact hours		23 h
	Self-study		27 h
	Total		50 h
Subjects of the module	Sustainability Basics		
Lecture types	SU - lecture		

Examinations

seminar paper (10 slides) with oral presentation (15 min.)

Additional explanations regarding examinations

None

Prerequisites according examination regulation

None

Recommended prerequisites

None

Objectives

The students:

- Understand the core principles and historical development of sustainability concepts.
- Sustainable Development Goals (SDGs) and Systems Thinking:
- Learn about the 17 SDGs and analyze the interconnectedness of environmental, social, and economic systems.
- Understand planetary boundaries and learn strategies for effective energy and resource management.
- Understand the social dimensions of sustainability and learn about governance frameworks and policies.
- Understand the science of climate change and explore potential future scenarios for sustainability.
- Know various sustainability metrics and assessment tools, and learn to apply them in practical contexts.

Content

The content covers the following content:

- Foundations of Sustainability
- Historical Perspectives on Sustainability
- Sustainable Development Goals (SDGs)
- Systems Thinking and Interconnectedness
- Environmental BoundariesEnergy and Resource Management

- Social Aspects in Sustainability
- Sustainability Metrics and Assessments
- Climate Change
- Governance: Strategies, Policies and Public Measures
- Future Scenarios and Sustainable Futures
- Practical Applications and Leadership

Literature

Will be specified at the beginning

Additional remarks

The language of instruction for the module is English.

The module is offered exclusively digitally.As part of the module, you will work in a team with students from Brazilian universities.

THIS EVENT WILL BE RECORDED ON VIDEO:

When you enter the lecture room, you will take note of therecording of the event. This recording can be made publicly available.be made available to the public. By entering the room, you consent to the possible unintentional recording of your person. Insofar as individualized verbal contributions on your part are part of the final version of the recording, you can object in writing to the lecturer within 14 days of publication of the final version and your acknowledgement. Your contribution will then be deleted insofar as you can be individualized within the group and the contribution can be directly attributed to you. The recording ends at the end of the event.

Sustainability Science			
Module abbreviation	NUM_SustScie	**Reg.-Nr.**	35
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Einsetzungstext ist leer!	4,6
Module frequency	only winter term	**Module duration**	1 semester

Responsible for module	Busche, Annika		
Lecturer(s)	Busche, Annika		
Language of instruction	English	**Language of exams**	English
Credit points / SWS	2 ECTS / 2 SWS		
Workload	Contact hours		23 h
	Self-study		27 h
	Total		50 h
Subjects of the module	Sustainability Science		
Lecture types	SU - lecture		

Examinations

seminar paper (10 slides) with oral presentation (15 min.)

Additional explanations regarding examinations

None

Prerequisites according examination regulation

None

Recommended prerequisites

None

Objectives

This course aims to enable students to analyze the complex interactions between human activities and E-arth's systems, evaluate the drivers and impacts of key environmental challenges such as climate change, biodiversity loss, and resource depletion, and apply sustainability principles to engineering practices. Students will assess the role of energy systems, biogeochemical cycles, and land-use change in shaping global environmental outcomes. They will also critique current approaches to managing freshwater use, atmospheric aerosol loading, and the introduction of novel entities while developing strategies to address these challenges through innovative, interdisciplinary solutions. By the end of the course, students will be equipped to propose evidence-based interventions that align with sustainability goals and communicate their findings effectively to diverse stakeholders.

Content

The modules covers the following content in individual sessions:

- Introduction - Lecture context and presentation of sustainED
- Climate change
- Change in biosphere integrity (biodiversity loss and species extinction)
- Stratospheric ozone depletion
- Ocean (acidification)

- Biogeochemical flows (phosphorus and nitrogen cycles)
- Land-system change (for example deforestation)
- Freshwater use
- Atmospheric aerosol loading (microscopic particles in the atmosphere that affect climate and living organisms)
- Introduction of novel entities
- Energy
- Ressources
- Students-led: Brazilian and German Perspectives on Sustainability
- Introduction - Lecture context and presentation of sustainED
- Climate change
- Change in biosphere integrity (biodiversity loss and species extinction)
- Stratospheric ozone depletion
- Ocean (acidification)
- Biogeochemical flows (phosphorus and nitrogen cycles)
- Land-system change (for example deforestation)
- Freshwater use
- Atmospheric aerosol loading (microscopic particles in the atmosphere that affect climate and living organisms)
- Introduction of novel entities
- Energy
- Ressources
- Students-led: Brazilian and German Perspectives on Sustainability

Literature

- GODIN, Seth, 2022. *The Carbon Almanac: it's not too late*. New York: Portfolio Penguin. ISBN 978-0-593-54251-4, 0593542517

Additional remarks

The language of instruction for the module is English. The module is offered exclusively digitally.

As part of the module, you will work in a team with students from Brazilian universities.

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be made available to the public. By entering the room, you consent to the possible unintentional recording of your person. Insofar as individualized verbal contributions on your part are part of the final version of the recording, you can object in writing to the lecturer within 14 days of publication of the final version and your acknowledgement. Your contribution will then be deleted insofar as you can be individualized within the group and the contribution can be directly attributed to you. The recording ends at the end of the event.

