Module manual for Resilient Civil Engineering MSRCE

SPO Version 2024

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RWTH AACHEN UNIVERSITY

Module manual for Resilient Civil Engineering (Master (1-Subject))

Module manual for
Resilient Civil
Engineering
MSRCE

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Resilient Civil Engineering MSRCE Examination Regulation Description

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Examination Regulation Title & Version:
Resilient Civil Engineering (SPO Version / 2024)

Title	Resilient Civil Engineering
Short title	MSRCE
Version	2024
Study/Qualification Objectives	Graduates who have successfully completed the international and interdisciplinary master's program in Resilient Civil Engineering have a particular professional specialization with the following qualifications: • They have an in-depth understanding of the design, planning and construction of resilient and sustainable building structures and can systematically analyze and evaluate complex tasks. For this purpose, they apply the acquired subject-specific technical, analytical, and methodological competences. • In particular, they have extensive expertise in the behavior and characteristics of various building materials in the context of extreme loads, but also against the backdrop of sustainability aspects and resource efficiency. • With an increasing digitalization in the construction industry, they know how to specifically apply digital methods such as Building Information Modeling (BIM) in the construction process. They are able to design and efficiently use technologies necessary for the construction, planning and implementation of resilient and sustainable infrastructures and buildings, thus demonstrating technology orientation and innovation skills. • They are able to develop problem-solving approaches, holistically from the perspective of civil engineering and architecture, explicitly using innovative, sustainable and resilient concepts. They are able to work on versatile tasks in the interdisciplinary application fields of civil engineering and architecture, taking into account technological, sustainable and socio-economic parameters. They possess the necessary competencies, which are characteristic in the combination and in the sense of resilience and sustainability, such as a sense of responsibility for their own actions, dealing with complexity and networked systems thinking. This enables them to recognize and understand the complex interrelationships and dependencies between the economy, technology, society and the environment. • They are characterized by dialogue and action competencies, which are expressed in transformative skills and the ability to translate innovative approaches into action. • They are characterized by a goal-oriented and self-responsible collaboration in interdisciplinary teams, using agile working methods. • They are able to independently plan and conduct research projects and present research results. They possess extensive knowledge and skills in the areas of scientific work, research methodology, data analysis and project management. • They are qualified for positions in industry (construction companies, energy and utility companies, transport companies), in project planning or in research and development departments, in consulting and engineering offices as well as in trade associations, authorities and public institutions (government agencies, ministries) and in disaster control organizations. In addition, they are also qualified to take on their first leadership tasks. • They acquire the scientific qualification for a doctorate and thus have opportunities for a continuing scientific career in research and teaching.
Qualification Profile	
Additionnal information	

+ Construction Planning and Realization (0530185)

Module titel	Construction Planning and Realization (Compulsory subject)
Identifier	0530185
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	We pursue basic knowledge of the planning culture of buildings, while the following questions are put into context: • Which sustainability aspect can and should be considered where and when? • How can I incorporate the diverse requirements into the process? • What instruments do I have at my disposal? • What do the certification systems actually say and which one is considered when? • What rules and laws need to be known and observed? • What are the special features when integrating sustainability aspects into the planning process?
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • gain access to energetically sustainable and integral building planning. • represent the performative architectural form-finding process by simulation and visualization in a team, with the focus on the consideration of the most diverse sustainability criteria. • understand planning, under the aspect of defined sustainability goals, as a cooperative process. • document, analyze and practice the design process, using various planning parameters and applications, and assign it to the various actors in the process. • learn about integral energy and fire protection concepts, the processes of energetic form finding, building information management, simulation, automation, the construction process, and cost calculation. Abilities / Skills Students… • are familiar with planning process and planning Economy in the performance of sustainable goals.
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	English
Examination Terms	The course grade will be evaluated based on the following modes of evaluation: • Presentation (Referat, 50% graded) • Written (individual) paper (50% graded)

+ Construction Planning and Realization (0530185)

Miscellaneous	-
Module coordinator	Prof. Sabine Brück-Dürkop
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Construction Planning and Realization (053018501)	1st semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Construction Planning and Realization	1st semester	no semester recommended	-	2
Exercise Construction Planning and Realization	1st semester	no semester recommended	-	2

+ Earthquake Engineering (0530188)

Module titel	Earthquake Engineering (Compulsory subject)
Identifier	0530188
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	• Basic of structural analysis • Earthquakes; nature, intensity, measurements • Earthquake response of linear single-degree-of-freedom systems • Earthquake response of inelastic single-degree-of-freedom systems • Earthquake response of linear multi-degree-of-freedom systems • Earthquake response, design and evaluation of multistory buildings
Learning Objectives/ Learning Outcomes	Fundamentals of earthquake engineering with emphasis on design of seismic resistant structures Knowledge / Understanding Students… • understand how to define seismic load; • know different types of seismic analysis; • know the basic principles of seismic design; • understand the relation of seismic hazard-vulnerability-risk; • know analytical methods for seismic vulnerability assessment. Abilities / Skills Students… • make use of linear and nonlinear seismic analysis of structures; • apply analytical methodologies for definition of seismic vulnerability. Competencies Students… • calculate the seismic response of structures; • define seismic vulnerability functions
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	Lecture Notes 1. K. Chopra: “Dynamics of Structures, Theory and Application to Earthquake Engineering”, Prentice Hall, 2012 K. Meskouris, C. Butenweg, K.-G. Hinzen, R. Höffer: “Structural Dynamics with Applications in Earthquake and Wind Engineering” 2nd Ed. Springer 2019
Language	English
Examination Terms	Written Examination (100 %) or Oral Examination (100 %)

+ Earthquake Engineering (0530188)

Miscellaneous	-
Module coordinator	Prof. Sven Klinkel
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Earthquake Engineering (053018801)	3rd semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Earthquake Engineerin	3rd semester	no semester recommended	-	2
Exercise Earthquake Engineerin	3rd semester	no semester recommended	-	2

+ Environmental Sustainability in Transport Engineering (0530190)

