Description of the degree program

Industrial Engineering, Study Course Civil Engineering (Master) PO 9

Date: 09.02.2026

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Specialisation Building Material

Title	Concrete Technology and Materials Engineering		
Number	4334090	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Baustoffe
Hours per Week / ECTS	6 / 6,0	**Module owner**	Dr. Thorsten Leusmann
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Oral exam (approx. 30 Min.)		
Course achievement			

Contents

[Concrete Technology (V)]
The Concrete Technology course deals with modern concrete technology which includes normal concrete, lightweight concrete, high-strength concrete, self-compacting concrete, and architectural concrete. Furthermore, the topics of rheology, hardening, heat release and structure formation, production of dense and massive concrete structures, recycling, and additive manufacturing in construction are covered.

[Materials behavior (V)]
The Material Behaviour course is dedicated to the chemico-physical behaviour of building materials. The focus of the course is on describing the structure and porosity of hardened cement pastes as well as the strength and load-dependent deformations of concretes. In addition, processes such as shrinkage, creep and relaxation of concretes are presented in detail. This is followed by an explanation of the load-bearing behaviour of concrete, reinforcing steel and concrete, and fibre reinforced polymer bonding. Then the production and chemico-physical behaviour of the reinforcement materials, reinforcing steel and fibre reinforced polymers, are presented.

Objective qualification

After attending the module, students will be able to identify and define requirements on concrete as a material for special constructions and applications, select suitable high-performance concretes, design them according to the requirements, and, if necessary, develop them. Students will gain competence in assessing modern concrete technology with regard to its application. With the in-depth knowledge gained of the physical, chemical and mechanical behaviour of building materials, students will be able to make application-oriented decisions for structures and implement them in proper planning and realisation, thus counteracting potential defects and damage. They will be able to describe the structure-related characteristics of building materials in depth and link properties such as rheological properties, hardening, and fracture formation, as well as load-dependent and load-independent deformations, with the elementary structure of the materials based on scientific fundamentals. Through the link with current issues from research and development, students will also be able to discuss scientific issues and research results critically.

Literature

ausführliches Vorlesungsmanuskript, aktuelle Themen werden in ergänzenden Unterlagen aufbereitet

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Seminar	german
	2,0	Lecture	german
	2,0	Lecture	german

Title	Structural Repair		
Number	4398210	**Module version**	V1
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Baustoffe
Hours per Week / ECTS	6 / 6,0	**Module owner**	Dr. Thorsten Leusmann
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 Min.)		
Course achievement			

Contents

In the course Building Damages, knowledge is given on the durability of structures made of mineral building materials, on origins and mechanisms of damage, on models for the description of damage and on strategies for the prevention of structural damage. Based on this, concepts for repair and strengthening of reinforced and prestressed concrete structures as well as masonry, plasters and screeds are discussed in the context of current standardization.
Furthermore, tasks, objectives and methods of structural investigation and material testing will be addressed. In addition, the topics of planning, organization and evaluation of measurement and testing tasks, safety, reliability, standardization and approval, application of methods and instruments for experimental investigation and monitoring of reinforced concrete structures are discussed. Case studies are presented and analysed in the course, which train interdisciplinary problem-solving skills. Moreover, a practical course on the use of investigative methods is offered.
The topics discussed are based on the fundamentals of the bachelor's subject Building Materials Science.

Objective qualification

After completing the course Building Damages, the students will be able to describe, explain and differentiate the causes as well as the mechanical, chemical and physical mechanisms of damage to structures made of mineral building materials. Based on this, the students will be able to design strategies for the prevention of damage, assess structural damage, design target-oriented repair strategies, develop suitable repair concepts and carry out a success control.
After successful participation in the course Building Investigation, students are able to describe methods for damage analysis of reinforced and pre-stressed concrete structures and to define building inspection strategies depending on the condition of the structures and the building materials used. In addition, they will be able to understand how current non-destructive testing methods for quality control, inspection and long-term monitoring of structural components, facilities and structures work, apply them practically and assess their fields of application and limitations.
Targeted case studies are designed to give students the ability to abstract and to transfer what they have learned to a new problem area and to develop their own investigation concepts.

Literature

Remark
The module can only be included in one specialisation. Please ensure the correct assignment when registering.

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Related courses			
Rules for the choice of courses			
Building Damages and Building Investigation must be documented. Furthermore, either the Building Maintenance Adventure or Sealing of Buildings adventure can be taken. The Building Maintenance Adventure can be taken by a maximum of 20 people.			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	1,0	Exercise	german
	3,0	Lecture/Exercise	german
	2,0	Lecture	german
	1,0	Lecture/Exercise	german

Title	Additive Manufacturing in Construction		
Number	4398700	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Baustoffe
Hours per Week / ECTS	6 / 6,0	**Module owner**	Dr. Thorsten Leusmann
Workload (h)	180		
Class attendance (h)	91	**Self studying (h)**	89
Compulsory requirements			
Expected performance/ Type of examination	Written exam (60 Minuten) and laboratory experiment		
Course achievement			
Module grade composition	The grade is made up of half of the grades for each of the two examinations.		

Contents

In the course Materials and Processes in Additive Manufacturing, basic knowledge of the various additive manufacturing processes in the construction industry is first obtained across all materials. Subsequently, a special focus is set on 3D concrete printing. The main topics are 3D concrete printing processes (Selective Cement Activation, Selective Paste Intrusion, Large Particle 3D Concrete Printing, Concrete Extrusion, Shotcrete 3D Printing, Injection 3D Concrete Printing), material development (concrete technology, composition, use of additives), testing of additively manufactured objects (rheology, mechanics), quality control and application in practice.
In the course Methods of Digital Construction the basic knowledge of programming in Rhino Grasshopper and Python is taught. Based on the lecture, students learn in practical exercises to create printable geometries parametrically, to prepare them for 3D printing and to generate robot paths. Robot simulation is also taught to test the manufacturability of designed objects.
In the collaborative exercise Applied Additive Manufacturing, the acquired knowledge is applied to implement physical objects by means of a selected additive manufacturing process.

Objective qualification

After completing the module, the students will be able to make an application-oriented choice of additive manufacturing methods in the construction industry and to characterize and evaluate the material technology, process technology and robotic aspects.
Students will be able to recognize important material-process interactions and evaluate them on the basis of learned relationships. Basic design methods for material and structural behavior are learned and applied to various applications. In addition, knowledge of the composition of materials for additive manufacturing is available, which can be further developed and subsequently manufactured using the knowledge obtained. The students also know relevant investigation methods for evaluating an additive manufacturing process, can apply them and evaluate the data obtained.
In addition, students will be able to design 3D objects using computer-aided design and prepare the data appropriately for the additive manufacturing process. In addition, students will be able to perform robot path planning and control the robot in a simple process.
By participating in the exercise, students will also be able to apply specific additive manufacturing processes and produce physical objects.

Literature
Remark
The module can only be included in one specialisation. Please ensure the correct assignment when registering. Methods of Digital Construction Fabrication and Applied Additive Manufacturing can be attended by a maximum of 20 participants.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Lecture/Exercise	german
	2,0	Exercise	german

Title	Organic Materials in Construction		
Number	4310670	**Module version**	V1
Shorttext		**Language**	english german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Organische Baustoffe und Holzwerkstoffe
Hours per Week / ECTS	6 / 6,0	**Module owner**	Dr. Thorsten Leusmann
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	2 Written exams (each 45min) The module examination comprises 2 x 45 min., as each of the courses offered in the module deals with different aspects of organic materials. The wood-based materials are natural renewable raw materials, while the plastics are synthetically produced organic polymers. The materials differ significantly in their structure and in their mechanical		
Course achievement			

Contents

General: location determination and introduction
Structure of polymers: chemical structure, formation reactions, macromolecules (shape, size and arrangement), bonding forces, classification of plastics
Processing of polymers: pressing, injection molding, extrusion, blow molding, calendering, foaming, forming, machining, welding, bonding, mechanical joining
Properties of polymers: strength and deformation behavior, temperature influence, loading influence, influence of molecular orientations, stress cracking, physical properties, thermal properties, electrical properties, density, weathering behavior and chemical resistance, important standard plastics
Application of polymers: Site aids, construction aids and binders (polymer impregnated concrete [PIC], polymer modified cement-bound concrete [PCC], reaction resin bound concrete [PC], rigid foam lightweight concrete, joint sealants and joint profiles); polymers in building construction (thermal and acoustic insulation, light elements, windows, facades, installation materials, roofing membranes); polymers in civil engineering (sealing membranes, supply and disposal systems, frost protection layers); polymer structures (structures made of fiber-reinforced composites, textile structures); structural repair, damage to polymers in civil engineering.

[Plant-based Natural Fibre Reinforcements in Construction (VÜ)] :
Natural fibres as construction materials. Fibre structure and properties.
Properties of natural fibre reinforced polymer (NFRP) composites. Natural fibre reinforced cementitious (NFRC) materials in construction. NFRP materials in construction.
NFRP tube encased NFRC hybrid structure. NFRP and NFRC for Structure Strengthening. Durability of NFRP and NFRC in construction. Degradation mechanism.
Fibre modifications.

Objective qualification

Students acquire the essential anatomical, morphological, physical and chemical properties of organic building materials (wood-based materials and polymers) and acquire in-depth knowledge of raw materials, properties, manufacture and application of organic building materials and wood-based materials. The materials science aspects of organic materials such as constitutive laws, creep, mechanosorptive creep, etc. are emphasized.
Students will also acquire the essential non-destructive and semi-destructive methods for the in-situ evaluation of wood in structures and acquire in-depth knowledge of principles, procedures, and limitations of various methods. Practical knowledge is reinforced through laboratory exercises and "in-field" (field) exercises.
With reference to polymers, the influence of macromolecular structure on the properties of polymers is considered in detail. Another important aspect is the long-term behavior of polymers under the influence of loads, media and weathering. Furthermore, the students learn methods of plastics analysis.
By achieving the qualification objectives, the students will be able to select wood materials and polymers in civil engineering for the respective application purpose and to carry out evaluations on existing buildings and structures properly during the planning phase, not only in the event of damage.

Literature

-Forest Products Laboratory. Wood handbook - Wood as an engineering material. General Technical Report FPL-GTR- 190. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory: 508 p. 2010. Free download http://www.fpl.fs.fed.us/products/publications/specific_pub.php?posting_id=18102
-Niemz, P., and W. U. Soderegger. 2017. Holzphysik. Physik des Holzes und der Holzwerkstoffe. Hanser-Verlag Leipzig, 580 p. ISBN 978-3-446-44526-0.
Holzmann, G., Wangelin, M., and R. Bruns. 2012. Natürliche und pflanzliche Baustoffe. 2. Auflage. Springer-Vieweg. 394 p. ISBN 978-3-8348-1321-3.
-Folien in PDF-Format, vom Dozenten benannte Veröffentlichungen aus dem Fachbereich
-Menges / Schmachtenberg / Michaeli / Haberstroh: Werkstoffkunde Kunststoffe, ISBN 3-446-21257-4, Carl Hanser Verlag 2002
-Oberbach: Saechtling Kunststoff Taschenbuch, ISBN: 3-446-22670-2, Carl Hanser Verlag 2004
-Frank: Kunststoff-Kompendium, ISBN: 3-8023-1589-8, Vogel Fachbbuchverlag 2000
-Braun: Kunststofftechnik für Einsteiger, ISBN 3-446-22273-1, Carl Hanser Verlag 2003
-Braun: Erkennen von Kunststoffen, Qualitative Kunststoffanalyse mit einfachen Mitteln, Carl Hanser Verlag 2003
-Gächter / Müller: Kunststoff-Additive, ISBN: 3-446-15627-5, Carl Hanser Verlag 1989
-Bargel / Schulze: Werkstoffkunde, Springer Verlag 2004
-Potente: Fügen von Kunststoffen, Grundlagen, Verfahren, Anwendung, ISBN: 3-446-22755-5, Carl Hanser Verlag 2004

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
	3,0	Lecture/Exercise	german
	3,0	Lecture/Exercise	english

Title	Procedures for Preservation and Restoration		
Number	4310780	**Module version**	V1
Shorttext		**Language**	english german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Organische Baustoffe und Holzwerkstoffe
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Bohumil Kasal
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	2 Written exams (45min)		
Course achievement			

Contents

[Bautenschutz und Bauwerkssanierung (V+Ü)]
(Building restoration) Damage to concrete and reinforced concrete devices, building inspectorate treatment of repair measures, repair of cracked reinforced and prestressed concrete structures, replacement of structural concrete and surface protection on concrete and reinforced concrete structures, chloride removal of reinforced concrete structures contaminated with de-icing salt and hydrogen chloride, basics on fibrous hazardous substances including asbestos, Asbestos inventory, restructuring urgency, asbestos abatement and protective measures (building protection). Building physics and materials with regard to thermal and moisture protection, basics of the Energy Conservation Act and the Energy Conservation Ordinance, construction, materials, advantages and disadvantages of various wall constructions and roof constructions as well as roof sealing, landfill base sealing.

This course is designed for Bachelor and Master students in architecture and civil engineering and will be held in English. Advanced composite materials made of glass and carbon fibers have been used for infrastructure globally for many years. The course will focus on use and design of structures with fiber reinforced polymer (FRP) composite materials.
Material properties of FRP composites, Manufacturing of composite structures, Mechanics and failure analysis of FRP, Flexural and Shear strengthening of RC structures with externally bonded FRP reinforcement, Concrete column confinement, FRP strengthening of masonry and timber structures, Design of FRP profile and all FRP structures, Monitoring and testing methods of FRP will be taught. Students will learn about relevant physical and mechanical properties of advanced composite materials and acquire in-depth knowledge about raw materials, properties, manufacturing, and design of composite materials as well as their hybrid structures for structural engineering.

Objective qualification

Students learn essential aspects of thermal and moisture protection based on building physics and material technology, as well as fundamentals of roof constructions, roof sealing, and landfill base sealing, each with an emphasis on plastic-based materials and structures. Relevant standards and regulations are consulted in relation to the application.

This will enable you to prevent damage caused by building physics in execution and planning, to carry out an initial analysis of damage that has occurred and damage in this respect, to commission in-depth investigations in a targeted manner and to draw up suitable repair concepts.
The students acquire knowledge of the main physical, chemical and electrochemical damage mechanisms in concrete structures and acquire in-depth knowledge of damage analysis, repair construction materials and their practical application in construction. The focus is on plastic-based repair building materials. Furthermore, the fundamentals of fibrous hazardous materials including asbestos, assessment of urgency for asbestos abatement and its implementation are learned. Practical demonstrations of analytical methods will supplement the lecture. This will enable you to assess existing damage, establish and implement an appropriate repair conception.
Students will acquire the essential non-destructive and semi-destructive methods for in-situ assessment of wood in structures and acquire in-depth knowledge of principles, procedures and limitations of various methods. Practical knowledge is deepened by laboratory and "in-field" (field) exercises.

Advance Composite Materials in Construction (VÜ)
Students acquire knowledge of the properties of fiber-reinforced composite materials and their use in construction. This will enable them to use such materials in a targeted manner in planning, construction and building reinforcement.

Literature

ausführliches Vorlesungsmanuskript, Handouts

Kasal, B., Tannert, T. (Editors). 2011. In-situ assessment of timber. RILEM State of the Art Reports, Vol. 7. Springer
Verlag. ISBN: 978-94-007-0559-3. 150 p.