Umwelt- und Zukunftstechnologien

Module abbreviation	NUM_UZT	**Reg.-Nr.**	35
Curriculum	**Study Programme**	**Module type**	**Semester**
	Sustainable Civil Engineering (SPO WS 23/24)	Electives	1
Module frequency	nur Wintersemester	**Module duration**	1 Semester

Responsible for module	Holzhammer, Uwe		
Lecturer(s)	Holzhammer, Uwe		
Language of instruction	Deutsch	**Language of exams**	Deutsch
Credit points / SWS	4 ECTS / 4 SWS		
Workload	Contact hours		47 h
	Self-study		53 h
	Total		100 h
Subjects of the module	Umwelt- und Zukunftstechnologien		
Lecture types	SU/Ü - seminaristischer Unterricht/Übung		

Examinations

schrP90 - schriftliche Prüfung, 90 Minuten

Additional explanations regarding examinations

Keine

Prerequisites according examination regulation

Keine

Recommended prerequisites

Keine

Objectives

Die Studierenden sind in der Lage,

- sicher mit technischen Begrifflichkeiten und physikalischen Größen umzugehen (z. B. Energie und Leistung, Wirkungs- und Nutzungsgraden, Primärenergie bis hin zur Endenergienutzung).
- die grundlegenden Mechanismen Klimawandel, CO2-Kreislauf, deren relevante Einflussgrößen und deren Wirkung zu beschreiben. Begriffe wie Kipppunkte (CTPs), Solarkonstante, Treibhausgaseffekt u.v.m. können durch die Studierenden sicher verwendet werden.
- auf Basis dieser energiepolitischen Einblicke mögliche Entwicklungen zu diskutieren, zu bewerten und daraus Folgen für Unternehmensentscheidungen ableiten.
- einschlägigen Technologien rund um eine klimaschonende Energiebereitstellung (Wind, Biogas, PV, Geothermie, Wasserkraft) als auch klimaschonende Nutzung (z. B. E-KFZ, Wärmepumpe) und Speicherung (Wasserstoff, Batterie) in ihrer Funktionsweise grundsätzlich zu verstehen.
- durch überschlägige Abschätzungen von Potentialen erneuerbaren Energien diese in das gesamte Versorgungsystem einzuordnen und Wechselwirkungen zu erkennen.
- neue Technologien (Zukunftstechnologien), auch für die zukünftige, nachhaltige Rolle in den unterschiedlichen Organisationseinheit, unter Nachhaltigkeitsaspekten zu bewerten.
- unter Nutzung der behandelten Beispiele die physikalischen Grundlagen für die Umwelt- und Energietechnik entsprechend richtig anzuwenden.
- ihr gestärktes Verständnis zu systemischen Zusammenhängen anzuwenden.

- sich mit neuen Themen rund um Umwelt- und Zukunftstechnologien selbst und im Team einarbeiten und diese im Plenum vorzustellen.

Content

- Klimawandel, Treibhausgasbilanz, Kohlenstromkreislauf, Kipppunkte, Solarkonstante, Temperaturerhöhung, Einflussgrößen auf Temperatur
- Nationale Energiewende im internationalen Kontext, Grundlagen Energiepolitik
- Energiebilanz, Energieerhaltung, Energieformen, Wirkungsgrad, Nutzungsgrad
- Technische Grundlagenvermittlung (Energie, Leistung, Endenergie (Fokus: Strom, Wärme, Energie für Mobilität), Kennzahlen wie Wirkungsgrad, Nutzungsgrad, Leistungszahl (COP), Jahresarbeitszahl)
- Umwelttechnologien im technologischen Überblick
- Erneuerbare Energieerzeugung (Fokus: Wind, PV, Biogas, Erdwärme, Wasserkraft)
- Energieeffiziente Energiebereitstellung (Wärmepumpen, gekoppelte Strom- und Wärmebereitstellung)
- Effiziente Energienutzung (Dämmung, E-KFZ, Wärmepumpe)
- Energiespeichertechnologien (Batterietechnologien, Wärmespeicher, Wasserstoff als Energieträger)
- Wasser (Abwasserbehandlung, Wasseraufbereitung)
- Ausblick in (mögliche) Zukunftstechnologien (z. B. Meerpumpspeicher, Wasserbatterie, Power to Liquid, CO2-Speicherung, EE-Methanol, usw.)

Literature

- QUASCHNING, Volker, . *Regenerative Energiesysteme*. [s.l.]: Hanser.
- BRÖSICKE, Wolfgang, . *Sonnenenergie*. [s.l.]: Verlag Technik.
- KÖNIGSTEIN, Thomas, . *Ratgeber energiesparendes Bauen*. Taunusstein: Blottner.
- BUCHHOLZ, Martin, . *Energie*. [s.l.]: Springer.
- UNNERSTALL, Thomas, . *Energiewende verstehen*. [s.l.]: Springer.
- UNNERSTALL, Thomas, . *Faktencheck Energiewende*. [s.l.]: Springer.
- UNNERSTALL, Thomas, 2021. *Faktencheck Nachhaltigkeit: Ökologische Krisen und Ressourcenverbrauch unter der Lupe* [online]. Berlin, Heidelberg: Springer Berlin Heidelberg. PDF e-Book. ISBN 978-3-662-62601-6. Verfügbar unter: https://doi.org/10.1007/978-3-662-62601-6.
- HOLLER, Christian und Joachim GAUKEL, . *Erneuerbare Energien*. [s.l.]: UIT Cambridge.
- STRAUSS, Karl, . *Kraftwerkstechnik*. [s.l.]: Springer.
- GÖRNER, Klaus und Kurt HÜBNER, . *Gewässerschutz und Abwasserbehandlung*. [s.l.]: Springer.
- STERNER, Michael und Ingo STADLER, . *Energiespeicher*. [s.l.]: Springer.

Additional remarks

Im Rahmen der Vorlesung wird auf aktuelle Studienergebnisse eingegangen, ebenso wird auf einschlägige Literatur hingewiesen. Darüber hinaus können bis zu 9 Bonuspunkte durch erfolgreiche Präsentation einer Zukunftstechnologie erzielt werden. Zur Erreichung der Bonuspunkte wird eine aktive Beteiligung an der Diskussion vorausgesetzt.