Module titel	Environmental Sustainability in Transport Engineering (Compulsory subject)
Identifier	0530190
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	• Pollutants: Gases, Particles • Pollutant Sources: Motor Vehicles Emissions, Train Emissions, Shipping • Emissions, Aircraft Emissions • Measurement and Data Analysis: Concentration Measurement of Gases, Concentration Measurement of Particles, Analysis of an Air-quality Data Set • Deposition: Dry Deposition Wet Deposition • Mitigation and Effects of Air Pollution: The Role of Vegetation, Effects on Humans and Animals, Effects on Plants, Soil and Groundwater, Effects on Materials • Control of Emission: EU legislation, UK legislation, US legislation, Legislation in Asian Regions • Noise: Introduction to Acoustics, The nature of environmental noise • Noise Sources: Motor Vehicles Emissions, Train Emissions, Aircraft Emissions • Measurement, Prediction, Propagation and Control of Noise: Noise Measurement; Prediction, Propagation and Control of Road Traffic Noise; Prediction, Propagation and Control of Railway Noise; Prediction, Propagation and Control of Airport Noise • Effects of Noise on Humans and Animals • Environmental assessment: Pollutant Assessment, Noise Assessment • Texture, Environment, Health: Rolling resistance, Driving resistance and Energy consumption
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • estimate air-pollution, emission levels, passive and active propagation of pollutants in the atmosphere • know planning concepts in development of ecologically sustainable transport systems • understand traffic noise generation and noise prediction methods • know about the rolling resistance, driving resistance and energy consumption Abilities / Skills Students • master analysis methods required for the assessment of air pollution of traffic and transport systems • master different methods used to determine noise exposure levels Competencies Students • critical thinking and problem-solving • collaboration with colleagues and leading by influence • effective oral and written communication • accessing and analyzing information
(Study-Specific) Prerequisites	-

+ Environmental Sustainability in Transport Engineering (0530190)

(recommended) Requirements	none
References	Tiwary, A. and Colls, J. (2010). Air Pollution: Measurement, Modelling and Mitigation, 3rd, Routledge, London.
Language	English
Examination Terms	The final grade for this course will be based on the sum of the scores from the written paper (including presentation) and the final written examination: • Written paper, including presentation (Hausarbeit, 50% graded) • Written examination (Klausur, 50% graded, 60 min.) The written examination is open-book.
Miscellaneous	-
Module coordinator	Jun. Prof. Dr. Pengfei Liu
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Environmental Sustainability in Transport Engineering (053019001)	1st semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Environmental Sustainability in Transport Engineering	1st semester	no semester recommended	-	2
Exercise Environmental Sustainability in Transport Engineering	1st semester	no semester recommended	-	2

+ Innovative Concrete Constructions (0530196)

Module titel	Innovative Concrete Constructions (Compulsory subject)
Identifier	0530196
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	summer semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	• Introduction and Motivation: Introduction to fatigue as a failure mechanism in structural engineering • Fatigue Loading in Structures: Overview of low-cycle and high-cycle fatigue loading and understanding different fatigue failure modes. • Classification of Fatigue Process Zones: Classification of fatigue process zones in lightweight modern reinforced and prestressed concrete structures • Experimental Characterization Methods: Overview of techniques used to characterize fatigue behavior in structures through laboratory testing and analysis methods. • Modeling Hypotheses for Fatigue in Concrete Structures: Review of modeling approaches and challenges for fatigue in concrete structures and representing cyclic behavior in numerical models. • Advanced Modeling Approaches: Exploration of advanced modeling techniques for cyclic behavior in reinforced concrete structures using constitutive models and its application in nonlinear Finite Element Analysis. • Virtual Fatigue Experiments: Introduction to virtual fatigue experiments through computer simulations and an overview of software tools and simulation techniques. • Loading Sequence Effects: Understanding the influence of loading sequence on fatigue behavior and the importance of considering loading sequences in design. • Design Concepts for High-Cycle Fatigue Resistance Structures: Introduction to design principles and strategies for high-cycle fatigue-resistant structures, including considerations for enhanced fatigue performance. • Prospects for Innovative Fatigue-Resistant Structures: Discussion on emerging trends, advancements, new materials, technologies, and construction techniques for designing innovative fatigue-resistant structures.
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • understand the concept of fatigue as a failure mechanism in the lightweight civil engineering structures • are able to classify fatigue process zones in reinforced and prestressed concrete structures • know the experimental methods used to characterize fatigue behavior in concrete structures Abilities / Skills Students… • apply appropriate modeling hypotheses and techniques to simulate fatigue behavior in concrete structures • are able to conduct virtual fatigue experiments using computer simulations and software tools • are able to apply design concepts and strategies to enhance the high-cycle fatigue resistance of modern concrete structures Competencies Students…

+ Innovative Concrete Constructions (0530196)

	• utilize advanced modeling approaches to simulate and predict fatigue performance in reinforced concrete structures • are able to design structures considering fatigue loading and high-cycle fatigue resistance requirements
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	English
Examination Terms	The course grade will be evaluated based on the following modes of evaluation: • Seminar paper (Seminararbeit, 60% graded, 15 pages) • Written examination (Klausur, 40% graded, 90 min
Miscellaneous	-
Module coordinator	Dr. Abedulgader Baktheer
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Innovative Concrete Constructions (053019601)	2nd semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Innovative Concrete Constructions	2nd semester	no semester recommended	-	2
Exercise Innovative Concrete Constructions	2nd semester	no semester recommended	-	2

+ Life Cycle Assessment (0530197)

Module titel	Life Cycle Assessment (Compulsory subject)
Identifier	0530197
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	Several methods have been developed in the last decades to assess the environmental and social Impact of a product along its life cycle primarily the ISO Norm 14040 and 14044. This lecture provides a detailed description (step-by-step) of these methodologies according to the current international and European standards e.g. Carbon or Water Footprint. Further the lecture introduces assessment methods, tools, and certification schemes for sustainable buildings such as DGNB and the European framework Level(s). Throughout the lecture, approaches and criteria to evaluate the sustainability performance of buildings in the three dimensions (environmental, economic, and social) are discussed. Particular focus is given to life cycle approaches
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • get an overview over the existing methodologies and concepts in Life Cycle Sustainability Assessment. • understand the complexity of the evaluation of Sustainability due to trade-offs within the three-column approach (environmental, economic, social). Abilities / Skills Students… • are able to implement the methodologies cited above in different contexts and sectors to support decision-making process towards a more sustainable production and consumption Competencies Students… • are able to even further develop the named methodologies and adapt them to new evolving issues related to environmental and social impacts.
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	English
Examination Terms	Written examination (Klausur, 50% graded), seminar with group presentation (Seminar mit Gruppenreferat, 50 % graded)
Miscellaneous	-