Forest Products Laboratory. Wood handbook - Wood as an engineering material. General Technical Report FPL-GTR- 190. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory: 508 p. 2010. Free download http://www.fpl.fs.fed.us/products/publications/specific_pub.php?posting_id=18102

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
	4,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	english

Specialisation Building Preservation

Title	Basics in Conservation of Building Stocks		
Number	4398220	**Module version**	V1
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Stahlbau
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Klaus Thiele
Workload (h)	180 h		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written exam (60 Min.)		
Course achievement	Presentation		

Contents

Presentation of the increasing importance of building preservation as a responsible task in the construction industry. Building preservation in the context of historical buildings, dealing with cultural high-value buildings. Building analysis methods and knowledge of historical building materials and building structures. Overview of basic damage mechanisms and causes of damage divided into the areas of steel, solid, masonry and timber construction.
Presentation of common test methods as well as measuring instruments for damage assessment or condition assessment (anamnesis and diagnosis). Demonstration of methods for damage prevention, retrofitting and strengthening of structures and constructions (therapy). Aspects of history, material science, building physics and construction are illuminated. Project-oriented exercises.

Objective qualification

Upon completion of the course, students will have knowledge of the fundamentals of preservation of buildings. They know the methodical procedure for assessing the condition of an existing structure. They have the necessary knowledge of the basic causes and consequences of damage. They have an overview of possible strategies for repair and preservation. They have gained insights into the handling of high-value architectural monuments. Students will be able to recognize problems in the preservation and/or further development of the building stock as a resource. They know methods to select suitable measures from a transdisciplinary context and to represent these in a professional discussion.

For didactic reasons, the fundamentals taught will be elaborated in small groups to an exercise example and presented in the plenary session.

Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	4,0	Lecture/Exercise	german

Title	Structural Design - Theory		
Number	4398260	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Stahlbau
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Klaus Thiele
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Portfolio		
Course achievement			

Contents

Lectures by the project participants as well external scholars are offered as part of the module. In a weekly seminar, students prepare and present papers and student research projects; successful participants in the module “Design and Construction in Existing Contexts - project” can deepen their student research projects or further develop them in terms of design. The two modules Design and Construction in Existing Contexts - Project and Theory can be taken separately and independently of each other.

Objective qualification

Knowledge of theoretical and strategic principles of building preservation: handling of culturally/historically high-ranking building heritage, economically supported strategies for the preservation of larger (historical as well as modern) building stocks, constructive aspects of building preservation.
Students will be able to reason in the context of socio-cultural, ecological, and economic values and to develop and discuss sustainable strategies in groups.

Literature

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Related courses

Rules for the choice of courses

Compulsory attendance

Attendance is compulsory, the scope of possible absences is determined at the beginning of the course.

Name of the course	SWS	Eventtype	Language
	4,0	Lecture/Exercise	german

Title	Structural Design - Project		
Number	4398250	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Stahlbau
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Klaus Thiele
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Portfolio		
Course achievement			

Contents

The topic of building in existing contexts will be studied in theory and practice on a selected building. For this purpose, lectures are offered on two block dates, illuminating the interdisciplinary aspects of building in existing contexts.
In parallel, a selected building is analyzed and documented in interdisciplinary groups in the form of a supervised seminar. This ranges from the urban planning analysis, the evaluation of architectural design, the building construction and load-bearing systems used, to the inventory of building materials and building physics. In the second step, possibilities for repair and retrofitting are discussed and scenarios for a further use of the structure are developed. On the basis of the results elaborated here, a Studienarbeit can subsequently take place. The project Design and Construction in Existing Contexts - Theory in the winter semester is recommended as a theoretical consolidation. Anyway, the two modules Design and Construction in Existing Contexts - Project and Design and Construction in Existing Contexts - Theory can be taken independently of each other.

Objective qualification

The main approach is the interdisciplinary cooperation of architecture and engineering students of various disciplines on project examples. The focus is less on the individual structure or building, but rather on typical representatives of construction tasks in the project. The goal is a redefinition of the planning task of building in existing contexts, which places an emphasis on the complex analysis of the respective structural-technical and architectural framework conditions in order to enable a clever handling of the existing. Due to the interdisciplinary supervision and staffing, the subject is viewed from its holistic approach.
Students are enabled to plan and carry out necessary investigations on a selected object and to evaluate them in the overall context in order to develop suitable strategies and immediate measures for preservation and/or conversion

Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Attendance is compulsory, the scope of possible absences is determined at the beginning of the course.			
Name of the course	**SWS**	**Eventtype**	**Language**
	4,0	Lecture/Exercise	german

Title	Additive Manufacturing in Construction		
Number	4398700	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Baustoffe
Hours per Week / ECTS	6 / 6,0	**Module owner**	Dr. Thorsten Leusmann
Workload (h)	180		
Class attendance (h)	91	**Self studying (h)**	89
Compulsory requirements			
Expected performance/ Type of examination	Written exam (60 Minuten) and laboratory experiment		
Course achievement			
Module grade composition	The grade is made up of half of the grades for each of the two examinations.		

Contents

In the course Materials and Processes in Additive Manufacturing, basic knowledge of the various additive manufacturing processes in the construction industry is first obtained across all materials. Subsequently, a special focus is set on 3D concrete printing. The main topics are 3D concrete printing processes (Selective Cement Activation, Selective Paste Intrusion, Large Particle 3D Concrete Printing, Concrete Extrusion, Shotcrete 3D Printing, Injection 3D Concrete Printing), material development (concrete technology, composition, use of additives), testing of additively manufactured objects (rheology, mechanics), quality control and application in practice.
In the course Methods of Digital Construction the basic knowledge of programming in Rhino Grasshopper and Python is taught. Based on the lecture, students learn in practical exercises to create printable geometries parametrically, to prepare them for 3D printing and to generate robot paths. Robot simulation is also taught to test the manufacturability of designed objects.
In the collaborative exercise Applied Additive Manufacturing, the acquired knowledge is applied to implement physical objects by means of a selected additive manufacturing process.

Objective qualification

After completing the module, the students will be able to make an application-oriented choice of additive manufacturing methods in the construction industry and to characterize and evaluate the material technology, process technology and robotic aspects.
Students will be able to recognize important material-process interactions and evaluate them on the basis of learned relationships. Basic design methods for material and structural behavior are learned and applied to various applications. In addition, knowledge of the composition of materials for additive manufacturing is available, which can be further developed and subsequently manufactured using the knowledge obtained. The students also know relevant investigation methods for evaluating an additive manufacturing process, can apply them and evaluate the data obtained.
In addition, students will be able to design 3D objects using computer-aided design and prepare the data appropriately for the additive manufacturing process. In addition, students will be able to perform robot path planning and control the robot in a simple process.
By participating in the exercise, students will also be able to apply specific additive manufacturing processes and produce physical objects.

Literature
Remark
The module can only be included in one specialisation. Please ensure the correct assignment when registering. Methods of Digital Construction Fabrication and Applied Additive Manufacturing can be attended by a maximum of 20 participants.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Lecture/Exercise	german
	2,0	Exercise	german

Title	Fire Protection for Existing Buildings		
Number	4310980	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Brandschutz
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Jochen Zehfuß
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written exam+ (120min.) or oral exam (approx. 45 min.)		
Course achievement	The homework can be done in advance and can be included with 10% in the final grade of the module. The request for a written homework (exam+) has to be made by the student at the beginning of the exam. More detailed information on submission deadline of the homework will be provided during the lectures.		

Contents

Presentation of the fundamentals of preventive fire protection and fire fighting. Presentation of the historical development of fire safety regulations and the typical deviations of existing buildings from the current state of the art. Possibilities for upgrading structural fire protection measures and associated proof of usability. Concept creation for the fire protection upgrade of a historic building, taking into account the protection of monument aspects. Discussion of upgrade measures using specific project examples (excursion if applicable).
Independent application of the learned methodical approaches and concepts to different examples of special constructions (processing in groups and presentation of the results).

Objective qualification

The students know the typical deviations of existing buildings from the building code requirements of fire safety and the alternative measures for compensation. They are able to plan and evaluate compensation measures, taking into account the existing building and monument protection aspects

Literature

Zehfuß, J.; Wesche, J.; Lyzwa, J.: Brandschutz bestehender Gebäude (Skript); Geburtig, G.: Brandschutz im
Baudenkmal, Beuth-Verlag (2009).

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german

Title	Structural Repair		
Number	4398210	**Module version**	V1
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Baustoffe
Hours per Week / ECTS	6 / 6,0	**Module owner**	Dr. Thorsten Leusmann
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 Min.)		
Course achievement			

Contents

In the course Building Damages, knowledge is given on the durability of structures made of mineral building materials, on origins and mechanisms of damage, on models for the description of damage and on strategies for the prevention of structural damage. Based on this, concepts for repair and strengthening of reinforced and prestressed concrete structures as well as masonry, plasters and screeds are discussed in the context of current standardization.
Furthermore, tasks, objectives and methods of structural investigation and material testing will be addressed. In addition, the topics of planning, organization and evaluation of measurement and testing tasks, safety, reliability, standardization and approval, application of methods and instruments for experimental investigation and monitoring of reinforced concrete structures are discussed. Case studies are presented and analysed in the course, which train interdisciplinary problem-solving skills. Moreover, a practical course on the use of investigative methods is offered.
The topics discussed are based on the fundamentals of the bachelor's subject Building Materials Science.

Objective qualification

After completing the course Building Damages, the students will be able to describe, explain and differentiate the causes as well as the mechanical, chemical and physical mechanisms of damage to structures made of mineral building materials. Based on this, the students will be able to design strategies for the prevention of damage, assess structural damage, design target-oriented repair strategies, develop suitable repair concepts and carry out a success control.
After successful participation in the course Building Investigation, students are able to describe methods for damage analysis of reinforced and pre-stressed concrete structures and to define building inspection strategies depending on the condition of the structures and the building materials used. In addition, they will be able to understand how current non-destructive testing methods for quality control, inspection and long-term monitoring of structural components, facilities and structures work, apply them practically and assess their fields of application and limitations.
Targeted case studies are designed to give students the ability to abstract and to transfer what they have learned to a new problem area and to develop their own investigation concepts.

Literature

Remark
The module can only be included in one specialisation. Please ensure the correct assignment when registering.

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Related courses			
Rules for the choice of courses			
Building Damages and Building Investigation must be documented. Furthermore, either the Building Maintenance Adventure or Sealing of Buildings adventure can be taken. The Building Maintenance Adventure can be taken by a maximum of 20 people.			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	1,0	Exercise	german
	3,0	Lecture/Exercise	german
	2,0	Lecture	german
	1,0	Lecture/Exercise	german

Title	Steel Structures in Building Preservation		
Number	4310250	**Module version**	V2
Shorttext		**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Stahlbau
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Klaus Thiele
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Written exam (60min) or oral exam (30min) and term paper		
Course achievement			

Contents

[Experimental Structural Diagnostics (V)]
Lecture and demonstration experiments on measurement techniques in civil engineering with emphasis on steel structures.
- Measuring with strain gages: problems, models.
- Transducers: displacement, acceleration, vibration measurements
- Component testing with non-destructive testing methods I
  (dye penetrant testing, magnetic particle testing, potential probe)
- Component testing with non-destructive testing methods II
  (active thermographic methods, radiographic testing),
- material testing: hardness testing methods and tensile tests
- statistical evaluation of test data

[Test-based structural diagnostics (Ü)] Practical laboratory tests with homework/project
[Service-Life and Fatigue 2(VÜ)]
Advanced verification in the field of fatigue of steel structures and introduction to fracture mechanics.

[Historic Steel Structures(V)]
Introduction to the construction and design of historical steel structures made of cast iron and steel. Material fundamentals of cast iron and old steels. Joining techniques: welding of old steels, riveting.

Objective qualification

Students are able to evaluate and assess old, historic steel structures made of cast iron or steel with regard to their
load-bearing capacity and develop suitable repair measures.

Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	3,0	Lecture/Exercise	german
	1,0	Lecture/Exercise	german
	2,0	Seminar	german
		Lecture/Exercise	german

Specialisation Fire Protection Engineering

Title	Fundamentals of Fire Protection		
Number	4310990	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Brandschutz
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Jochen Zehfuß
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written exam+ (120min.) or oral exam (approx. 45 min.)		
Course achievement	seminar paper The presentation can be prepared in advance and contribute 10% to the final grade of the module. The student at the start of the exam must make the request for an exam+. Students will receive more information on presentation submission deadlines in the module's courses.		

Contents

Explanation of fire risks, causes of fire and typical fire damage and the corresponding preventive fire protection measures. Presentation of the legal basis and prerequisites for preventive fire protection, general and material requirements in building regulations law. Explanation of the planning principles for structural fire protection and the concept components for fire protection verification. Presentation and practice of the structure and function of fire safety concepts. Explanation of organizational fire safety measures. Discussion of the societal duty of fire protection and the role of fire brigades. Explanation of the prerequisites and requirements for firefighting operations. Presentation of fires system measures, their effectiveness and areas of application (fire alarm systems, smoke and heat extraction systems, equipment for the fire department, extinguishing water retention systems, control matrices). Tutorial and independent practices for the planning and dimensioning of the fire system measures according to the technical rules.

Objective qualification

Students know about the elements of preventive fire protection, fire fighting and fire systems and are able to apply them correctly in the context of fire safety design and planning for a building of normal type and use. Interdependencies and limits to the effectiveness of the measures are identified. Students will recognize the suitability of fire protection measures to compensate for deviations from the requirements of the building code and are able to develop a fire safety concept for a standard building.

Literature

-Zehfuß, J. et al.: Vorbeugender baulicher Brandschutz (Skript);
-Gressmann, H.-J.: Abwehrender und anlagentechnischer Brandschutz, expert verlag

-Zehfuß, J.; Kampmeier, B.: Konstruktiver baulicher Brandschutz im Betonbau. In: Betonkalender, 2018.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german

Title	Fire Safety Engineering Methods for Fire and Egress Simulation		
Number	4398820	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Brandschutz
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Jochen Zehfuß
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written exam+ (60 min.) or oral exam (approx. 30 min.)		
Course achievement	The homework can be done in advance and can be included in the final grade of the module. The request for a written homework (Klausur+) has to be made by the student at the beginning of the exam. More detailed information on submission deadline of the homework will be provided during the lectures.		

Contents

Understanding the basics of fire science, natural fire behaviour as well as the relevant parameters and physical and thermodynamic relationships. Illustration of plume models and parametric temperature-time curves. Explanation of the basics of zone and CFD models for the simulation of fire development and the determination of fire consequences. Depiction of extinction and recognition ranges. Introduction to the models for evacuation evaluations. Self employed application and working on a chosen topic independently. Individual treatment of typical fire related problems (fire impact of natural fires, smoke spread, influence on people, evacuation of buildings with large crowds of occupants).
Seminar presentations of special topics from the field of fire modeling by lecturers and by external experts.

Objective qualification

The students are familiar with the basics of fire science as well as the methods and models of fire safety engineering. They learn how to apply engineering methods in the context of fire safety and crowd management and recognise the scope of application. In addition the students know the exertion ability of these methods in the context of performance based design

Literature

-Zehfuß, J.: Ingenieurmethoden für die Brand- und Personenstromsimulation, Vorlesungsskript
-Zehfuß, J.. (Hrsg.): Leitfaden Ingenieurmethoden im Brandschutz, 4. Auflage, 2020 (elektronisch zum download)
-Karlsson, B.; Quintierre, G.: Enclosure fire dynamics
-Zehfuß, J., Riese, O.: Anwendung von Brandsimulationsmodellen für die Berechnung der thermischen -Einwirkungen im
-Brandfall und der Rauchableitung. In: Fouad, N. (Hrsg.):Bauphysik Kalender 2015. Verlag Ernst & Sohn, Berlin.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture/Exercise	german
	1,5	Internship	german
	0,5	Seminar	german

Title	Fire Safety Engineering Methods for Structural Fire Design		
Number	4398810	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Brandschutz
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Jochen Zehfuß
Workload (h)			
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written exam+ (60 min.) or oral exam (approx. 30 min.)		
Course achievement	The homework can be done in advance and can be included in the final grade of the module. The request for a written homework (Klausur+) has to be made by the student at the beginning of the exam. More detailed information on submission deadline of the homework will be provided during the lectures.		

Contents

Explanation and comprehensive description of the three-stage verification concept of the Eurocode for structural design in case of fire and its application in the scope of structural fire design of a special building. Introduction of the tabular verification based on national supplementary standard DIN 4102-4. Explanation of the concept of equivalent fire duration and presentation of the verification methods according to DIN 18230 for fire safety design of industrial buildings. Independent processing of typical questions concerning fire resistance and the mechanical behavior of load-bearing structures exposed to fire. Independent application of the software for specific tasks. Independent processing of a selected topic.
Seminar presentations of special topics in the field of structural fire design by lecturers and external experts.

Objective qualification

The students will be familiar with the fundamental procedures in structural fire design. They can correctly apply the Eurocode design methods in the 3 levels (tabular, simplified and advanced design procedures). They can also identify application areas and limitations. Students will understand the appropriate use of engineering methods for alternative performance-based fire safety design.

Literature

-Zehfuß, J.: Ingenieurmethoden für die Brandschutzbemessung von Bauteilen und Tragwerken, Vorlesungsskript
-Zehfuß, J. (Hrsg.): Leitfaden Ingenieurmethoden im Brandschutz, 4. Auflage, 2020 (elektronisch zum download) Hosser,
-D.; Zehfuß, J. (Hrsg.): Brandschutz in Europa Bemessung nach Eurocodes, Beuth Verlag, 2017
-Zehfuß, J.: Grundlagen nach Eurocode 1. In: Bauphysik-Kalender 2021.
-Zehfuß, J.; Kampmeier, B. (2021): Brandschutzbemessung von Betonbauteilen nach Eurocode 2. In: Bauphysik-Kalender 2021.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Mandatory attendance to the lecture series, max. 1 absence is allowed.			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture/Exercise	german
	1,5	Internship	german
	0,5	Lecture/Exercise	german

Title	Special areas of fire safety 1		
Number	4334210	**Module version**	V2
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	2	**Institution**	Fachgebiet Brandschutz
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Jochen Zehfuß
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	3 examinations: written exam (30 min. or 60 min.) or oral exam (15 or 30 min.)		
Course achievement			

Contents

[Fire protection of existing buildings (VÜ)]
Presentation of the fundamentals of preventive fire protection and fire fighting. Presentation of the historical development of fire safety regulations and the typical deviations of existing buildings from the current state of the art. Possibilities for upgrading structural fire protection measures and associated proof of usability. Concept creation for the fire protection upgrade of a historic building, taking into account the protection of monument aspects. Discussion of upgrade measures using specific project examples (excursion if applicable).

[Fire protection for special-purpose buildings (VÜ)]
Presentation of the material requirements for buildings of special type and use. Possibilities of compensatory measures within the framework of fire-safety-objective-oriented fire protection reports. Fire protection evaluation of unregulated special-purpose buildings. Presentation of project examples.

[Risk methods in fire safety (V)]
Presentation of internationally used qualitative and quantitative risk methods for determining fire risk in buildings. Determination of acceptable risks. Presentation of risk methods for the economic optimization of fire safety measures. Safety concept for life safety.

[Preventive disaster control (V)]
Presentation of the basics and organization of preventive civil protection and disaster response. Explanation of organizational and management structures in disaster response. Presentation of the design of structures for extreme load cases.

Objective qualification

Students acquire knowledge and competencies in special and peripheral areas of fire safety and are able to apply them correctly. In doing so, they will recognize interfaces and points of conflict with regard to the fire safety design of buildings and learn solution approaches. They know which compensation measures can be used to achieve the objectives of fire safety in special-purpose buildings and how this can be verified.

Literature

-Vorlesungsskripte und die Handouts der Vorlesungsfolien (in elektronischer Form) werden zur Verfügung gestellt. Zehfuß,

-J.; Kampmeier, B.: Konstruktiver baulicher Brandschutz im Betonbau. In: Betonkalender, 2018.
-Mayr, J.; Battran, L. (Hrsg.): Brandschutzatlas. FeuerTrutz
-Geburtig, G.: Brandschutz im Baudenkmal, Beuth-Verlag (2009).

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Related courses

Rules for the choice of courses

Selection of courses so that at least 6 LP are achieved.
The module can only be selected if the module fire protection in building redevelopments has not been selected. Risk methods in fire safety cannot be selected if taken in the math.-sci. fundamentals module.

Compulsory attendance

Name of the course	SWS	Eventtype	Language
	2,0	Lecture/Exercise	german
Risk Methods in Fire Protection	1,0	Lecture	english
	1,0	Lecture	german
	2,0	Lecture/Exercise	german

Specialisation Geotechnical Engineering

Title	Theoretical and Experimental Soil and Rock Mechanics		
Number	4315030	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Geomechanik und Geotechnik
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Marius Milatz
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Exam (120 min)		
Course achievement			

Contents

Soil and rock mechanics:
Basic understanding of soil and rock mechanics for the planning and execution of works in the ground. Soil investigation and geotechnical reports, geophysical methods of soil investigation, strength and deformation behavior of cohesive soils, stability investigation, material models, calculation of area foundations, subgrade reaction modulus method, stability of flow-through embankments, spreading stresses in embankments, static and dynamic pile tests, load-bearing behavior of piles, calculation of horizontally loaded piles / lateral pressure on piles, rock mechanics, rock hydraulics, rock structure models, rock classification, rock mechanical investigations, risk considerations in geotechnics.

Soil mechanics, practical course:
Soil identification, site investigation, laboratory and field tests for classification, water permeability in laboratory tests, strength and deformation behavior depending on the soil type.

Objective qualification

Literature

- Vorlesungsunterlagen
- Grundbautaschenbuch Teil 1 bis Teil 3, Ernst & Sohn, 8. Auflage, 2018
- Geotechnik Bodenmechanik, G. Möller, Ernst & Sohn, 1. Auflage, 2007

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Internship	german
	4,0	Lecture/Exercise	german

Title	Construction Techniques, Methods and ... [Fehlt]		
Number	4315040	**Module version**	V1
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Geomechanik und Geotechnik
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Marius Milatz
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

Foundation and rock engineering:
Understanding of foundation and rock engineering for the design and construction of works in the ground. Catch dams and marine quays, special forms of excavation enclosures, special forms of support structures (e.g. reinforced earth), special earth pressure approaches, underpinning, pipe drilling, micro-tunnelling, pile grids, combined pile-raft foundations, subsoil improvement, soil stabilization, environmental aspects in geotechnical engineering, wedge statics, legal issues in geotechnical engineering.

Ground dynamics:
Principles of dynamics, description of dynamic processes in foundation engineering dynamics, vibration theory, waves and wave propagation, frequency response, magnification functions, modeling in foundation engineering dynamics, dynamically loaded foundations, machine foundations, transfer factors, vibration isolation, reduction of vibrations, design and construction guidance, monitoring.

Objective qualification

Literature

-Vorlesungsunterlagen
-Grundbautaschenbuch Teil 1 bis Teil 3, Ernst & Sohn, 8. Auflage, 2018
-Geotechnik kompakt Band 2: Grundbau nach Eurocode 7, G. Möller, Bauwerkverlag, 5. Auflage, 2017

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	4,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german

Title	Numerical Simulations and Field Measurements in Geotechnical Engineering		
Number	4310760	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Geomechanik und Geotechnik
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Marius Milatz
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

Principle of the finite element method in structural mechanics, different element types, isoparametric elements, material models and their characteristics (linear elasticity, Mohr-Coulomb, Hardening Soil Model), numerical integration, discretization and boundary conditions, simulation of construction conditions, results and plausibility checks.

Objective qualification

Literature

- Vorlesungsunterlagen
- Finite-Elemente-Methoden, K.-J. Bathe, Springerverlag, 2. Auflage, 2002
- Kontinuumsmechanik, J. Betten, Springerverlag, 2. Auflage, 2001
- Grundbautaschenbuch Teil 1 bis Teil 3, Ernst & Sohn, 8. Auflage, 2018

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
	3,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german

Title	Deep Storage		
Number	4399780	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Geomechanik und Geotechnik
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Marius Milatz
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 min)		
Course achievement			
Contents			
Introduction to the disposal of hazardous waste in deep geological formations.			
Objective qualification			
Literature			
Forschungsberichte, Veröffentlichungen, aktuelle Informationen im Internet, Skript			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	6,0	Lecture/Exercise	german

Title	Subsurface Excavation Construction		
Number	4315050	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Geomechanik und Geotechnik
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Marius Milatz
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 min)		
Course achievement			

Contents

Planning of tunnelling structures, preliminary geological exploration, rock and excavation classification, rock mechanics in tunnelling, geology, excavation types, blasting and roadheaders, cutter operation, safety measures and monitoring measurement, dewatering, sealing and lining, caverns, escape routes and rescue concepts, open shields, air pressure shields, fluid shields, earth pressure and mix shields, tunnel boring machines in hard rock, excavation tools and methods, haulage equipment, separation, classification and prediction of performance and wear parameters, securing equipment in mechanized tunnelling, tubbings, pipe drilling and micro-tunnelling, rock support behavior of salt, planning of underground cavities, explosives and detonating devices, tunnel statics, finite element calculations (predical course) practical course in tunnel statics.

Objective qualification

Literature

Vorlesungsunterlagen

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
	2,0	Excursion	german

	4,0	Lecture/Exercise	german

Specialisation Timber Design

Title	Timber Components and Connections		
Number	4316050	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Baukonstruktion und Holzbau
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Mike Sieder
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			
Skript			

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
	4,0	Lecture/Exercise	german

Title	Existing Timber Structures		
Number	4398670	**Module version**	4398670-E-FK3
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	2	**Institution**	Institut für Baukonstruktion und Holzbau
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Mike Sieder
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			
Skripte			

↑

Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german

Title	New Timber Structures		
Number	4398660	**Module version**	2024-25
Shorttext	BAU-STD5-66	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	2	**Institution**	Institut für Baukonstruktion und Holzbau
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Mike Sieder
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Written Exam (60 Min.) or Oral Exam (30 Min.) 3/6 CP and Portfolio 3/6 LP		
Course achievement	Portfolio		
Contents			
Objective qualification			
Literature			
Skripte			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Seminar	german
	2,0	Seminar	german
	2,0	Lecture/Exercise	german

Title	Special Subjects of Timber Structures		
Number	4310650	**Module version**	2024-25
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	2	**Institution**	Institut für Baukonstruktion und Holzbau
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Mike Sieder
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			
Skripte			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture/Exercise	german
	2,0		german
	2,0	Seminar	german
	2,0	Seminar	german
	2,0	Lecture/Exercise	german

	2,0	Block course	german
Computer-Based Structural Analysis in Timber Structure	2,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german

Specialisation Solid Constructions

Title	Prestressed Concrete Constructions		
Number	4334060	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Massivbau
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Vincent Oettel
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 Min.) or oral exam (30 Min.)		
Course achievement			

Contents

Building materials; prestressing methods; tendon anchorage; internal forces from prestressing, effects of creep and shrinkage; proofs in the limit state of serviceability and load-bearing capacity; constructive detailing of prestressed concrete components; fatigue verification

Post-tensioning systems; applications of prestressed concrete in civil and industrial construction (halls, bridges etc.)

Objective qualification

By the end of this course, the students will have deep knowledge of the basics principles and applications of prestressed concrete. They will be able to calculate internal forces for statically determinate and indeterminate prestressed concrete structures and to carry out verifications in the ultimate limit and service states. Finally, the students will be capable of independently designing, dimensioning and detailing prestressed concrete components.

Literature

A detailed script with all contents from the lectures is available.

-Fingerloos, F. et al.: Eurocode 2 für Deutschland DIN EN 1992-1-1 Bemessung und Konstruktion von Stahlbeton- und Spannbetontragwerken, Teil 1-1: Allgemeine Bemessungsregeln und Regeln für den Hochbau mit -Nationalem Anhang, Kommentierte Fassung, 2. Auflage, Beuth Verlag, Berlin, 2016.
-Albert, A. et. al.: Spannbeton Grundlagen und Anwendungsbeispiele, 2. Auflage, Werner Verlag, 2013.
-Avak, R.; Meiss, K.: Spannbetonbau Theorie, Praxis, Berechnungsbeispiele nach Eurocode 2, 3. Auflage, Beuth Verlag, 2015.
-Krüger, W.; Mertzsch, O.: Spannbetonbau-Praxis nach Eurocode 2 Mit Berechnungsbeispielen, 3. Auflage, Beuth Verlag, 2012.
-Rombach, G.: Spannbetonbau, 2. Auflage, Ernst & Sohn, 2010.
-Rossner, W.; Graubner, C.-A.: Spannbetonbauwerke Teil 4: Bemessungsbeispiele nach Eurocode 2, Ernst & Sohn,

2012.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Exercise	german
	2,0	Lecture/Exercise	german

Title	Concrete Bridge Construction		
Number	4398760	**Module version**	V1
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Massivbau
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Vincent Oettel
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Recommended requirements	Students are expected to have a thorough knowledge of Prestressed Concrete Construction in order to participate in this class.		
Expected performance/ Type of examination	Portfolio or oral exam (30 Min.)		
Course achievement			

Contents

[Concrete Bridges - Design and Construction]
Bridge types, regulations and guidelines, loads, design and construction design, cross-sections for superstructures, substructures (columns, abutments, foundations), bridge equipment, construction methods

[Concrete Bridges - Structural Design and Applications]
Practical examples and possible applications of bridges in reinforced concrete and prestressed concrete construction, design and pre-dimensioning of bridge structures

Objective qualification

Students have knowledge of the design and construction of bridges in reinforced concrete and prestressed concrete construction. They have advanced knowledge of the loads on bridges, bridge types, cross-sections for superstructures, substructures and bridge-specific details (bearings, transitions etc.). They also have knowledge of different construction methods, the structural design of bridge structures and specific verifications in the ultimate and serviceability limit states.

Literature

A detailed script with all contents from the lectures is available.

-DIN Deutsches Institut für Normung e. V.: Handbuch Eurocode 2 Betonbau Band 2: Brücken, 1. Auflage, Beuth Verlag, 2013.
-Tue, N. V., Reichel, M., Fischer, M.: Berechnung und Bemessung von Betonbrücken. Ernst & Sohn, 2015.
-Holst, R., Holst, K. H.: Brücken aus Stahlbeton und Spannbeton Entwurf, Konstruktion und Berechnung, 6. Auflage, Ernst & Sohn, 2013.
-Mehlhorn, G., Curbach, M.: Handbuch Brücken Entwerfen, Konstruieren, Berechnen, Bauen und Erhalten, 3. Auflage, Springer, 2014.
-Geißler, K.: Handbuch Brückenbau Entwurf, Konstruktion, Bewertung und Ertüchtigung, Ernst & Sohn, 2014

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Exercise	german
	2,0	Lecture/Exercise	german

Title			
Number	3314000000	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Massivbau
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Vincent Oettel
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

Objective qualification

Literature

Es stehen ausführliche Foliensätze mit Quellenangaben zur Verfügung.
[Ingenieurbauwerke im Wasserbau]
DIN 19702: Massivbauwerke im Wasserbau – Tragfähigkeit, Gebrauchstauglichkeit und Dauerhaftigkeit, 2013.
Kunz, C.: Massive (Verkehrs-)Wasserbauwerke – ein aktueller bautechnischer Überblick, Betonkalender 2020: Wasserbau. Konstruktion und Bemessung. (Teil 1), Ernst & Sohn Verlag, Berlin, 2020.
DIN 19661-1: Wasserbauwerke – Teil 1: Kreuzungsbauwerke, Durchleitungs- und Mündungsbauwerke, 1998.
DIN 19703: Schleusen der Binnenschifffahrtsstraßen – Grundsätze für Abmessungen und Ausrüstung, 2014.