+ Life Cycle Assessment (0530197)

Module coordinator	Prof. Marzia Traverso
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Life Cycle Assessment (053019701)	3rd semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Life Cycle Assessment	3rd semester	no semester recommended	-	2
Exercise Life Cycle Assessment	3rd semester	no semester recommended	-	2

+ Probabilistic Design Methods and Safety (0530199)

Module titel	Probabilistic Design Methods and Safety (Compulsory subject)
Identifier	0530199
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	Probabilistic Design Methods and Safety covers the statistical background of design methods in civil engineering and introduces different methods for a more detailed determination of structural safety and the probability of failure.
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • know the safety concept of the Eurocode design standard for buildings. • can distinguish between different levels: deterministic, semi-probabilistic and full probabilistic and explain its backgrounds. Abilities / Skills Students… • are able to perform a structural design with semi and full probabilistic methods. • are able to determine the probability of failure based on probabilistic methods. Competencies Students… • can apply different probabilistic design methods. • can discuss the term structural safety in a wider sense.
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	English
Examination Terms	Written examination (Klausur, 100% graded)
Miscellaneous	-
Module coordinator	Prof. Frank Kemper
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-

+ Probabilistic Design Methods and Safety (0530199)

Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Probabilistic Design Methods and Safety (053019901)	1st semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Probabilistic Design Methods and Safety	1st semester	no semester recommended	-	2
Exercise Probabilistic Design Methods and Safety	1st semester	no semester recommended	-	2

+ Sustainable Steel Structures (0530200)

Module titel	Sustainable Steel Structures (Compulsory subject)
Identifier	0530200
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	summer semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	Load-bearing behavior of the steel building material; safe and simultaneously cost-effective design of steel components for resource-efficient material usage; Particularly beneficial fatigue construction methods; Utilization of recycling and direct re-use of steel components; Introduction to sustainability assessment and identification of key sustainability criteria in construction
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • understand the load-bearing behavior of steel components. • learn safe, cost-effective steel component design for resource-efficient use. • are able to identify advantageous fatigue construction methods. • understand steel component recycling and re-use possibilities. • learn about the sustainability assessment of constructions. Abilities / Skills Students… • analyze steel material load bearing behavior • design safe, cost-effective steel components with resource efficiency • apply fatigue beneficial construction methods • implement recycling and re-use of steel components. • performing sustainability assessments and integrate criteria in construction Competencies Students… • conceive material efficient design of steel components • conceive fatigue beneficial design • manage sustainability assessment
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	English
Examination Terms	The course grade will be determined based on one of the following modes of evaluation: (A) Written examination (Klausur, 100% graded) (B) Oral examination (mündliche Prüfung, 100% graded)

+ Sustainable Steel Structures (0530200)

	The final mode of evaluation (A or B) will be announced and publicly displayed prior to the first class-session. In general, grading for this class will be based on mode (A).
Miscellaneous	-
Module coordinator	Dr. Helen Bartsch
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Sustainable Steel Structure (053020001)	2nd semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Sustainable Steel Structures	2nd semester	no semester recommended	-	2
Exercise Sustainable Steel Structures	2nd semester	no semester recommended	-	2

+ Wind Engineering (0530202)

Module titel	Wind Engineering (Compulsory subject)
Identifier	0530202
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	summer semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	Wind engineering covers the effects of the stochastic wind process with respect to extreme wind velocities, structural load admittance (aerodynamics) and the vulnerability of wind induced vibrations od structures.
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • can describe the background of natural wind as a structural loading. • can distinguish static and dynamic wind effects. Abilities / Skills Students… • can determine wind load recommendations for individual shapes. • can predict expected wind induced vibrations for individual structures. Competencies Students… • can develop concepts to determine realistic wind load models based on standards or additionally needed investigations
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	English
Examination Terms	Written examination (Klausur, 100% graded)
Miscellaneous	-
Module coordinator	Prof. Frank Kemper
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	150,0

+ Wind Engineering (0530202)

Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Wind Engineering (053020201)	2nd semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Wind Engineering	2nd semester	no semester recommended	-	2
Exercise Wind Engineering	2nd semester	no semester recommended	-	2

+ Water Management and Resilience (0530201)

Module titel	Water Management and Resilience (Compulsory subject)
Identifier	0530201
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	Water Resilience and water management, adaption and transformation, future ecosystem services, climatic drivers and stressors on water systems, Water governance, human dimensions of water, water ethics.
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • understand water engineering as an interdisciplinary approach • learn the basics of system thinking and the concept of resilience • learn to balance the needs of water management with the demands of a more complicated world Abilities / Skills Students… • recognize interrelationships of issues beyond their own discipline • identify weaknesses in existing systems and thinking • learn how to identify and solve causes of problems on an as-needed basis Competencies Students… • develop concepts and derive recommendations for action to address analyzed sample issues • learn to present their results and to discuss them in group
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	English
Examination Terms	Project work with final presentation (Projektarbeit mit Referat,100% graded)
Miscellaneous	-
Module coordinator	Prof. Frank Kemper
ECTS Credits	5
Contact time (WSH)	4

+ Water Management and Resilience (0530201)

Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Water Management and Resilience (053020101)	3rd semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Water Management and Resilience	3rd semester	no semester recommended	-	2
Exercise Water Management and Resilience	3rd semester	no semester recommended	-	2

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+ Timber Structures I (3011867)