[Automatisiertes und modulares Bauen]
Bergmeister, K. et al.: Beton-Kalender 2006 – Schwerpunkte: Turmbauwerke –Industriebauten, Ernst & Sohn Verlag, Berlin, 2006. Beer, B.: Beton-Kalender 2019 – Schwerpunkte: Parkbauten, Geotechnik und Eurocode 7, Ernst & Sohn Verlag, Berlin, 2019.
DIN EN 61400-3: Windenergieanlagen –Teil 3: Auslegungsanforderungen für Windenergieanlagen auf offener See. VDE Verlag, Berlin, 2010.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Exercise	german
	2,0	Lecture/Exercise	german

Title	Sustainability in Concrete Construction		
Number	4398650	**Module version**	V1
Shorttext	BAU-STD5-65	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Fachgebiet Massivbau
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Vincent Oettel
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 min.) or oral exam (30 min.)		
Course achievement			

Contents

[Maintenance and Rehabilitation]
Regulations and guidelines, condition assessment of structures, assessment of load-bearing capacity and serviceability, strengthening with concrete reinforcement, strengthening with additional reinforcement, strengthening with steel components etc.

[Innovations and Sustainability Aspects]
Lightweight concrete, steel fibre concrete, ultra high-strength concrete, non-metallic reinforcement, solutions for the sustainable use of concrete construction methods

Objective qualification

Students have advanced knowledge of the maintenance and rehabilitation of concrete structures and are able to plan and calculate the strengthening of a structure. In addition, students have knowledge of innovative applications of concrete construction, the optimisation of concrete structures and sustainability aspects.

Literature

Detailed scripts are available.

[Maintenance and Rehabilitation]

-Schnell, J. et. al.: Sachstandbericht – Bauen im Bestand – Teil I: Mechanische Kennwerte historischer Betone, Betonstähle und Spannstähle für die Nachrechnung von bestehenden Bauwerken, Deutscher Ausschuss für Stahlbeton (DAfStb), Heft 616, Beuth Verlag, Berlin, 2016.

-Seim, W.: Bewertung und Verstärkung von Stahlbetontragwerken, 2. Auflage, Ernst & Sohn, 2007.

-DAfStb-Richtlinie Verstärken von Betonbauteilen mit geklebter Bewehrung, Teil 1 bis 4, Deutscher Ausschuss für Stahlbeton (DAfStb), Beuth Verlag, Berlin, 2012. DAfStb-Richtlinie Schutz und Instandsetzung von Betonbauteilen (Instandsetzungsrichtlinie), Teil 1 bis 4, Deutscher Ausschuss für Stahlbeton (DAfStb), Beuth Verlag, Berlin, 2001.

[Innovations and Sustainability Aspects]

-DAfStb-Richtlinie Stahlfaserbeton, Deutscher Ausschuss für Stahlbeton (DAfStb), Beuth Verlag, Berlin, 2021. DAfStb-Richtlinie Betonbauteile mit nichtmetallischer Bewehrung – Entwurf, Deutscher Ausschuss für Stahlbeton (DAfStb), Beuth Verlag, Berlin, 2024.

-Schmidt, M. et. al.: Nachhaltiges Bauen mit ultra-hochfestem Beton, Schriftenreihe Baustoffe und Massivbau, Universität Kassel, 2014.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Exercise	german
Innovations and Sustainability Aspects	2,0	Lecture/Exercise	german

Specialisation Pavement Engineering

Title			
Number	3320000010	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Straßenwesen
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Michael Wistuba
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

[Bituminous binders (VÜ)]

The binder in asphalt mixtures, the main construction material in road infrastructure, is bitumen. Its properties (temperature behavior, aging, adhesion behavior, reuse) are carefully tested in the laboratory because they have a significant influence on the performance of asphalt mixtures. In this course, rheological test methods are presented that are used in modern asphalt mixture technology and serve to increase the sustainability of asphalt mixtures. With their help, it is possible to assess alternative bituminous binders (e.g. bio-asphalt) and/or additive binders with regard to their effect on the road, e.g. with regard to increasing durability, the regenerative effect in asphalt mixture recycling or the reduction of environmental pollution.

[Performance of asphalt mixtures (VÜ)]

In this course, the requirements for the road structure (such as skid resistance, crack and resistance to permanent deformation, ageing resistance) are defined and suitable mechanical laboratory test methods are presented. In particular, it is shown how a specific asphalt mixture can be systematically tested in the laboratory on the basis of the performance properties of the composed and compacted asphalt mixture. Optimization conflicts with regard to the requirements are presented and possibilities for reacting to them in the best possible way through targeted formulation and design of the asphalt mixture composition.

[Road construction laboratory course (P)]

In the course, students carry out selected tests in the institute's own laboratory. For example, soil parameters are determined under supervision (density, water content, compaction), tests are carried out to determine the condition in situ (load-bearing capacity, evenness, skid resistance) and specimens are produced by a supervisor from rolled and mastic asphalt mixtures, the composition and characteristic values of which are then checked in the laboratory.

Objective qualification
Students gain in-depth knowledge of asphalt technology in order to understand the complex optimization process in the design of asphalt mixes and to carry out systematic testing in the laboratory, taking into account all performance properties. They will be able to carry out fundamental and rheological laboratory tests to determine the mechanical properties of construction materials and interpret the results correctly. Using selected material models, they will become familiar with the tools for predicting the performance of road construction materials in order to evaluate the effectiveness and quality of different types of construction materials. This is of particular interest against the background of the further development of sustainable road construction technology. They will then be able to critically evaluate existing asphalt construction methods and contribute to the development of new asphalt construction methods. In addition, they are qualified to promote the reuse of reclaimed asphalt at a high value-added level. Students also learn how to produce and test typical road construction test specimens. They will be able to estimate the costs and benefits of standard test procedures and correctly evaluate and interpret test results. They acquire in-depth theoretical and practical knowledge of the methods used to test the suitability and quality of raw materials, building material mixtures and additives, as well as the technical implementation of asphalt recycling.
Literature
Richtlinien und Empfehlungen Vorlesungsskripte

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Bituminous binders	2,0	Lecture/Exercise	german
Performance of asphalt mixtures	2,0	Lecture/Exercise	german
Road construction laboratory course	2,0	Internship	german

Title			
Number	3320000030	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Straßenwesen
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Michael Wistuba
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

[Road planning and design (VÜ)

In this course, road planning is presented from the determination of the need for the construction of a road to its implementation. The planning process, the planning levels with their different levels of detail, environmental concerns, public participation, legal issues, the financing of public roads, the planning design of junctions and intersections, proof of traffic quality as well as economic efficiency and life cycle analysis are discussed.

[Computer-supported dimensioning and design of roads (VÜ)]

This course teaches the fundamentals of the structural design of road pavements and the computational dimensioning. The main focus is on highly loaded roads and flexible (asphalt) and rigid construction methods (cement concrete). The model representation of the layer structure, the time and load-dependent behavior of the construction material, the bonding of the layers and the load-bearing behavior of the subsoil are explained. The course also demonstrates practical planning and design work on a specific road construction project using the VESTRA CAD road planning program. It begins with the three-dimensional site survey, after which all planning tasks relating to the alignment, gradient and cross-section design are processed and solved with computer support.

[Digitalization in the road sector (VÜ)]

The course "Digitalization in the road sector" provides basic knowledge and practical methods for digital transformation in the field of road infrastructure. The focus is on current technologies and strategies that are used to optimize the planning, construction, operation and maintenance of roads. Students are introduced to the challenges and potentials of digitalization and learn how digital systems and smart technology approaches can change traditional work processes in the transport and road sector in the long term. This includes, for example, sensor technologies for condition monitoring (Pavement Monitoring System) or the methods of Building Information Modeling (BIM) in the planning of infrastructure projects.

Objective qualification

The qualification objective is the independent planning of road projects from project initiation, variant planning, dimensioning of the road structure, structural design through to the preparation of tender documents including the documentation of technical and economic decisions. Students understand the holistic plan-

ning process in its individual planning stages (preliminary planning, design planning, approval planning) and recognize the legal, financial and environmental framework conditions of public road projects. On the basis of a realistic example of a road project, students combine their specialist knowledge with application, creating specifications, cost and schedule plans, variant studies and tender documents. They take into account economic, ecological and social criteria as well as the contents of a life cycle analysis. In the area of structural design and computational dimensioning, they are proficient in the modeling and dimensioning of multi-layer road structures, can apply building material and load-bearing behavior models and are proficient in the use of planning software (e.g. VESTRA CAD). They can create terrain models, develop route variants and optimize gradient and cross-section constructions with the aid of computers. The project-oriented group work sharpens their team and communication skills and prepares them to work on road projects independently and in a solution-oriented manner.

Literature

Richtlinien und Empfehlungen

Vorlesungsskripte

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
	2,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german
	2,0	Exercise	german

Title			
Number	3320000020	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Straßenwesen
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Michael Wistuba
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

[Road construction materials (VÜ)]

The course begins with the question of the requirements for road construction materials (skid resistance, crack resistance, ageing resistance) and then explains how these can be met through the targeted selection, formulation and mix design of construction materials. The quality of aggregates, binders and construction material mixtures, binder modification, reuse of construction materials, determination of the layer structure and prediction of the service life of road pavements are discussed in more detail.

[Road construction technology (VÜ)]

The course deals with the technical handling and implementation of road construction projects. The transportation, paving and quality assurance of road pavements are dealt with in a practical manner. Road maintenance is then discussed. The methods for recording and assessing the condition of surface and layer properties, structural and operational road maintenance (especially winter road maintenance) and the recovery and reuse of road construction materials are explained in detail. Numerous application examples are used to prepare students for construction site-related and operational issues in road construction.

[Road construction technology in practice VÜ)]

Using selected examples from the design and production of building materials and building material components, from road construction and from the testing of new/innovative construction equipment or construction methods, the course offers an insight into the current and future practice of road construction technology. This is supported by excursions and specialist lectures by people from the construction industry.

Objective qualification

Students learn that the sustainability of road constructions depends largely on the formulation of the construction material mixtures and their composition to form a layered load-bearing system. They will be able to assess the basic suitability of building materials for road construction, for example, to recognize rocks for road construction or to interpret the quality of bituminous binders on the basis of results from laboratory tests. Students learn how to produce and test typical road construction specimens. They will be able to estimate the costs and benefits of standard test methods and correctly evaluate and interpret test results. They will acquire in-depth theoretical and practical knowledge of the methods used to test the suitability and quality of raw materials, construction material mixtures and additives as well as the technical implementation of

asphalt recycling. Students also gain in-depth knowledge of the life cycle of road constructions, starting with the delivery of construction materials, through installation and use, to reuse.

Literature

Richtlinien und Empfehlungen

Vorlesungsskripte

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Road Construction Materials	2,0	Lecture/Exercise	german
Road Construction Technology	2,0	Lecture/Exercise	german
Road Construction Technology in Practice	2,0	Lecture/Exercise	german

Title			
Number	3320000000	**Module version**	
Shorttext		**Language**	english
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Straßenwesen
Hours per Week / ECTS	2 / 6,0	**Module owner**	Prof. Dr. Michael Wistuba
Workload (h)	180		
Class attendance (h)	28	**Self studying (h)**	152
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

The seminar provides insight into research in the field of road pavement engineering in general (including topics, boundary conditions, internationality, interdisciplinarity, scientific language) and imparts knowledge of scientific working methods in the subject area. Students work independently on a sub-question within one of the research topics by studying sources, write a short paper on the topic and give a short presentation. In this way, they are introduced to scientific work and acquire essential core competencies for a targeted, methodologically sound and comprehensible preparation and summary of selected research topics as preparation for independent scientific work and publication (e.g. also as part of a dissertation).

Objective qualification

Students gain insight into current international research in the field of road pavement engineering (in particular asphalt technology, testing, rheological modeling) and are enabled to grasp the state of the art in selected specific questions from the field of research, to critically analyze it using scientific methods and to formulate new research questions.

Literature

International Journal Papers

Richtlinien und Empfehlungen

Vorlesungsskripte

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
		Seminar	english

Specialisation Transport and Urban Planning

Title	Transport Planning		
Number	4318020	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Verkehr und Stadtbauwesen
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Bernhard Friedrich
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 Min.) or oral exam (30 Min.)		
Course achievement	Homework assignment		

Contents

[Verkehrsplanung (VÜ)]
- Introduction to transport planning
- Planning Methodology
- Behavioural traffic surveys
- Planning of transport networks
- Planning of measures in public transport (external lecturer from the field)
- Decision models
- Traffic models (traffic generation, traffic distribution, traffic allocation)
- Impact models and evaluation procedures
- Traffic safety

Objective qualification

The students gain an overview of the characteristics of mobility, the socio-economic significance of transport that can be derived from this and the resulting legal anchoring of spatial and transport planning. Based on the understanding of the problems and tasks of transport planning, the planning methodology and the instruments of transport network planning in public transport and individual transport are introduced. In this context, the students get to know the requirements of the German guidelines in transport planning and can apply them to planning tasks. Through the in-depth examination of the theory and practice of transport demand modelling, the students are enabled to carry out own planning studies and to quantitatively evaluate planning alternatives. They are thus qualified to make reliable recommendations for the development of the transport infrastructure.

Literature

vgl. Vorlesung

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	4,0	Lecture/Exercise	german

Title	Research Seminar Traffic Planning and Traffic Engineering		
Number	4398080	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	every term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Verkehr und Stadtbauwesen
Hours per Week / ECTS	2 / 6,0	**Module owner**	Prof. Dr. Bernhard Friedrich
Workload (h)	180		
Class attendance (h)	28	**Self studying (h)**	152
Compulsory requirements			
Expected performance/ Type of examination	Presentation		
Course achievement			

Contents

In this seminar, specific questions from the research fields of traffic planning and traffic engineering are dealt with on changing topics. The seminar topics are embedded in the current research work or research content of the Institute of Transport and Urban Engineering. The students gain an insight into current research topics in traffic planning and traffic engineering and have the opportunity to actively participate and shape them.

- introduction, discussion of research topics
- presentation and discussion of first ideas for individual research questions
- literature review methods -overview to methods
- literature review methods -exercise
- intro on how to write a scientific paper
- development and formulation of own, individual research questions
- preparation of a short scientific paper on the individual research topic
- presentation and discussion of individual research questions

Objective qualification

The seminar imparts knowledge in the planning and implementation of research projects and gives an in-depth insight into scientific working methods. The students independently work out a partial question within one of the research topics by studying sources, write a short paper on it and present it in a short presentation. The students are thus guided to in-depth scientific work and acquire essential core competences for a goal-oriented, methodically clean and comprehensible preparation and summary of selected research topics

Literature

Die Recherche der maßgebenden aktuellen Literatur und deren Erfassung ist Bestandteil des Forschungsseminars

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Research Seminar Traffic Planning and Traffic Engineering	2,0	Seminar	english german

Title	Microscopic Traffic Flow Simulation and its Applications		
Number	4301910	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Verkehr und Stadtbauwesen
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Bernhard Friedrich
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	written exam (90 Min.) or oral exam (30 Min.)		
Course achievement			

Contents

- Traffic surveys
- Microscopic traffic flow modelling
- Calibration and validation methods
- Traffic-actuated control methods
- Applications of microsimulation using professional software

Objective qualification

The students acquire basic knowledge of the theoretical principles of microscopic traffic flow models, for the collection of input, calibration and validation data as well as for the statistically correct evaluation of simulation results. They are enabled to plan and carry out traffic surveys and to check traffic and design planning with the help of microsimulation using the collected data.
In the course of the lecture, the students learn how to use a simulation tool and are enabled to independently set up and carry out simulations with the software.

Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	4,0	Lecture/Exercise	german

Title	Urban Road Design		
Number	3319000000	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Verkehr und Stadtbauwesen
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Bernhard Friedrich
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Portfolio		
Course achievement			

Contents

- Requirements for a sustainable and climate-friendly design of urban roads
- Design principles and utilisation requirements for urban roads
- Guidelines and recommendations for the design and layout of urban roads
- User and mode of transport-specific design elements for road sections and junctions
- Design and layout of facilities for motorised private transport
- Design and layout of facilities for pedestrian traffic
- Design and layout of facilities for bicycle traffic
- Design and layout of facilities for local public transport
- Accessibility
- Project study in collaboration with the city of Braunschweig

Objective qualification

(E) The planning and design of sustainable urban streets is based on objectives derived from the quality of sojourn and functionality. To this end, the existing road users' requirements, aspects of accessibility, traffic safety and ecological compatibility are considered. Students are given a systematic overview of these requirements for a sustainable street space and learn how to take them into account in the design process. They will also be able to apply the state of the art of the relevant recommendations and guidelines. Students acquire practical skills as part of a project study in which they design a real street space, taking appropriate account of all user requirements and boundary conditions. In cooperation with the city of Braunschweig, exemplary streetscapes are selected and worked on in small groups in order to implement, coordinate and finally present what has been learnt in the lecture in a practical exercise.

Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Urban Road Design	4,0	Lecture/Exercise	german

Title	Traffic Management		
Number	3319000010	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Verkehr und Stadtbauwesen
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Bernhard Friedrich
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written exam+ (90 Min.) or oral examination (ca. 30 Min.) Two assignments can be completed in advance which, if passed, count for 25% of the final grade for the module. The application for an written exam+ must be submitted by the student at the start of the examination. Further information on deadlines for the submission of term papers is provided in the courses of the module.		
Course achievement			

Contents

- Functional and organisational system architectures for the management of road traffic facilities
- Traffic flow theory as the basis for determining the traffic situation and evaluating measures
- Recording, processing and analysing traffic data (practical course)
- Design and traffic engineering dimensioning of road traffic facilities
- Procedures and methods of traffic control for road network, road sections and junctions within (urban roads) and outside built-up areas (motorways)
- Procedures for determining the traffic situation and quality management
- Insights into practice through guest lectures and excursions

Objective qualification

Students gain a comprehensive overview of the responsibilities, tasks and objectives of the management of road traffic facilities inside and outside built-up areas. In this context, system architectures for traffic management in Germany are introduced in their functional and organisational forms. Students learn the basics of traffic data analysis and traffic flow theory in order to be able to competently deal with the tasks of traffic management and, building on this, to apply state-of-the art methods for the dimensioning of road traffic facilities and the various methods of traffic control in accordance with the regulations applicable in Germany. This gives students the skills to develop and evaluate measures that make sense from a traffic flow perspective and are ecologically and economically suitable. Taking into account the existing traffic infrastructure, they will be able to dimension road traffic systems on urban roads and motorways that meet the standards of German guidelines and equip them with the necessary traffic engineering systems (operation).

Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Traffic Management	4,0	Lecture/Exercise	german

Title			
Number	3329000000	**Module version**	
Shorttext		**Language**	english
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät Architektur, Bauingenieurwesen und Umweltwissenschaften
Module duration		**Institution**	
Hours per Week / ECTS	4 / 6,0	**Module owner**	Alejandro Tirachini
Workload (h)	180h		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Exam (120 Min.)		
Course achievement			

Contents

- Motivation: why public transport and history of public transport
- Public transport planning: strategic, tactical and operational decisions
- User costs and values of time in public transport
- Single line design: Determination of frequency of service, type of vehicle
- Single line design: stop/station design and density
- Network design: general rules, simple models, complex models
- Waiting time modelling and timetabling
- Pricing and financing
- Public transport ownership and regulation
- Demand modelling, quality of service and user satisfaction
- Future public transport

Objective qualification

The students acquire an in-depth understanding of planning processes in public transport systems. Upon successful completion, students will be able to: (1) apply methods for designing single public transport lines (including route alignment, stop location, frequency, and vehicle size determination), considering the concepts of value of time, user cost components (access, waiting, in-vehicle time, transfers), and operator cost, informed by empirical data; (2) formulate and solve fundamental frequency setting and optimal stop spacing problems; (3) evaluate public transport network structures based on density principles and solve basic network design problems under constraints; (4) analyse public transport timetabling problems using different objective functions; (5) critically assess fare systems and pricing principles using welfare economics and practical fare setting rules; (6) compare models of public transport organization and ownership including regulation; (7) utilize fundamental concepts of public transport demand modelling including mode choice,

and (8) discuss topics pertaining to future developments such as automation and sustainability challenges in the public transport industry.
Literature
Präsentation, Artikel, Buchkapitel

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	4,0	Lecture/Exercise	german

Economic Sciences

Title	Orientation Management Control		
Number	2214170	**Module version**	V2
Shorttext	WW-ACuU-14	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Controlling und Unternehmensrechnung
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Heinz Ahn
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Recommended requirements	Basic knowledge of economics is a prerequisite for the module.		
Expected performance/ Type of examination	1 Klausur (90 min) oder 1 Take-at-Home-Exam		
Course achievement	for Organization, Governance, Education / MA Social Sciences instead of the examination performance: 1 written exam, 90 minutes or take-at-home exam		

Contents

Selected contents - depending on the respective current course:
- Effectiveness and efficiency measurement
- Performance indicators
- Budgeting systems
- Transfer pricing systems

Objective qualification

The students understand fundamental topics and methods of management control. Based on this, they are able to analyze related problems, critically evaluate proposed concepts, and soundly support respective decision-making in practice.

Literature

- Weber/Schäffer: Einführung in das Controlling, Stuttgart, aktuelle Auflage
- Ewert/Wagenhofer: Interne Unternehmensrechnung, Berlin et al., aktuelle Auflage
- Eisenführ/Weber/Langer: Rationales Entscheiden, Berlin et al., aktuelle Auflage

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Related courses
Rules for the choice of courses
In this module, the courses Coordination Instruments of Controlling (V2, Ü1) and Performance Measurement (V1) are compulsory. Optional colloquia and tutorials are voluntary.
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Coordination Instruments for Management Control	3,0	Lecture/Exercise	german
Literature			
Ewert, R./Wagenhofer, (2014): Interne Unternehmensrechnung, 8. Aufl., Berlin et al.			
Performance Analytics	1,0	Lecture	english

Title	Orientation Data-Driven Enterprise		
Number	2218300	**Module version**	
Shorttext	WW-WINFO-30	**Language**	
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Wirtschaftsinformatik/Abt. Data-Driven Enterprise
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Frederik Möller
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 term paper & 1 presentation or 1 portfolio or 1 written exam (120 min) or 1 oral exam (30 minutes) or 1 term paper or 1 presentation or 1 take-at-home exam		
Course achievement			

Contents

In “Digital Business Engineering”, students acquire in-depth knowledge about the transformation of business models through a series of practical case studies and the strategic use of digital technologies and data. Business Engineering provides the theoretical framework. It offers a methodology for designing business models and is a model-driven and design-oriented approach to transforming companies. In the practical part of the course, students learn to apply various business engineering techniques (e.g. customer process modeling, information architecture design, SWOT analysis and more). The aim of the practical part is the independent (but guided) solving of a practical problem using the methods and techniques taught by the chair.

Objective qualification

After completing the module, students are able to apply business engineering techniques. Students will also be able to explain business engineering concepts and apply them to unfamiliar problems.

Literature

- OSTERWALDER, Alexander; PIGNEUR, Yves. Business model generation: a handbook for visionaries, game changers, and challengers. John Wiley & Sons, 2010.
- OSTERWALDER, Alexander; PIGNEUR, Yves; TUCCI, Christopher L. Clarifying business models: Origins, present, and future of the concept. Communications of the association for Information Systems, 2005, 16. Jg., Nr. 1,
- MÖLLER, Frederik, et al. Designing business model taxonomies–synthesis and guidance from information systems research. Electronic Markets, 2022, S. 1-26.

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Digital Business Engineering	4,0	Lecture/Exercise	german

Literature

- OSTERWALDER, Alexander; PIGNEUR, Yves. *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons, 2010.
- OSTERWALDER, Alexander; PIGNEUR, Yves; TUCCI, Christopher L. Clarifying business models: Origins, present, and future of the concept. *Communications of the association for Information Systems*, 2005, 16. Jg., Nr. 1,
- MÖLLER, Frederik, et al. Designing business model taxonomies–synthesis and guidance from information systems research. *Electronic Markets*, 2022, S. 1-26.

Digital Business Models and Sustainability	4,0	Lecture/Exercise	german

Literature

- Hahn, R. (2022). Sustainability management: Global perspectives on concepts, instruments, and stakeholders.
- Lüdeke-Freund, F., Carroux, S., Joyce, A., Massa, L., & Breuer, H. (2018). The sustainable business model pattern taxonomy—45 patterns to support sustainability-oriented business model innovation. Sustainable Production and Consumption, 15, 145-162.
- Osterwalder, A., & Pigneur, Y. (2010). Business model generation: a handbook for visionaries, game changers, and challengers (Vol. 1). John Wiley & Sons.
- Schaltegger, S., Lüdeke-Freund, F., & Hansen, E. G. (2016). Business models for sustainability: A co-evolutionary analysis of sustainable entrepreneurship, innovation, and transformation. Organization & environment, 29(3), 264-289.
- Schoormann, T., Stadtländer, M., & Knackstedt, R. (2021). Designing business model development tools for sustainability—a design science study. Electronic Markets, 1-23.

Title	Orientation Decision Support		
Number	2218220	**Module version**	V2
Shorttext	WW-WINFO-22	**Language**	english german
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Wirtschaftsinformatik - Lehrstuhl für Decision Support
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Dirk Mattfeld
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (120 min) or 1 take-at-home exam		
Course achievement	only for Organisation, Governance, Education instead of the exam: 1 exam (120 min) or 1 take-at-home exam		

Contents

Selected contents - depending on the course selection:

Importance of information modelling for planning problems
Classification methods
Cluster analysis
Association analysis
Network models for route planning
Exciting trees, shortest paths
Round trip and route planning problems
Exact and heuristic methods for route planning

Objective qualification

Students have an insight into models and methods of data analysis and decision support. Students are able to map processes from the areas of mobility and transport in information and decision support models. They are familiar with algorithmic methods for analysing systems and generating recommendations for action.

Literature

- Vahrenkamp, R.; Mattfeld, D.C.: Logistiknetzwerke: Modelle für Standortwahl und Tourenplanung. Gabler, 2007.
- Berthold, M. et al: Guide to Intelligent Data Analysis
- Gabriel, R. et al: Computergestützte Informations- und Kommunikationssysteme in der Unternehmung. Technologien, Anwendungen, Gestaltungskonzepte. 2. Auflage. Springer, 2001.

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Intelligent Data Analysis	2,0	Lecture	german
Literature			
M.R. Berthold, C. Borgelt, F. Höppner, F. Klawonn: Guide to Intelligent Data Analysis: How to Intelligently Make Sense of Real Data. Springer, London (2010)			

Planning for Mobility and Transportation Purposes	2,0	Lecture	german
Literature			
Dirk C. Mattfeld, Richard Vahrenkamp: Logistiknetzwerke - Modelle für Standortwahl und Tourenplanung, Springer, 2. Aufl. 2014			

Title	Orientation Services Management		
Number	2201000000	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Automobilwirtschaft und Industrielle Produktion - Lehrstuhl für Dienstleistungsmanagement
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. David Woisetschläger
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 portfolio or 1 take-home exam		
Course achievement	for Organization, Governance, Education / MA Social Sciences instead of the examination performance: 1 portfolio or 1 take-home exam		

Contents

Contents - depending on the course selection:

Strategic Brand Management & Brand Strategy Bootcamp
Contents of the lecture include
- Brand understanding and the importance of brands
- Measurement of brand associations
- Secondary brand associations
- Instruments for building brand associations
- Brand strategy and positioning
- Brand architecture
- Measuring brand performance
- International brand management
- Internal brand management
- Organizational aspects of brand management
- Sectoral specialties in retail, industrial goods and the luxury sector.

Contents of the exercise are:
Working on a real practical problem in the field of brand management in cooperation with a company partner.

Business Model Innovation & Service Innovation
Contents of the lecture include:
- Relevance, importance and understanding of business model innovations
- Organizational success factors and barriers
- Transformation of existing business models
- Methods of business model innovation
- Building blocks of business model innovation and related methods
- Sectoral aspects such as innovation in mobility

Contents of the exercise are:
Application of service innovation methods on a practical example.

Customer Relationship Management & Customer Analytics
Contents of the lecture include:
- Relevance, importance and understanding of customer relationship management
- Theoretical foundations of CRM
- Target indicators of CRM
- Lifecycle perspective of the customer relationship
- Acquisition and new customer management
- Customer loyalty programs
- Types and management of switching barriers
- Customer evaluation and segmentation
- Expansion of customer relationships
- Complaint management
- Termination prevention and reactivation management
- Customer data and privacy

Contents of the exercise include learning and applying methods
- to calculate customer value
- to evaluate the customer relationship (e.g. satisfaction, loyalty, recommendation)
- to calculate customer churn or the probability of churn
- to evaluate the success of promotions and reactivation measures

Objective qualification

Depending on the selected courses:

After successful participation, students will have a basic understanding of brands and knowledge of which aspects play a role in branding. In addition, they will understand and be able to critically discuss how brands are developed and positioned and which instruments are suitable for this. They can argue on the basis of theory why certain brand-related measures can be expected to have an effect and have methodological knowledge in order to measure the brand and quantify influencing factors. Students will be able to formulate precise problems and research questions based on a complex practical issue in the field of brand management and develop a solution to the problem using the content and methods learned in the lecture.

After successful participation, students have a basic understanding of business model innovation and know which factors play a role in the development of business model innovations. In addition, they will understand and be able to critically discuss how innovations are developed and which methods are suitable for this. They can argue on the basis of theory why certain corporate measures can be expected to have an effect on the success of innovation and have methodological knowledge to develop, evaluate and critically reflect on business model innovations themselves. Students can formulate precise problems and research questions based on a complex practical issue in the field of innovation management and develop solutions to problems using the content and methods learned in the lecture and taught in the exercise.

Students have an understanding of issues that arise in the context of recording, designing and evaluating customer relationships. Based on the concepts and methods they have learned, students will be able to independently record, conceptually structure and analyze customer relationship management issues in various industry contexts. They have methodological and application knowledge for the qualitative and quantitative analysis of customer and company data required to answer customer relationship management tasks.

Literature

Strategic Brand Management & Brand Strategy Bootcamp
- Keller, Kevin L. und V. Swaminathan (2019): Strategic Brand Management - Building, Measuring, and Managing Brand Equity, 5th ed., Prentice Hall
- Supplementary journal paper per chapter
- Lecture notes for download.
- Supplementary information and literature as bibliography and/or download for the exercise.