Module titel	Timber Structures I (Compulsory subject)
Identifier	3011867
Version	Angelegt über RWTH API als 1
Duration (Semester)	one semester
Cycle (Semester)	winter/summer semester
Valid from	Winter semester 2017
Valid until	-
Module level	Master
Content	Timber as a building material: properties, classification, safety concept EN 1995; Solid wood and glued-laminated timber as building material: Mechanical behaviour, design values; Structural timber systems: boundary conditions, assessment of internal forces and deformation; Design of timber cross sections; Stability of timber components: lateral buckling, flexual buckling of simple beams; Built-up sections; Fastener: nails, peg-shaped steel-connections (nails, bolts, dowels), proprietary connector, nail plates; Connections: Carpenter connections; Timber compatible construction with connections; Simple verifications of pencil-shaped connections; Complex verifications of rod shaped connections und proprietary connectors; Application and proof of nail plate connections; Roof structures
Learning Objectives/ Learning Outcomes	Understanding of structural behaviour of timber and its properties; Understanding the safety concept of timber structures; Skill of selection appropriate structural systems of timber; Skill of analysis and calculation of 2D or 3D bearing structures of timber; Skill of timber compatible construction of connections and simple details; Knowledge of required proofs: Cross section capacity; Stability (lateral buckling, flexual buckling); Design of connections; Knowledge of typical roof structures its capacity and proofs
(Study-Specific) Prerequisites	-
(recommended) Requirements	-
References	Umdruck: Grundlagen des Holzbaus; Vorlesungsmitschriften; Übungshandout; Werner, G., Zimmer, K.: (2008): Holzbau 1, 4. überarbeitete Auflage, Springer-Berlag, Berlin,Heidelberg, New York; Werner, G., Zimmer, K.: (2008): Holzbau 2, 4. überarbeitete Auflage, Springer-Verlag, Berlin, Heidelberg, New York; Leonardo da Vinci Pilot Projekt 'Lehr- und Lernunterlagen für die Bemessung und Konstruktion von Tragwerken aus Holz - TEMTIS', Handbuch 1 - Tragwerke aus Holz, Handbuch 2 - Nachweisführung für Tragwerke aus Holz nach Eurocode 5, 2008
Language	English
Examination Terms	Graded written exam. Admission requirements for participation in the written exam is passed homework.
Miscellaneous	-
Module coordinator	Modulverantworlicher: apl. Professor Dr.-Ing. Benno Hoffmeister
ECTS Credits	5
Contact time (WSH)	3
Examination duration (min)	0

+ Timber Structures I (3011867)

Total hours (h)	150,0
Contact hours (h)	45,0
Self-study hours (h)	105,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Homework assignment Timber Structures I (301186701)	1st semester	no semester recommended	0	0
Exam Timber Structures I (301186702)	1st semester	no semester recommended	5	0

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Timber Structures I	1st semester	no semester recommended	-	2
Exercise Timber Structures I	1st semester	no semester recommended	-	1

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+ Structural Control and Health Monitoring (3017272)

Module titel	Structural Control and Health Monitoring (Compulsory subject)
Identifier	3017272
Version	Angelegt über RWTH API als 1
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2018
Valid until	-
Module level	Master
Content	Wind, traffic load and earthquake induced dynamic loading cause structural vibrations, which can jeopardize both the safety and the serviceability of structures. In order to prevent these vibrations, structural design should satisfy a number of requirements. On existing structures a post implementation of these measures, lead generally to vastly extensive and prohibitive construction activities. Architectural and economical challenges motivated slender design makes it for modern structures impossible to fulfill the demands regarding the vibration protection. An example for this is the Millenium Bridge in London, which was closed shortly after the opening ceremony because of structural vibrations caused by dynamic pedestrian loads. In civil engineering practice for mitigation of vibrations and to keep the slender character of the constructions supplementary dampers are used. These structural control systems can dissipate the oscillation energy of the structures similar to the car suspensions. In order to ensure the safety and serviceability criteria the high-rise buildings and other important civil infrastructure, which are usually under continous dynamic loading, should be monitored and maintained permanently. Because of the enormous number of the structures, this demand is a huge challenge for today's civil engineers. For instance, in Germany there are over 38.000 highway bridges, which are suffering under dynamic traffic loads. For the sake of the sustainability of these structures, structural health monitoring systems are being developed, which can permanently measure and evaluate the condition of a structure using high-tech sensors and data communication technologies. From these two topics "structural control" and "structural health monitoring" the keystones of this course are built up. In particular the course includes the following subjects: Structural control: • Structural rehabilitation and retrofitting • Passive, active and semi-active damper systems • Anti-seismic devices • Principles of control engineering Structural health monitoring: • Sensor and actuator technology • Signal processing • System identification methods • Vibration measurement and evaluation • Condition monitoring
Learning Objectives/ Learning Outcomes	This course gives the attendees a comprehensive overview about the latest developments of this highly innovative and interdisciplinary research field of structural control and health monitoring systems for important civil engineering structures. The course provides students with a usefull tool set for the analytic, numeric and experimental design of these systems. At the end of the course, the students gain the necessary skills for the implementation of structural control and health monitoring systems on high-rise buildings and other important civil infrastructure, such as bridges.

+ Structural Control and Health Monitoring (3017272)

(Study-Specific) Prerequisites	-
(recommended) Requirements	-
References	• Adams D E (2007): Health Monitoring of Structural Materials and Components, Wiley, ISBN 978-0-470-03313-5. • Casciati F, Magonette G, Marazzi F (2006): Technology of Semiactive Devices and Applications in Vibration Mitigation, Wiley, ISBN 978-0-470-02289-4. • Constantinou M C, Soong T T, Dargush G F (1998): Passive Energy Dissipation Systems for Structural Design and Retrofit, MCEER, ISBN 0-9656682-1-5. • Hanson R D, Soong T T (2001): Seismic Design with Supplemental Energy Dissipation Devices, EERI, ISBN 0-943198-13-5. • Karbhari V M, Ansari F (2009): Structural Health Monitoring of Civil Infrastructure Systems, Elsevier, ISBN 978-1-84569-392-3. • Soong T T, Constantinou M C (1994): Passive and Active Structural Vibration Control in Civil Engineering, Springer, ISBN 3-211-82615-7. • Soong T T, Dargush G F (1997): Passive Energy Dissipation Systems in Structural Engineering, Wiley, ISBN 978-0-471-96821-4.
Language	English
Examination Terms	Graded written exam. There are no admission requirements for attending the written exam.
Miscellaneous	-
Module coordinator	Prof. Dr.-Ing. habil. Sven Klinkel
ECTS Credits	3
Contact time (WSH)	2
Examination duration (min)	0
Total hours (h)	90,0
Contact hours (h)	30,0
Self-study hours (h)	60,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Exam Structural Control and Health Monitoring (301727201)	3rd semester	no semester recommended	3	0