Business Model Innovation & Service Innovation

- Textbooks and further literature will be announced in the lectures
- Supplementary literature (PDF documents, lecture notes for download)

Customer Relationship Management & Customer Analytics
- Kumar, V. and Werner Reinartz (2018): Customer Relationship Management: Concept, Strategy, and Tools, 3. ed., Springer.
- Textbooks and further literature will be announced in the lectures
- Supplementary literature (PDF documents, lecture notes for download)

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Related courses

Rules for the choice of courses

Students must choose a course from the following program:
- Strategic Brand Management & Brand Strategy Bootcamp
- Business Model Innovation & Service Innovation
- Customer Relationship Management & Customer Analytics

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Business Model Innovation: Concepts and Applications	4,0	Lecture/Exercise	english

Literature

- Lehrbücher und weiterführende Literatur werden in den Veranstaltungen bekannt gegeben
- Ergänzende Literatur (PDF-Dokumente, Vorlesungsunterlagen zum Download)

Strategic Brand Management: Concepts and Applications	4,0	Lecture/Exercise	german

Literature

- Keller, Kevin L. und V. Swaminathan (2019): Strategic Brand Management - Building, Measuring, and Managing Brand Equity, 5th ed., Prentice Hall
- Ergänzende Journalpaper je Kapitel
- Vorlesungsunterlagen zum Download.
- Ergänzende Informationen und Literatur als Literaturverzeichnis und/oder zum Download zur Übung.

Customer Relationship Management and Customer Analytics	4,0	Lecture/Exercise	german

Literature

- Kumar, V. and Werner Reinartz (2018): Customer Relationship Management: Concept, Strategy, and Tools, 3. ed., Springer.
- Lehrbücher und weiterführende Literatur werden in den Veranstaltungen bekannt gegeben
- Ergänzende Literatur (PDF-Dokumente, Vorlesungsunterlagen zum Download

Title	Orientation Finance		
Number	2215000040	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Finanzwirtschaft
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Marc Gürtler
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 written exam (120 min) or 1 oral exam (30 min) or 1 term paper or 1 presentation or 1 portfolio or 1 take-at-home exam		
Course achievement	for Organization, Governance, Education instead of the examination performance: 1 written exam (120 min) or 1 oral exam (30 min) or 1 term paper or 1 presentation or 1 portfolio or 1 take-at-home exam		

Contents

- Management of interest rate risk
- Management of stock price risk (portfolio management)
- Management of foreign exchange risk
- Management of credit risks in banks
- Valuation of financial instruments subject to risk

Objective qualification

Students have knowledge of the measurement, evaluation and management of financial risks and can apply this knowledge to issues faced by banks and insurance companies on the one hand and industrial companies on the other. In particular, students gain in-depth insights into the topics of “credit risks”, “interest rate risks”, “foreign exchange risks” and “stock price risks”.

Literature

- Gürtler (2013): Finanzwirtschaftliches Risikomanagement
- Breuer (2000): Unternehmerisches Währungsmanagement
- Breuer/Gürtler/Schuhmacher (2010): Portfoliomanagement I
- Breuer/Gürtler (2003): Internationales Management
- Hartmann-Wendels/Pfingsten/Weber (2007): Bankbetriebslehre

↑

Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Financial Risk Management	4,0	Lecture/Exercise	german
Literature			
vergleiche Homepage des Lehrstuhls			
Risk Management and Sustainability	4,0	Lecture/Exercise	german
Literature			
vergleiche Homepage des Lehrstuhls			

Title	Orientation Marketing		
Number	2221110	**Module version**	V2
Shorttext	WW-MK-11	**Language**	english german
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Marketing und Innovation
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Christof Backhaus
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (120 min) or 1 take-home exam		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination: 1 exam (120 min) or 1 take-home exam		

Contents

Selected content - depending on the event selection:

Special features of international marketing
Consumer behaviour and organisational buying behaviour
Techniques of data collection and data analysis in marketing

Objective qualification

The aim of the orientation module Marketing is to give students the opportunity to expand their knowledge in a subject that is not one of their specialisations. After completing the module, students will have a sound knowledge of the following areas: 1. buyer behaviour and marketing research, 2. international marketing

Literature

- Zentes, J./Swoboda, B./Schramm-Klein, H. (2006): Internationales Marketing, München 2006
- Kroeber-Riel, W./Weinberg, P./Gröppel-Klein, A. (2008): Konsumentenverhalten, 9. Aufl., München 2008
- Fantapié Altobelli, C. (2007): Marktforschung, Stuttgart 2007
- Folienskripte

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Sustainability Transformation Management	2,0	Lecture	english
Consumer Behaviour	2,0	Lecture	german

Title	Orientation Marketing		
Number	2221110	**Module version**	V3
Shorttext	WW-MK-11	**Language**	english german
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Marketing und Innovation
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Christof Backhaus
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (120 min) or 1 take-home exam		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination: 1 exam (120 min) or 1 take-home exam		

Contents

Selected content - depending on the event selection:

Special features of international marketing
Consumer behaviour and organisational buying behaviour
Techniques of data collection and data analysis in marketing

Objective qualification

The aim of the orientation module Marketing is to give students the opportunity to expand their knowledge in a subject that is not one of their specialisations. After completing the module, students will have a sound knowledge of the following areas: 1. buyer behaviour and marketing research, 2. international marketing

Literature

- Zentes, J./Swoboda, B./Schramm-Klein, H. (2006): Internationales Marketing, München 2006
- Kroeber-Riel, W./Weinberg, P./Gröppel-Klein, A. (2008): Konsumentenverhalten, 9. Aufl., München 2008
- Fantapié Altobelli, C. (2007): Marktforschung, Stuttgart 2007
- Folienskripte

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Consumer Behaviour	2,0	Lecture	german

Sales Management	2,0	Lecture	german

Literature

- Johnston, Mark W. und Marshall, Greg W. (2021). Sales Force Management – Leadership, Innovation, Technology, 13. ed., New York: Routledge.
- sowie zu den einzelnen Kapiteln weitere, in den Veranstaltungsunterlagen aufgeführte Literatur.

Sales Management	2,0	Exercise	german

Literature

- Johnston, Mark W. und Marshall, Greg W. (2021). Sales Force Management – Leadership, Innovation, Technology, 13. ed., New York: Routledge.
- sowie zu den einzelnen Kapiteln weitere, in den Veranstaltungsunterlagen aufgeführte Literatur.

Title	Orientation Production and Logistics		
Number	2220250	**Module version**	V2
Shorttext	WW-AIP-25	**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Automobilwirtschaft und Industrielle Produktion - Lehrstuhl für Produktion und Logistik
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Thomas Spengler
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 written exam 120 (min) or 1 take-at-home exam		
Course achievement	for Organization, Governance, Education / MA Social Sciences instead of the examination performance: 1 written exam 120 (min) or 1 take-at-home exam		

Contents

Selected content - depending on course selection:

Production Facility Management:
The course “Production Facility Management” deals with various issues that arise in the context of production facility planning and operation. First of all, an overview is given of the tasks involved in the project management of a production facility construction project. Of particular relevance here is the interdisciplinary handling of such projects. A special focus is placed on investment and cost planning. Methods are taught with which economically relevant parameters can be estimated based on the technical planning in various project phases. Students are also taught methods for static and dynamic capacity planning. Finally, students are given an overview of configuration planning and maintenance.

Sustainability in Production and Logistics:
The course “Sustainability in Production and Logistics” teaches the main conditions and options to design a sustainable production and logistics system. The initial focus is laid on approaches for the static and dynamic modeling of energy and material flows as well as the design of disassembly and recycling processes. Within the subsequent sustainability assessment, approaches for an economic, environmental, and social assessment of products and processes are presented. This is followed by an introduction to multi-criteria decision-making, which enables the consideration of various sustainability aspects in the context of corporate decisions. The lecture is accompanied by interactive discussions and practical examples from various sectors, such as the steel industry or electromobility.

Operations Management in the Automotive Industry:
In the course "Operations Management in the Automotive Industry," students gain a detailed insight into the methods and concepts for planning and controlling automotive production. Students are introduced to model-based planning approaches, enabling them to solve strategic (network planning), tactical (assembly line balancing), and operational (assembly line sequencing) problems within automotive production. Special focus is the development of mathematical planning models from Operations Management.

Supply Chain Management:
In the course “Supply Chain Management”, a model-based analysis of industrial supply chains is carried out. Special features of various industries such as the automotive, steel, and semiconductor industries are worked out and their effects on the supply chain are illustrated using the models presented. During the course, typical efficiency losses of industrial supply chains are discussed and approaches to maximize the efficiency of a supply chain are presented. Finally, a quantitative planning approach is presented that can be used to create distribution networks depending on product-specific requirements.

Objective qualification

In the "Production and Logistics" orientation, students are taught various quantitative and qualitative methods from Operations Management for evaluating, designing, planning, and controlling sustainable value creation networks. These methods are applied to practical production and logistics-related issues across various disciplines, such as process engineering, electrical engineering, electromobility, mechanical engineering, or the chemical industry.

Through the course, students are empowered to independently apply and develop quantitative and qualitative methods from Operations Management. Additionally, they are able to appropriately apply and adapt the learned methods in collaboration with different disciplines to address specific challenges.

Literature

Textbooks and further literature will be mentioned in the lectures.

↑

Related courses

Rules for the choice of courses

Production and Logistics A: Supply Chain Management + Operations Management in the Automotive Industry
Production and Logistics B: Asset Management + Sustainability in Production and Logistics

Students in the Master of Social Sciences can only choose option B.

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Sustainability in Production and Logistics	2,0	Lecture	german

Literature

- Baumast, A.; Pape, J. (2008): Betriebliches Umweltmanagement: Nachhaltiges Wirtschaften in Unternehmen, Eugen Ulmer: Stuttgart
- Deutsches Institut für Normung (2006): Umweltmanagement – Ökobilanz – Anforderungen und Anleitungen (ISO 14044:2006). Beuth-Verlag. Berlin. Ausgabedatum: 2006-10
- Erbguth, W.; Schlacke, S. (2010): Umweltrecht, Nomos: Baden-Baden
- Spengler, T. (1998): Industrielles Stoffstrommanagement, Erich Schmidt: Berlin
- Walther, G. (2010): Nachhaltige Wertschöpfungsnetzwerke – Überbetriebliche Planung und Steuerung von Stoffströmen entlang des Produktlebenszyklus, Gabler-Verlag: Wiesbaden.

Operations Management in the Automotive Industry	2,0	Lecture	english

Literature

Examples:
- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Supply Chain Management	2,0	Lecture	english

Literature

- Chopra, S./Meindl, P. (2016): Supply Chain Management – Strategy, Planning, and Operation. Pearson
- Shapiro, J. (2006): Modeling The Supply Chain, Duxbury/Thomson Learning
- Simchi-Levi, D./Kaminsky, P./Simchi-Levi, E. (2007): Designing and Managing the Supply Chain: Concepts, Strategies, and Case studies, McGraw-Hill/Irwin
- Stadtler, H./Kilger, C. (2007): Supply Chain Management and Advanced Planning, Springer

Production Facility Management	2,0	Lecture	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Exercise Supply Chain Management & Operations Management in the Automotive Industry	2,0	Exercise	english

Literature

Examples:
- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Exercise Production Facility Management and Sustainability in Production & Logistics	2,0	Exercise	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Title	Orientation Law		
Number	2216350	**Module version**	V3
Shorttext	WW-RW-35	**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Rechtswissenschaften
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Anne Paschke
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Recommended requirements	Basic knowledge from the module Fundamentals of Law is assumed.		
Expected performance/ Type of examination	1 exam (120 min) or 1 take-at-home exam		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination: 1 exam (120 min) or 1 take-at-home exam		

Contents

The content depends on the choice of specialisation:
In the Public Law specialisation, the basic principles of technology law and environmental law are taught. After an introduction to the historical and European and international law principles of the named areas of law, the various forms of these areas of law are examined in more detail with reference to other areas such as the natural sciences and economics. In each case, reference is made to knowledge already acquired by the students.
In the environmental law lecture, construction and immission control law, recycling management law, nature conservation law and climate protection law are examined in detail. The technical law lecture also addresses plant law, product liability law, mobility law, product and equipment safety law, patent law, technical criminal law, data protection law and the creation of technical standards.

In the civil law specialisation, students learn about IT and data law as well as the areas of law that are important for start-ups. The internet has fundamentally changed the way we communicate, analyse, work and consume information, which is why the IT and data law lecture deals with the legal requirements of the digital transformation. Students learn the legal basis for data utilisation and compliance with data protection law. They learn the basics of copyright law and learn what needs to be considered legally when creating a web presence (homepage, web shop, social media account). They are also sensitised to the risks of warnings when selling online. Finally, the lecture takes a closer look at the main features of IT security law.

The Law for Start-Ups course teaches the practical knowledge required to successfully launch a start-up company. Among other things, students learn about different types of companies. They also learn step by step what is required to found a company and what legal issues they will face when the company goes into business, e.g. in the areas of trademark and patent law, commercial and unfair competition law and labour law. In the lecture, the other economics lectures, e.g. on business models, are discussed in order to work on legal challenges.

Objective qualification

The courses teach the following theoretical legal content in order to enable graduates to independently identify the relevant legal standards in their respective specialist area and to make subject-related legal decisions taking into account the current legal situation and to present these in a scientific and practice-oriented manner in writing and orally. Only the application-orientated integrative consideration of legal requirements and technical processes enables legally compliant company/product/production design (compliance).

After completing the module in the Public Law specialisation, students will be able to independently deal with the specialist laws in environmental and technical law and identify relevant legal norms and technical standards. Here, technical examples from other lectures or from the students' internships are taken up and jointly assessed on the basis of the existing legal situation. This enables students to identify the responsible supervisory authorities and independently check whether their plant or machine requires official authorisation or whether it is subject to notification. In this context, the ‘state of the art’ as an important legal concept is also brought to life with examples from technical practice in order to sensitise students to the need to take future developments into account. Students also learn about legal issues relating to the mitigation of the consequences of climate change in order to be able to better assess and implement their significance and consequences from an economic perspective. They also learn about liability responsibilities and can identify liability and sanctioning risks in production processes.

After completing the module in the Civil Law specialisation, students will be able to independently find the specialist laws and relevant standards relevant to them and solve legal issues in IT and data law as well as in the context of company formation and management by working with the law. As regulation in this area is very fast-moving, the teaching of legal methodological skills in particular is of decisive importance in addition to the teaching of specialist skills in order to enable students to apply the law independently. After completing the module, students are sensitised to the content of the lectures in order to behave in a legally compliant manner when using the internet independently (commercially) or when founding a company. They will also have learnt how to ask the right questions to lawyers who support them in enforcing the law.

Literature

For the Public Law specialisation

- Law book
- Umweltrecht dtv. Beck, 31. Aufl. 2022
- Bundes-Immissionsschutzgesetz, dtv. Beck, 17. Aufl. 2022

For the civil law specialisation

- Textbooks

- Ensthaler, Jürgen, Technikrecht: Rechtliche Grundlagen des Technologiemanagments, 2. Aufl. 2022
- Schlacke, Umweltrecht, 8. Aufl. 2021
- Rodi, Handbuch Klimaschutzrecht, 2022

- Law book
- Datenschutzrecht, dtv Beck, 14. Aufl. 2022
- IT- und Computerrecht, dtv. Beck, 15. Aufl. 2022
- Arbeitsgesetze, dtv. Beck, 100. Aufl. 2022

- Textbooks

- Informations- und Kommunikationsrecht, 2018
- Kühling/Klar/Sackmann, Datenschutzrecht, 2021
- Schädel, Wirtschaftsrecht für Hightech-Start-ups, 2019

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Related courses
Rules for the choice of courses
One of the two specialisations must be chosen: Public Law: Environmental Law Technology law Civil law: IT and data law Law for StartUps Students on the Master's in Environmental Engineering can only take the Public Law specialisation.
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Environmental Law	2,0	Lecture	german
Literature			
Wird in der Veranstaltung bekanntgegeben.			
Technology Law	2,0	Lecture	german
Literature			
Wird in der Veranstaltung bekanntgegeben.			
IT- and Data Law	2,0	Lecture	german
Literature			
Wird in der Vorlesung bekannt gegeben.			
Law for StartUps	2,0	Lecture	german
Literature			
Wird in der Veranstaltung bekanntgegeben.			
Mobility Law	4,0	Lecture	english

Title	Orientation Information Management		
Number	2222310	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	2	**Institution**	Institut für Wirtschaftsinformatik - Abteilung Service-Informationssysteme
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Susanne Robra-Bissantz
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Recommended requirements	The prerequisite for the module is basic knowledge in economics.		
Expected performance/ Type of examination	1 assignment or 1 exam (120 min) or 1 portfolio or 1 take-at-home-exam or 1 exam+		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination: 1 term paper or 1 exam (120 min) or 1 portfolio or 1 take-at-home exam		

Contents

Selected content – depending on the course selection:
- Servicification
- Role of IT in Service Processes
- Service Dominant Logic
- Digital Products
- Value in Interaction
- E-Services
- Service Design
- Service Ecosystems and Platforms
- Digital Economy
- Digital Management
- Cooperation and Collaboration
- Digital Collaboration

Objective qualification

Students understand the strategic relevance of information systems for companies in terms of operational tasks, people and technology. They are familiar with concepts for internal or inter-company IT-supported cooperation as well as their objectives and strategies in the context of strategic management. A possible specialisation is the view of application systems as e-services.