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Structural Control and Health Monitoring	3rd semester	no semester recommended	-	2

+ Mechanics of Engineering Materials (3017572)

Module titel	Mechanics of Engineering Materials (Compulsory subject)
Identifier	3017572
Version	Angelegt über RWTH API als 1
Duration (Semester)	one semester
Cycle (Semester)	summer semester
Valid from	Summer semester 2019
Valid until	-
Module level	Master
Content	Mechanics of Engineering Materials The course aims at the understanding of the behaviour of engineering materials such as metals, plastics, and carbon fiber-reinforced composites. The major objective is the development and discussion of appropriate material models for elastic and inelastic materials. Further, the numerical treatment of these models will be addressed in the context of the finite element method. Finally, the according parameters will be identified by comparison with experiments. In particular, the following aspects will be addressed: • Elasticity at small and finite strains • Thermo-elasticity • Anisotropic elasticity for composites • Viscoelasticity – Creep an relaxation • Plasticity and hardening • Damage and crack initiation • Parameter identification
Learning Objectives/ Learning Outcomes	Mechanics of Engineering Materials Overall goal: Students gain theoretical and practical knowledge in mechanics of engineering materials. After successfully completing this course, the students will have acquired the following learning outcomes: Knowledge / Understanding Students: • know the different phenomena which can be observed in experiments; • know the different material models which have been proposed to describe these phenomena; • understand the basic concept of how to achieve an appropriate material model. Abilities / Skills Students: • analyse analytical and numerical results with respect to the quality of the adopted model; • predict the material response to a given loading scenario. Competencies Students: • critically assess the applicability and correctness of material models; • transfer theoretical models to actual engineering problems from the fields of mechanical, civil, and aeronautical engineering.
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	• Lecture Notes, AudioSlides • Students also receive a list of relevant literature
Language	English
Examination Terms	Written exam (or oral exam)
Miscellaneous	-

+ Mechanics of Engineering Materials (3017572)

Module coordinator	Modulangebotsorganisator: Modulangebotsverantwortliche Fakultät 3Modellierungsteamverantwortlicher: André Stuhrmann M. Sc.Modulverantworlicher: Dr.-Ing. Jaan-Willem Simon
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	0
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination: Mechanics of Engineering Materials (301757201)	1st semester	no semester recommended	5	0

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture: Mechanics of Engineering Materials	1st semester	no semester recommended	-	2
Exercise: Mechanics of Engineering Materials	1st semester	no semester recommended	-	2

+ Structural Analysis and Computational Methods (3017562)

Module titel	Structural Analysis and Computational Methods (Compulsory subject)
Identifier	3017562
Version	v02
Duration (Semester)	one semester
Cycle (Semester)	summer semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	Fundamentals of the analysis of plates and shells, disks and plates, membrane and bending theory of axisymmetric shells, fundamentals of differential geometry, introduction to the finite element method, exemplary derivation of selected element types, modelling with finite elements by means of practical examples, analysis of plates and shells based on closed solutions, static analysis of practical examples with finite elements.
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • have fundamental knowledge in the analytical calculation of planar and curved axisymmetric plates and shells • have deeper understanding of the finite element method, its derivation, application, and limits Abilities / Skills Students… • apply the finite element method on the basis of static structural analysis. • have good skills with Finite Element Programs and critical evaluation of the analysis result Competencies Students… • master the load carrying mechanisms of plates and shells
(Study-Specific) Prerequisites	-
(recommended) Requirements	None
References	-
Language	English
Examination Terms	The course grade will be determined based on one of the following modes of evaluation: (A) ; Written examination (Klausur, 100% graded, 75 min.) (B) ; Oral examination (mündliche Prüfung, 100% graded, 30 min.) The final mode of evaluation (A or B) will be announced and publicly displayed prior to the first class-session. In general, grading for this class will be based on mode (A).
Miscellaneous	-

+ Structural Analysis and Computational Methods (3017562)

Module coordinator	Prof. Sven Klinkel
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Structural Analysis and Computational Methods (301756201)	2nd semester	no semester recommended	5	0

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Structural Analysis and Computational Methods	2nd semester	no semester recommended	-	2
Exercise Structural Analysis and Computational Methods	2nd semester	no semester recommended	-	2

+ Structural Dynamics (3012585)

Module titel	Structural Dynamics (Compulsory subject)
Identifier	3012585
Version	V3
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2019
Valid until	-
Module level	Master
Content	• Linear and nonlinear single-degree-of-freedom systems, multiple-degree-of-freedom systems as well as systems with distributed mass and stiffness • Fundamentals of soil dynamics, soil-structure interaction as well as random vibrations • Solution of earthquake, wind, wave, machines, human and traffic induced vibration problems of the constructive building, structural and hydraulic engineering.
Learning Objectives/ Learning Outcomes	• Application of analytical and numerical methods in time and frequency domain for the investigation of structure dynamics • Evaluation of the results according to the requirements of the standards • Maintaining awareness of dynamic loading during the design of civil engineering structures. • Creating program codes in Matlab in regards to the learned dynamic content ;
(Study-Specific) Prerequisites	-
(recommended) Requirements	-
References	Chopra, A.K.: Dynamics of Structures, Prentice Hall, 2012; Clough, R.W., Penzien, J.: Dynamics of Structures, Computers &; Structure Inc., 2003; Humar, J.: Dynamics of Structures, CRC Press, 2012; Meskouris: Structural Dynamics - Models, Methods, Examples, Ernst und Sohn-Verlag, 2000; Paz, M., Leigh, W.: Structural Dynamics, Springer-Verlag, 2004
Language	English
Examination Terms	Graded written exam. Admission requirements for participation in the written exam: passed term paper.
Miscellaneous	-
Module coordinator	Dr.-Ing. Simon Klarmann
ECTS Credits	5
Contact time (WSH)	5
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	75,0

+ Structural Dynamics (3012585)

Self-study hours (h)	75,0

Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Term paper Structural Dynamics (301258501)	1st semester	no semester recommended	0	0
Written exam (or oral exam) Structural Dynamics (301258502)	1st semester	no semester recommended	5	0

Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Structural Dynamics	1st semester	no semester recommended	-	3
Excercise Structural Dynamics	1st semester	no semester recommended	-	2

RWTH AACHEN UNIVERSITY

+ Sustainability for the Built Environment - GREEN2Construction ...