Literature

Course materials are provided on Stud.IP, along with additional literature.

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Related courses			
Rules for the choice of courses			
Colloquium optional			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Digital Transformation: Collaborations	2,0	Lecture	german
Literature			
• Vorlesungsunterlagen zum Download • Weitere Literatur wird in der Veranstaltung bekannt gegeben			
Digital Transformation: Services	2,0	Lecture	german
Literature			
Vorlesungsunterlagen per Download, weitere Literatur wird in der Veranstaltung bekannt gegeben.			
	2,0	Colloquium	german

Title	Orientation Management and Organisation Science		
Number	2223100	**Module version**	
Shorttext	WW-ORGF-10	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Dietrich von der Oelsnitz
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

Objective qualification

Literature

- Oelsnitz, D. von der (2009): Die innovative Organisation, 2. Aufl., Stuttgart.
- Schulte-Zurhausen, M. (2005): Organisation, 4. Aufl., München.
- Schreyögg, G. (2008): Organisation, 5. Aufl., Wiesbaden.
- Stock-Homburg, R. (2008): Personalmanagement, Wiesbaden.
- Gemünden, H.G./Högl, M. (2005): Teamarbeit in innovativen Projekten, in: Högl, M./Gemünden, H.G. (Hrsg.): Management von Teams, 3. Aufl., Wiesbaden, S. 1-31.

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language

Organization	2,0	Lecture	german
Literature			
• Oelsnitz, D. von der (2009): Die innovative Organisation, 2. Aufl., Stuttgart. • Schulte-Zurhausen, M. (2005): Organisation, 4. Aufl., München • Schreyögg, G. (2008): Organisation, 5. Aufl., Wiesbaden.			

Team Management	1,0	Lecture	german
Literature			
• Stock-Homburg, R. (2008): Personalmanagement, Wiesbaden. • Gemünden, H.G./Högl, M. (2005): Teamarbeit in innovativen Projekten, in: Högl, M./Gemünden, H.G. (Hrsg.): Management von Teams, 3. Aufl., Wiesbaden, S. 1-31. • Oelsnitz, D. von der (2005): Kooperation: Entwicklung und Verknüpfung von Kernkompetenzen, in: Zentes, J./Swoboda, B./Morschett, D. (Hrsg.): Kooperationen, Allianzen und Netzwerke, 2. Aufl., Wiesbaden, S. 183-210.			

Team and Organizational Management	1,0	Exercise	german

		Colloquium	german

Organization and Change	4,0	Lecture/Exercise	english german
Literature			
• Oelsnitz, D. von der (2009): Die innovative Organisation, 2. Aufl., Stuttgart. • Schulte-Zurhausen, M. (2005): Organisation, 4. Aufl., München • Schreyögg, G. (2008): Organisation, 5. Aufl., Wiesbaden.			

Title	Specialisation Management Controlling		
Number	2214000000	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Controlling und Unternehmensrechnung
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Heinz Ahn
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam+ (30 min) or 1 take-home exam or 1 oral exam+ (20 min)		
Course achievement	1 presentation or 1 term paper or 1 presentation or 1 portfolio for Organisation, Governance, Education / MA Social Sciences instead of the examination additionally: 1 exam+ (30 min) or 1 take-home exam or 1 oral exam+ (20 min)		

Contents

Selected contents – depending on the respective current course:
- Management control in practice and research
- Controlling of risks and chances
- Project controlling

Effectiveness and efficiency analysis

Objective qualification

The students have a deeper understanding of actual topics and methods of management control. Based on this, they are able to analyze related problems, critically evaluate proposed concepts, and soundly support respective decision-making in practice. Furthermore, they are qualified to pursue academic work with the aim of writing a doctoral thesis.

Literature

- Weber/Schäffer: Einführung in das Controlling, Stuttgart, aktuelle Auflage
- Ewert/Wagenhofer: Interne Unternehmensrechnung, Berlin et al., aktuelle Auflage
- Eisenführ/Weber/Langer: Rationales Entscheiden, Berlin et al., aktuelle Auflage

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Related courses

Rules for the choice of courses

The module consists of two variants, one of which must be taken:

Variant A:
Current Topics in Controlling (VR3) and Advanced Performance Measurement (V1) are compulsory.
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Variant B:
Performance Analysis Projects is compulsory.
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Any colloquia and tutorials offered are voluntary in both variants.

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Advanced Performance Analytics	1,0	Lecture	english
Actual Topics of Management Control	3,0	Series of lectures	german

Literature

- Weber, U./Schäffer, J. (2016), Einführung in das Controlling, Stuttgart
- Ahn, H. (2003), Effektivitäts- und Effizienzsicherung - Controlling-Konzept und Balanced Scorecard, Frankfurt/M. et al.
- Ahn, H./Dyckhoff, H. (2004), Zum Kern des Controllings - Von der Rationalitätssicherung zur Effektivitäts- und Effizienzsicherung, in: Scherm/Pietsch (Hrsg.): Controlling - Theorien und Konzeptionen, München, S. 501-525

Actual Topics of Management Control	3,0	Series of lectures	german

Literature

- Weber, U./Schäffer, J. (2016), Einführung in das Controlling, Stuttgart
- Ahn, H. (2003), Effektivitäts- und Effizienzsicherung - Controlling-Konzept und Balanced Scorecard, Frankfurt/M. et al.
- Ahn, H./Dyckhoff, H. (2004), Zum Kern des Controllings - Von der Rationalitätssicherung zur Effektivitäts- und Effizienzsicherung, in: Scherm/Pietsch (Hrsg.): Controlling - Theorien und Konzeptionen, München, S. 501-525

Performance Analysis Projects	4,0	Series of lectures	german

Title	Orientation Economics		
Number	2212150	**Module version**	V2
Shorttext	WW-VWL-15	**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Volkswirtschaftslehre
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Felix Rösel
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (90 min) or 1 term paper or 1 oral exam (30 min) or 1 take-at-home exam		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination: 1 exam (90 min) or 1 term paper or 1 oral exam (30 min) or 1 take-at-home exam		

Contents

Selected topics from urban and regional economics:

Location theories
Spatial structure and sector theories
Regional economic growth theories

Selected topics from cost-benefit analysis:

Fundamentals of welfare theory
Theory of cost-benefit analysis (and other ex ante analysis methods)
Application of cost-benefit analysis in transport, health, environment and other subject areas

Objective qualification

Students have in-depth knowledge of the structure, functioning and efficiency of different market forms and can determine government measures to improve market outcomes. They are able to apply previously learnt economic thinking to the political system. Students specialise in one area of economics and become familiar with the latest research findings.

Literature

Urban and regional economics:

Farhauer, Oliver, Kröll, Alexandra: Location theories: Regional and urban economics in theory and practice, Springer, current edition.
Maier, Gunther, Tödtling, Franz: Stadt- und Regionalökonomik 1: Standorttheorie und Raumstruktur, Springer, current edition.

Cost-benefit analysis:

Boardman, Anthony, Greenberg, David, Vining, Aidan, Weimer, David: Cost-Benefit Analysis: Concepts and Practice, Pearson New International Edition, current edition.
Hanusch, Horst: Benefit-Cost Analysis, Vahlen, current edition.

Pindyck, Robert S., Rubinfeld, Daniel L.: Mikroökonomie, Pearson Studium, current edition.

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Related courses			
Rules for the choice of courses			
1 event of your choice			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Urban and Regional Economics	4,0	Lecture/Exercise	german
Literature			
• Farhauer, Oliver, Kröll, Alexandra: Standorttheorien: Regional- und Stadtökonomik in Theorie und Praxis, Springer, aktuelle Auflage • Maier, Gunther, Tödtling, Franz: Stadt- und Regionalökonomik 1: Standorttheorie und Raumstruktur, Springer, aktuelle Auflage.			
Cost-Benefit Analysis	4,0	Lecture/Exercise	german
Literature			
• Boardman, Anthony, Greenberg, David, Vining, Aidan, Weimer, David: Cost-Benefit Analysis: Concepts and Practice, Pearson New International Edition, aktuelle Auflage • Hanusch, Horst: Nutzen-Kosten-Analyse, Vahlen, aktuelle Auflage • Pindyck, Robert S., Rubinfeld, Daniel L.: Mikroökonomie, Pearson Studium, aktuelle Auflage			

Title	Specialisation Decision Support		
Number	2218250	**Module version**	V2
Shorttext	WW-WINFO-25	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Wirtschaftsinformatik - Lehrstuhl für Decision Support
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Dirk Mattfeld
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (60 min) or 1 take-at-home exam (2.5 CP)		
Course achievement	Exercises (for the exercise(s)) (2.5 CP) only for Organisation, Governance, Education instead of the examination additionally 1 exam (60 min) or 1 take-at-home exam (2.5 CP)		

Contents

Selected content - depending on the course selection:

Business requirements for information systems in logistics and transport (ISLV)
Conception of ISLV
Functionality and examples of ISLV
Importance of information modelling for planning problems
Classification methods
Cluster analysis
Association analysis
Network models for route planning
Exciting trees, shortest paths

Objective qualification

Students have an in-depth understanding of the structure and design of information systems for mobility applications. The module enables students to transfer their basic knowledge of information systems for mobility applications to other domains. Through exercises, students consolidate the use of methods and models.

Literature

- Vahrenkamp, R.; Mattfeld, D.C.: Logistiknetzwerke: Modelle für Standortwahl und Tourenplanung. Gabler, 2007.
- Berthold, M. et al: Guide to Intelligent Data Analysis
- Gabriel, R. et al: Computergestützte Informations- und Kommunikationssysteme in der Unternehmung. Technologien, Anwendungen, Gestaltungskonzepte. 2. Auflage. Springer, 2001.

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Data Driven Decision Making	2,0	Lecture	german
Literature			
wird in der Vorlesung bekannt gegeben			
Data Driven Decision Making - Exercise	2,0	Exercise	german

Title	Spezialisation Services Management		
Number	2201000020	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Automobilwirtschaft und Industrielle Produktion - Lehrstuhl für Dienstleistungsmanagement
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. David Woisetschläger
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 portfolio or 1 take-home exam		
Course achievement	for Organization, Governance, Education / MA Social Sciences instead of the examination performance: 1 portfolio or 1 take-home exam		

Contents

Contents - depending on the course selection:

Strategic Brand Management & Brand Strategy Bootcamp
Contents of the lecture include
- Brand understanding and the importance of brands
- Measurement of brand associations
- Secondary brand associations
- Instruments for building brand associations
- Brand strategy and positioning
- Brand architecture
- Measuring brand performance
- International brand management
- Internal brand management
- Organizational aspects of brand management
- Sectoral specialties in retail, industrial goods and the luxury sector.

Contents of the exercise are:
Working on a real practical problem in the field of brand management in cooperation with a company partner.

Business Model Innovation & Service Innovation
Contents of the lecture include:
- Relevance, importance and understanding of business model innovations
- Organizational success factors and barriers
- Transformation of existing business models
- Methods of business model innovation
- Building blocks of business model innovation and related methods
- Sectoral aspects such as innovation in mobility

Contents of the exercise are:
Application of service innovation methods on a practical example.

Customer Relationship Management & Customer Analytics
Contents of the lecture include:
- Relevance, importance and understanding of customer relationship management
- Theoretical foundations of CRM
- Target indicators of CRM
- Lifecycle perspective of the customer relationship
- Acquisition and new customer management
- Customer loyalty programs
- Types and management of switching barriers
- Customer evaluation and segmentation
- Expansion of customer relationships
- Complaint management
- Termination prevention and reactivation management
- Customer data and privacy

Contents of the exercise include learning and applying methods
- to calculate customer value
- to evaluate the customer relationship (e.g. satisfaction, loyalty, recommendation)
- to calculate customer churn or the probability of churn
- to evaluate the success of promotions and reactivation measures

Objective qualification

Depending on the selected courses:

After successful participation, students will have a basic understanding of brands and knowledge of which aspects play a role in branding. In addition, they will understand and be able to critically discuss how brands are developed and positioned and which instruments are suitable for this. They can argue on the basis of theory why certain brand-related measures can be expected to have an effect and have methodological knowledge in order to measure the brand and quantify influencing factors. Students will be able to formulate precise problems and research questions based on a complex practical issue in the field of brand management and develop a solution to the problem using the content and methods learned in the lecture.

After successful participation, students have a basic understanding of business model innovation and know which factors play a role in the development of business model innovations. In addition, they will understand and be able to critically discuss how innovations are developed and which methods are suitable for this. They can argue on the basis of theory why certain corporate measures can be expected to have an effect on the success of innovation and have methodological knowledge to develop, evaluate and critically reflect on business model innovations themselves. Students can formulate precise problems and research questions based on a complex practical issue in the field of innovation management and develop solutions to problems using the content and methods learned in the lecture and taught in the exercise.

Students have an understanding of issues that arise in the context of recording, designing and evaluating customer relationships. Based on the concepts and methods they have learned, students will be able to independently record, conceptually structure and analyze customer relationship management issues in various industry contexts. They have methodological and application knowledge for the qualitative and quantitative analysis of customer and company data required to answer customer relationship management tasks.

Literature

Strategic Brand Management & Brand Strategy Bootcamp
- Keller, Kevin L. und V. Swaminathan (2019): Strategic Brand Management - Building, Measuring, and Managing Brand Equity, 5th ed., Prentice Hall
- Supplementary journal paper per chapter
- Lecture notes for download.
- Supplementary information and literature as bibliography and/or download for the exercise.

Business Model Innovation & Service Innovation

- Textbooks and further literature will be announced in the lectures
- Supplementary literature (PDF documents, lecture notes for download)

Customer Relationship Management & Customer Analytics
- Kumar, V. and Werner Reinartz (2018): Customer Relationship Management: Concept, Strategy, and Tools, 3. ed., Springer.
- Textbooks and further literature will be announced in the lectures
- Supplementary literature (PDF documents, lecture notes for download)

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Related courses

Rules for the choice of courses

Students must choose a course from the following program:
- Strategic Brand Management & Brand Strategy Bootcamp
- Business Model Innovation & Service Innovation
- Customer Relationship Management & Customer Analytics

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Business Model Innovation: Concepts and Applications	4,0	Lecture/Exercise	english

Literature

- Lehrbücher und weiterführende Literatur werden in den Veranstaltungen bekannt gegeben
- Ergänzende Literatur (PDF-Dokumente, Vorlesungsunterlagen zum Download)

Strategic Brand Management: Concepts and Applications	4,0	Lecture/Exercise	german

Literature

- Keller, Kevin L. und V. Swaminathan (2019): Strategic Brand Management - Building, Measuring, and Managing Brand Equity, 5th ed., Prentice Hall
- Ergänzende Journalpaper je Kapitel
- Vorlesungsunterlagen zum Download.
- Ergänzende Informationen und Literatur als Literaturverzeichnis und/oder zum Download zur Übung.