Module titel	Sustainability for the Built Environment - GREEN2Construction (Compulsory subject)
Identifier	0531058
Version	V1
Duration (Semester)	one semester
Cycle (Semester)	summer semester
Valid from	Winter semester 2024
Valid until	-
Module level	-
Content	What is sustainability? How do buildings and building activity impact sustainability? What is my contribution as an engineer? What are aspects of sustainability and how are they interrelated? What are the aims and requirements of sustainable building design? In this course, students will learn methods, standards and tools in numerous aspects of sustainability (climate protection, energy efficiency, resource efficiency, biodiversity, etc.) and apply them on real projects. Part 1: Sustainability - the foundations The focus is on the fundamentals of sustainability and sustainable building design. Important aspects of sustainability such as climate change, energy demand, and certifications are covered along with the relevant methods such as life cycle assessment (LCA). Other important concepts such as ESG and SDG will be explained as well as the most common building sustainability certifications (e.g., DGNB, LEED, BNB), their scope and differences. The first cohort of topics is compulsory and covers climate change, energy efficiency, resource efficiency and circulatory. The second cohort of topics will be determined by the students, who select four from a pool of eleven additional topics. Part 2: Sustainability as a system One of the common problems in sustainable design are approaches, methods, materials, etc. that focus on one sustainability goal and ignores the others. The resulting "isolated solutions" solve the problem in question but trigger a chain reaction of other critical problems in other areas. For example, while most compound insulation systems are extremely effective in improving the energy efficiency and reducing the energy demand of buildings, they are completely non-circular, causing a huge waste of resources, skyrocketing life cycle costs and posing a risk to people and the environment due to the content of hazardous substances. The focus here is on the principles of systematic modeling and evaluation of sustainability-related measures in building design, the interdependencies between the parameters of the individual sustainability aspects, the avoidance of isolated solutions and greenwashing. Part 3: Digital Tools for sustainability optimization Here, students will learn and apply various digital tools that support sustainability in the design phase. These tools will be introduced and students will have the choice to learn and apply one of them on a real project. Most of the tools are intended for the BIM-based design process, therefore basic skills of the principles of the planning process in BIM as well as the familiarity with at least one BIM design system are required. Part 4: Development of a sustainability concept for a real project Developing sustainability concepts as a part of a project has become one of the key tasks for every architect, designer, planer, and engineer, both for new building projects and refurbishment projects. Based on the knowledge acquired in the previous modules, students have to develop their own sustainability concepts for two real competition projects (new building and existing building).
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • gain a deep understanding in the various aspects and principles of sustainability • know the different aspects and topics of sustainability and how they impact and interact with each other • understand and apply measures and solutions for the improvement of the building design in one or more aspects of sustainability in a systematic way, without damaging others

+ Sustainability for the Built Environment - GREEN2Construction ...

	• recognize and avoid greenwashing • know the various building sustainability certifications, the similarities and differences, the potentials, and the limitations in their application Abilities / Skills Students… • identify, which sustainability aspects need to be addresses according to the requirements of the project. • identify, which method and tools to be applied in alignment with the identified relevant sustainability aspects (LCA, circularity optimization, recyclability potential estimation; Ökobaudat etc.) • identify and apply the optimal tool for the optimization towards a specific sustainability goal. • develop and formulate sustainability concepts with detailed workflows and measures for their implementation for a real building project. Competencies Students… • have expertise in and utilize confidently the principles, standards and approaches for sustainability modelling and optimization in the built environment • recognize and avoid greenwashing • apply various tools, supporting the sustainability optimization in the planning process, identifying weaknesses in the prospective sustainability performance of the building, and avoiding them in the planning process • develop a comprehensive sustainability concept for a building project (new and in refurbishment)
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	English
Examination Terms	The course grade is composed as follows: • Portfolios (80 %, graded) • Written Examination (Klausur, 20 %, graded, 60 min)
Miscellaneous	-
Module coordinator	-
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

+ Sustainability for the Built Environment - GREEN2Construction ...

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Sustainability for the Built Environment - GREEN2Construction (053105802)	2nd semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Sustainability for the Built Environment - GREEN2Construction	2nd semester	no semester recommended	-	2
Exercise Sustainability for the Built Environment - GREEN2Construction	2nd semester	no semester recommended	-	2

+ Future Sustainability (0531057)

Module titel	Future Sustainability (Compulsory subject)
Identifier	0531057
Version	V1
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	The built world has a tremendous impact on the environment. Buildings are considered the largest consumer of material and energy resources, the largest consumer of energy, and the largest producer of waste. As designers of the built environment, we determine the performance and the future impact of buildings on the environment. Many of these challenges have been known to science and industry for decades. However, it is no longer sufficient to act reactively against the most pressing problems that are already known. The climate and resource crisis, the biodiversity crisis, the availability of water as a resource - to name just a few - have arisen because industry and policymakers have tried to respond too late and only reactively to processes that are already irreversible in some cases. A "next" generation of sustainability and environmental challenges and looming imbalances are already emerging and are being dramatically impacted by the built world, construction activities - and processes. The main objective of the course is to expose students to the challenges of sustainability and sustainability development today and in the upcoming decades. The students have the opportunity to analyze, comprehend, and develop coherent future scenarios for the built world in the context of the future sustainability development, based on the current status quo and observed trends, and proactively address them through research, analysis and conceptualization of innovations and innovative solutions for all levels of the built world – building materials, building technologies, building processes, building concept and city quarters. The work throughout the semester is divided into smaller modules, beginning with input by the lecturer, followed by a conceptual solution development by the students in constant feedback cycle with the lecturer and finally concluded with an exemplary implementation of the concepts in a project environment.
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • know about the current and future trends in sustainability development. • are capable to draw and understand scenarios in sustainability development • comprehend the possible impact a drawn scenario would have on building and the building process in near to mid-term future. • have comprehensive knowledge about the cutting edge technologies (state of art and state of research) and solutions for the building sustainability performance optimization from a multi-aspect perspective on material, building systems, building process, building and city quarter levels; knowledge of the implementation, the potentials and shortcomings of such technologies; Abilities / Skills Students • identify trends in the sustainability development regarding the built word • develop proactive solutions to address current and future challenges. • formulate solutions for the future trends and scenarios of the sustainability development corresponding with the expected impact and changes on the built environment (materials, processes, buildings, city quarters et)

+ Future Sustainability (0531057)

	• understand the impact of the implementation of innovative technologies in a systemic context. • explore and formulate demand and concepts for new and improved solutions for the current and future sustainability scenarios on material, building systems, building process, building and city quarter levels.
(Study-Specific) Prerequisites	-
(recommended) Requirements	Successful completion of the class “Sustainability for the Built Environment - Green2Construction”
References	Will be provided for each module; the lectures and the discussions will be recorded and provided to the students as learning material.
Language	English
Examination Terms	The course grade is composed as follows: • Portfolios (50 %, graded) • Final presentation of portfolio results (Referat, 50 %, graded)
Miscellaneous	-
Module coordinator	-
ECTS Credits	5
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	60,0
Self-study hours (h)	90,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Future Sustainability (053105701)	3rd semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Future Sustainability	3rd semester	no semester recommended	-	2
Exercise Future Sustainability	3rd semester	no semester recommended	-	2

RWTH AACHEN UNIVERSITY

– Part I
+ Design Process of Building Construction Part I (0530186)

Module titel	Design Process of Building Construction Part I (Compulsory elective subject)
Identifier	0530186
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	summer semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	The way the project work is carried out, i.e. the individual supervision, the discussion in groups at regular colloquia and the final public presentation promote the key competencies of the candidates, i.e. their ability to act independently, communicate and interact. Contents: In-depth courses that change every semester with a specific focus on key sustainability issues. A 2-semester project (module 1+module 2) with completion at the end of module 2. Its central object is to integrate sustainability aspects into a given building design draft. It contains synthetic-analytical and scientific components and questions that also contain innovation and research potential. The two-semester duration allows a comprehensive and at the same time intensive course of study, which enables the well-founded development of one's own specializations.

Learning Objectives/ Learning Outcomes	Knowledge / Understanding
	
	Students…
	
	• Complex projects require specific, success-oriented solution strategies. The design project is based on specific sustainable requirements from planning practice. Iterative procedures are practiced and here the interplay between the planning of its detailing with the special consideration of sustainability.
	• In addition, the following skills and abilities are taught:
	  • scientific working methods,
	  • application possibilities of the most diverse, construction and planning-relevant scientific fields,
	  • to consider, control and integrate the services of others involved in the planning,
	  • reconciling divergent factors, applying knowledge and integrating it holistically in creating a design solution.…

(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	English
Examination Terms	Presentation (Referat, 100% graded)
Miscellaneous	-

– Part I
+ Design Process of Building Construction Part I (0530186)

Module coordinator	Prof. Sabine Brück-Dürkop
ECTS Credits	3
Contact time (WSH)	2
Examination duration (min)	-
Total hours (h)	90,0
Contact hours (h)	30,0
Self-study hours (h)	60,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Design Process of Building Construction Part I (053018601)	2nd semester	no semester recommended	3	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Practical Session Design Process of Building Construction Part I	2nd semester	no semester recommended	-	2

– Part I
+ FE Application in the Construction Practice Part I (0530193)

Module titel	FE Application in the Construction Practice Part I (Compulsory elective subject)
Identifier	0530193
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	summer semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	• Application of commercial software for modeling of beam structures • static calculation and design • discussion of the approximation characteristics of numerical methods using examples • analytical rollover and comparison calculations • control options • Structural analysis-BIM interfaces
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • apply commercial software for modeling of beam constructions. • perform static and dynamic analysis and dimensioning of real-world examples. Abilities / Skills Students… • will evaluate and discuss the approximation characteristics of the numerical methods using examples. Competencies Students… • learn how to work with digital structural models and can apply them. • are able to carry out and check computer-aided modeling of structures on the basis of practical construction projects with commercial FE programs and to check them.
(Study-Specific) Prerequisites	-
(recommended) Requirements	None
References	-
Language	English
Examination Terms	Presentation and oral examination (100% graded)
Miscellaneous	-
Module coordinator	Prof. Sven Klinkel
ECTS Credits	3
Contact time (WSH)	2

RWTH AACHEN UNIVERSITY

– Part I
+ FE Application in the Construction Practice Part I (0530193)

Examination duration (min)	-
Total hours (h)	90,0
Contact hours (h)	30,0
Self-study hours (h)	60,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination FE Application in the Construction Practice Part I (053019301)	2nd semester	no semester recommended	3	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Practical Session FE Application in the Construction Practice Part I	2nd semester	no semester recommended	-	2

RWTH AACHEN UNIVERSITY

– Part II
+ Design Process of Building Construction Part II (0530187)

Module titel	Design Process of Building Construction Part II (Compulsory elective subject)
Identifier	0530187
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	The way the project work is carried out, i.e. the individual supervision, the discussion in groups at regular colloquia and the final public presentation promote the key competencies of the candidates, i.e. their ability to act independently, communicate and interact. Contents: In-depth courses that change every semester with a specific focus on key sustainability issues. A 2-semester project (module 1+module 2) with completion at the end of module 2. Its central object is to integrate sustainability aspects into a given building design draft. It contains synthetic-analytical and scientific components and questions that also contain innovation and research potential. The two-semester duration allows a comprehensive and at the same time intensive course of study, which enables the well-founded development of one's own specializations.

Learning Objectives/ Learning Outcomes	Knowledge / Understanding
	
	Students…
	
	• Complex projects require specific, success-oriented solution strategies. The design project is based on specific sustainable requirements from planning practice. Iterative procedures are practiced and here the interplay between the planning of its detailing with the special consideration of sustainability.
	• In addition, the following skills and abilities are taught:
	  • scientific working methods,
	  • application possibilities of the most diverse, construction and planning-relevant scientific fields,
	  • to consider, control and integrate the services of others involved in the planning,
	  • reconciling divergent factors, applying knowledge and integrating it holistically in creating a design solution.…

(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	English
Examination Terms	Presentation (Referat, 100% graded)
Miscellaneous	-

– Part II
+ Design Process of Building Construction Part II (0530187)

Module coordinator	Prof. Sabine Brück-Dürkop
ECTS Credits	5
Contact time (WSH)	2
Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	30,0
Self-study hours (h)	120,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Design Process of Building Construction Part II (053018701)	3rd semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Practical Session Design Process of Building Construction Part II	3rd semester	no semester recommended	-	2

RWTH AACHEN UNIVERSITY

– Part II
+ FE Application in the Construction Practice Part II (0530194)

Module titel	FE Application in the Construction Practice Part II (Compulsory elective subject)
Identifier	0530194
Version	v01
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	• Application of commercial software for modeling of beam, plate and shell structures • static and dynamic calculation and design • discussion of the approximation characteristics of numerical methods using examples • analytical rollover and comparison calculations • control options • Structural analysis-BIM interfaces
Learning Objectives/ Learning Outcomes	Knowledge / Understanding Students… • apply commercial software for modeling of beam, plate and shell constructions. • perform static analysis and dimensioning of real-world examples. Abilities / Skills Students… • will evaluate and discuss the approximation characteristics of the numerical methods using examples. Competencies Students… • learn how to work with digital structural models and can apply them. • are able to carry out and check computer-aided modeling of structures on the basis of practical construction projects with commercial FE programs and to check them.
(Study-Specific) Prerequisites	Passed Module "FE Application in the Construction Process Part I"
(recommended) Requirements	none
References	-
Language	English
Examination Terms	Presentation and oral examination (100% graded)
Miscellaneous	-
Module coordinator	Prof. Sven Klinkel
ECTS Credits	5
Contact time (WSH)	2

– Part II
+ FE Application in the Construction Practice Part II (0530194)

Examination duration (min)	-
Total hours (h)	150,0
Contact hours (h)	30,0
Self-study hours (h)	120,0

● Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination FE Application in the Construction Practice Part II (053019401)	3rd semester	no semester recommended	5	-

▲ Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Practical Session FE Application in the Construction Practice Part II	3rd semester	no semester recommended	-	2

+ Language Course I (4021266)

Module titel	Language Course I (Compulsory subject)
Identifier	4021266
Version	V1
Duration (Semester)	one semester
Cycle (Semester)	winter semester
Valid from	Winter semester 2019
Valid until	-
Module level	Master
Content	The course is aimed at students who are looking for a university-specific foreign lan-guage education, who need a foreign language for their studies and/or are planning a stay abroad (study, internship, project). Depending on the level, the range of foreign languages on offer takes into account the training of language skills specific to the profession. In the course you will learn the essential elements of grammar and vocabulary of the respective language, depending on your level, so that you can assert yourself both in writing and orally in everyday communication situations. In addition, you will learn to extract the essential information from authentic and university-specific reading and lis-tening texts as well as from various types of texts such as: Write e-mails, letters, messages and notes.
Learning Objectives/ Learning Outcomes	To learn the basics of the respective language or to deepen and expand already existing skills for active participation in everyday and working life.
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	German/English
Examination Terms	100% written examination in reading, listening, writing and grammar
Miscellaneous	-
Module coordinator	-
ECTS Credits	2
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	60,0
Contact hours (h)	60,0
Self-study hours (h)	,0

+ Language Course I (4021266)

Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Language Course I (402126601)	2nd semester	no semester recommended	2	-

Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Language Course I	2nd semester	no semester recommended	-	2
Exercise Language Course I	2nd semester	no semester recommended	-	2

+ Language Course II (4021267)

Module titel	Language Course II (Compulsory subject)
Identifier	4021267
Version	V1
Duration (Semester)	one semester
Cycle (Semester)	summer semester
Valid from	Winter semester 2019
Valid until	-
Module level	Master
Content	The course is aimed at students who are looking for a university-specific foreign lan-guage education, who need a foreign language for their studies and/or are planning a stay abroad (study, internship, project). Depending on the level, the range of foreign languages on offer takes into account the training of language skills specific to the profession. In the course you will learn the essential elements of grammar and vocabulary of the respective language, depending on your level, so that you can assert yourself both in writing and orally in everyday communication situations. In addition, you will learn to extract the essential information from authentic and university-specific reading and lis-tening texts as well as from various types of texts such as: Write e-mails, letters, messages and notes.
Learning Objectives/ Learning Outcomes	To learn the basics of the respective language or to deepen and expand already existing skills for active participation in everyday and working life.
(Study-Specific) Prerequisites	-
(recommended) Requirements	none
References	-
Language	German/English
Examination Terms	100% written examination in reading, listening, writing and grammar
Miscellaneous	-
Module coordinator	-
ECTS Credits	2
Contact time (WSH)	4
Examination duration (min)	-
Total hours (h)	60,0
Contact hours (h)	60,0
Self-study hours (h)	,0

+ Language Course II (4021267)

Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Language Course II (402126701)	3rd semester	no semester recommended	2	-

Offer node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Lecture Language Course II	3rd semester	no semester recommended	-	2
Exercise Language Course II	3rd semester	no semester recommended	-	2

+ Master Thesis (0521784)

Module titel	Master Thesis (Compulsory subject)
Identifier	0521784
Version	v02
Duration (Semester)	one semester
Cycle (Semester)	winter/summer semester
Valid from	Winter semester 2024
Valid until	-
Module level	Master
Content	Completed academic paper, which shall show that the students are capable of independently processing a problem related to their subject according to academic methods within a set deadline.
Learning Objectives/ Learning Outcomes	The students learn the independent approach and processing of academic themes, their documentation and written interpretation within a set deadline. They acquire systematic academic research skills.
(Study-Specific) Prerequisites	The topic of the Master thesis cannot be assigned until 80 CPs have been achieved.
(recommended) Requirements	-
References	-
Language	English
Examination Terms	Master Thesis (100 %, graded) and Colloquium (not graded)
Miscellaneous	-
Module coordinator	-
ECTS Credits	30
Contact time (WSH)	-
Examination duration (min)	-
Total hours (h)	900,0
Contact hours (h)	-
Self-study hours (h)	-

+ Master Thesis (0521784)

Exam node

Title	Recommended Semester (Study start winter)	Recommended Semester (Study start summer)	ECTS Credits	Contact time (WSH)
Examination Master Thesis (052178401)	4th semester	no semester recommended	30	-