Customer Relationship Management and Customer Analytics	4,0	Lecture/Exercise	german

Literature

- Kumar, V. and Werner Reinartz (2018): Customer Relationship Management: Concept, Strategy, and Tools, 3. ed., Springer.
- Lehrbücher und weiterführende Literatur werden in den Veranstaltungen bekannt gegeben
- Ergänzende Literatur (PDF-Dokumente, Vorlesungsunterlagen zum Download

Title	Specialisation Finance		
Number	2215000030	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Finanzwirtschaft
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Marc Gürtler
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 written exam (120 min) or 1 term paper or 1 oral exam (30 min) or 1 presentation or 1 portfolio or 1 take-at-home exam		
Course achievement	for Organization, Governance, Education instead of the examination performance: 1 written exam (120 min) or 1 term paper or 1 oral exam (30 min) or 1 presentation or 1 portfolio or 1 take-at-home exam		

Contents

- Advanced methods and techniques of machine and statistical learning (e.g. tree-based methods, neural networks, support vector machines, cluster analysis, explainable artificial intelligence (AI))
- Application of the methods to forecasting and estimation problems in the financial sector
- Implementation of the methods, especially in the context of scientific case studies

Objective qualification

Students have the ability to use advanced methods of machine and statistical learning for forecasting and estimation problems in finance and to implement them in specific case studies using statistical software packages. Furthermore, students know the structured procedure that should be followed for implementation in the context of practical and scientific empirical projects.

Literature

- Gürtler (2013): Finanzwirtschaftliches Risikomanagement
- Wooldridge (2015): Introductory Econometrics – A Modern Approach
- von Auer (2011): Ökonometrie
- Brooks (2008): Econometrics for Finance
- Galeotti/Gürtler/Winkelvos (2013): Accuracy of Premium - Calculation Models for CAT Bonds – an Empirical Analysis
- Gürtler/Hibbeln (2013): Do Investors Consider Asymmetric Information in Pricing Securitizations?
- Gürtler/Hibbeln/Winkelvos (2016): The Impact of the Financial Crisis and Natural Catastrophes on CAT Bonds

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Related courses			
Rules for the choice of courses			
The course Machine Learning and Data Science in Finance is compulsory. The colloquium is voluntary.			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Machine Learning and Data Science in Finance	4,0	Lecture/Exercise	german
Literature			
vergleiche Homepage des Lehrstuhls			
	2,0	Colloquium	german

Title	Specialisation Marketing		
Number	2221120	**Module version**	V3
Shorttext	WW-MK-12	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Marketing und Innovation
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Christof Backhaus
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (60 min) or 1 take-at-home exam (2.5 CP)		
Course achievement	1 written exam (60 min) or 1 exercise task or 1 take-at-home exam (for the exercise) (2.5 CP) for Organisation, Governance, Education / MA Social Sciences instead of the examination additionally: 1 exam (60 min) or 1 take-at-home exam (2.5 CP)		

Contents

Selected contents - depending on the course selection:

Selected aspects of distribution management
Techniques of data collection and data analysis in marketing
In-depth study of selected marketing topics using case studies and exercises

Objective qualification

After completing this module, students have a sound knowledge of the areas of distribution management, international marketing, buyer behaviour and marketing research. They are able to think through, structure and solve marketing problems of various kinds.

Literature

- Zentes, J./Swoboda, B./Schramm-Klein, H. (2006): Internationales Marketing, München 2006
- Kroeber-Riel, W./Weinberg, P./Gröppel-Klein, A. (2008): Konsumentenverhalten, 9. Aufl., München 2008
- Fantapié Altobelli, C. (2007): Marktforschung, Stuttgart 2007
- Specht, G./Fritz, W. (2005): Distributionsmanagement, 4. Aufl., Stuttgart 2005
- Folienskripte

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Related courses
Rules for the choice of courses
Sales management and the exercise Sustainability Transformation Management are compulsory. The exercise Sales Management is voluntary and only for exam preparation. The order of the courses is arbitrary.
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Sales Management	2,0	Lecture	german
Literature			
• Johnston, Mark W. und Marshall, Greg W. (2021). Sales Force Management – Leadership, Innovation, Technology, 13. ed., New York: Routledge. • sowie zu den einzelnen Kapiteln weitere, in den Veranstaltungsunterlagen aufgeführte Literatur.			
Exercise - Sustainability Transformation Management	2,0	Exercise	english
Sales Management	2,0	Exercise	german
Literature			
• Johnston, Mark W. und Marshall, Greg W. (2021). Sales Force Management – Leadership, Innovation, Technology, 13. ed., New York: Routledge. • sowie zu den einzelnen Kapiteln weitere, in den Veranstaltungsunterlagen aufgeführte Literatur.			

Title	Specialisation Marketing		
Number	2221120	**Module version**	V4
Shorttext	WW-MK-12	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Marketing und Innovation
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Christof Backhaus
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (60 min) or 1 take-at-home exam (2.5 CP)		
Course achievement	1 written exam (60 min) or 1 exercise task or 1 take-at-home exam (for the exercise) (2.5 CP) for Organisation, Governance, Education / MA Social Sciences instead of the examination additionally: 1 exam (60 min) or 1 take-at-home exam (2.5 CP)		

Contents

Selected contents - depending on the course selection:

Selected aspects of distribution management
Techniques of data collection and data analysis in marketing
In-depth study of selected marketing topics using case studies and exercises

Objective qualification

After completing this module, students have a sound knowledge of the areas of distribution management, international marketing, buyer behaviour and marketing research. They are able to think through, structure and solve marketing problems of various kinds.

Literature

- Zentes, J./Swoboda, B./Schramm-Klein, H. (2006): Internationales Marketing, München 2006
- Kroeber-Riel, W./Weinberg, P./Gröppel-Klein, A. (2008): Konsumentenverhalten, 9. Aufl., München 2008
- Fantapié Altobelli, C. (2007): Marktforschung, Stuttgart 2007
- Specht, G./Fritz, W. (2005): Distributionsmanagement, 4. Aufl., Stuttgart 2005
- Folienskripte

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Related courses			
Rules for the choice of courses			
The lecture and exercise Sustainability Transformation Management are compulsory.			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Sustainability Transformation Management	2,0	Lecture	english
Exercise - Sustainability Transformation Management	2,0	Exercise	english

Title	Specialisation Production and Logistics		
Number	2220260	**Module version**	V2
Shorttext	WW-AIP-26	**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Automobilwirtschaft und Industrielle Produktion - Lehrstuhl für Produktion und Logistik
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Thomas Spengler
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam 120 (min) or 1 take-at-home exam (on the 2 lectures of the chosen combination)		
Course achievement	only for Organisation, Governance, Education instead of the exam: 1 exam 120 (min) or 1 take-at-home exam (on the 2 lectures of the chosen combination)		

Contents

Selected content - depending on the course selection:

Plant management:
The course ‘Plant Management’ deals with various issues that arise in the context of plant planning and plant operation. Firstly, an overview is given of the tasks involved in the project management of a plant construction project. Of particular relevance here is the interdisciplinary handling of such projects. A special focus is placed on investment and cost planning. Methods are taught with which economically relevant parameters can be estimated on the basis of technical planning in various project phases. Students are also taught methods for static and dynamic capacity planning. Finally, students are given an overview of plant configuration planning and plant maintenance.

Sustainability in production and logistics:
In the course ‘Sustainability in Production and Logistics’, the relevant framework conditions and possibilities for designing sustainable production and logistics are taught. The focus is initially placed on approaches to static and dynamic modelling of energy and material flows as well as the design of dismantling and recycling. Within the subsequent sustainability assessment, approaches for an economic, ecological and social assessment of a product or process are presented. This is followed by an introduction to multi-criteria decision-making, which enables various aspects of sustainability to be taken into account when making business decisions. The lecture is accompanied by interactive discussions and application examples from various sectors, such as the steel industry or electromobility.

Operations Management in the Automotive Industry:
As part of the course ‘Operations Management in the Automotive Industry’, students gain a detailed insight into the methods and concepts for planning and controlling automotive production. Students learn about model-based planning approaches that enable them to solve strategic (network planning), tactical (assembly line balancing) and operational (assembly line sequencing) problems in the context of automotive production. A particular focus is always on integrating the special technical challenges of the automotive industry into the respective planning approaches.

Supply Chain Management:
In the course ‘Supply Chain Management’, a model-based analysis of industrial supply chains is carried out. Special features of various industries such as the automotive, steel and semiconductor industries are analysed and their effects on the supply chain are illustrated using the models presented. During the course, typical efficiency losses of industrial supply chains are discussed and approaches to maximise the efficiency of a supply chain are presented. Finally, a quantitative planning approach is presented that can be used to create distribution networks depending on product-specific requirements.

Master's Colloquium - Production and Logistics:
In the Master's colloquium, students are given the opportunity to present and discuss their Master's and diploma theses.

Objective qualification

The Production and Logistics specialisation builds on the quantitative and qualitative methods of economics learned in the orientation. The methods learnt are extended and further methods are introduced. Furthermore, additional subject areas are addressed in which the methods are applied.

The course enables students to independently apply and develop quantitative and qualitative methods in economics. In addition, students will be able to apply and adapt the methods they have learnt in cooperation with different subject areas to the specific challenges of the subject.

Literature

Textbooks and further reading will be given in the lectures

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Related courses

Rules for the choice of courses

Depending on the chosen combination in the corresponding orientation, the following combinations are possible:

Production and Logistics A: Supply Chain Management + Operations Management in the Automotive Industry
(Orientation consisted of Production and Logistics B: Plant Management + Sustainability in Production and Logistics)

Production and Logistics B: Plant Management + Sustainability in Production and Logistics
(Orientation consisted of Production and Logistics A: Supply Chain Management + Operations Management in the Automotive Industry)

The colloquium is voluntary.

Compulsory attendance

Name of the course	SWS	Eventtype	Language

Sustainability in Production and Logistics	2,0	Lecture	german

Literature

- Baumast, A.; Pape, J. (2008): Betriebliches Umweltmanagement: Nachhaltiges Wirtschaften in Unternehmen, Eugen Ulmer: Stuttgart
- Deutsches Institut für Normung (2006): Umweltmanagement – Ökobilanz – Anforderungen und Anleitungen (ISO 14044:2006). Beuth-Verlag. Berlin. Ausgabedatum: 2006-10
- Erbguth, W.; Schlacke, S. (2010): Umweltrecht, Nomos: Baden-Baden
- Spengler, T. (1998): Industrielles Stoffstrommanagement, Erich Schmidt: Berlin
- Walther, G. (2010): Nachhaltige Wertschöpfungsnetzwerke – Überbetriebliche Planung und Steuerung von Stoffströmen entlang des Produktlebenszyklus, Gabler-Verlag: Wiesbaden.

	2,0	Colloquium	german

Operations Management in the Automotive Industry	2,0	Lecture	english

Literature

Examples:
- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Production Facility Management	2,0	Lecture	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Supply Chain Management	2,0	Lecture	english

Literature

- Chopra, S./Meindl, P. (2016): Supply Chain Management – Strategy, Planning, and Operation. Pearson
- Shapiro, J. (2006): Modeling The Supply Chain, Duxbury/Thomson Learning
- Simchi-Levi, D./Kaminsky, P./Simchi-Levi, E. (2007): Designing and Managing the Supply Chain: Concepts, Strategies, and Case studies, McGraw-Hill/Irwin
- Stadtler, H./Kilger, C. (2007): Supply Chain Management and Advanced Planning, Springer

Exercise Supply Chain Management & Operations Management in the Automotive Industry	2,0	Exercise	english

Literature

Examples:

- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Exercise Production Facility Management and Sustainability in Production & Logistics	2,0	Exercise	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Title	Specialisation Law		
Number	2216360	**Module version**	V3
Shorttext	WW-RW-36	**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Rechtswissenschaften
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Anne Paschke
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (120 min) or 1 take-at-home exam		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination: 1 written exam (120 min) or 1 take-at-home exam		

Contents

The content depends on the choice of specialisation:

In the Public Law specialisation, the basic principles of energy law are taught in Energy Law I and Energy Law II.
The Energy Law I course serves to present the fundamentals of energy law at European and German level. At the beginning of the course, the development of energy law in recent decades is presented. The lecture focuses on the regulation of grid operation and related topics such as unbundling, grid connection, grid utilisation and grid utilisation fees. The main contractual structures of energy supply relationships and the position of end consumers in the energy industry will be the subject of the course. A further focus is on the supply of end consumers, e.g. basic supply and contract adjustment options. The lecture is designed to be interactive and offers the opportunity for discussion. The topics discussed will be illustrated using numerous practical cases.

The Energy Law II lecture is primarily dedicated to the law of the ‘energy transition’. It complements the Energy Law I lecture - however, it is not essential to have attended Energy Law I beforehand. One focus of the lecture is the introduction to the law of renewable energies (EEG) including historical developments and European references, including expansion targets, connection and feed-in priority, tenders/tariffs and financing, as well as an in-depth look at the specific legal situation of onshore and offshore wind turbines (including planning and approval, contract design). The event will also cover the most important legal foundations for the expansion of the electricity grid (from the Energy Industry Act, EnLAG, NABEG, BBPlG). Finally, there will be an opportunity to look at current developments in energy law, e.g. with regard to sector coupling or green hydrogen. The lecture is designed to be interactive and offers the opportunity for discussion. The topics discussed will be illustrated using numerous practical cases.

Depending on the students' choice, the Civil Law specialisation teaches content from public procurement law, patent and trademark law and IT security law.
In the Patent and Trade Mark Law lecture, students learn the basics of German and European patent law, the relevant patenting requirements and procedures at the German Patent and Trade Mark Office (DPMA) and the European Patent Office (EPO). The requirements for patenting and the corresponding case law are then applied and analysed in particular to computer-implemented inventions, i.e. especially inventions that

contain a substantial amount of software. To a lesser extent, utility models and their differences to patents as well as registered designs and Community designs are also discussed.

The lecture on public procurement law deals with the scope and procedure of public procurement procedures as well as the legal protection options under public procurement law. It is based on the regulations of EU procurement law (cartel procurement law) in accordance with Part 4 of the GWB and the VgV. However, excursions into sub-threshold procurement law and the special procurement regimes of sector contracts, defence and security-related contracts and concessions will be made at appropriate points. An initial focus of the lecture is on the question of the cases in which public procurement law is applicable and, if applicable, which public procurement law regime is to be applied. On the basis of upper-threshold procurement law, an overview of the procedure is given, starting with the possible types of procedure, the requirements to be met by bidders and the subject matter of the contract, the necessary notices, through to the evaluation of bids and the conclusion of the award procedure. Finally, the legal protection options under public procurement law (primary and secondary legal protection) are dealt with in detail. The lecture takes into account current developments in public procurement law and deals with the respective topics using examples from public procurement law practice.

The IT security law lecture examines one of the key areas of the coming decades from a legal perspective. Students will learn about the legal framework conditions that govern the introduction and maintenance of appropriate IT protection standards. They will also learn how IT security risks are distributed at a contractual level. The unit conveys a holistic approach and enables students to independently develop scientific and practice-orientated solutions together with the relevant specialist literature in order to supervise the necessary information technology steps.

Objective qualification

The courses teach the following theoretical legal content in order to enable graduates to independently identify the relevant legal standards in their respective specialist area and to make subject-related legal decisions taking into account the current legal situation and to present these in a scientific and practice-oriented manner in writing and orally. Only the application-orientated integrative consideration of legal requirements and technical processes enables legally compliant company/product/production design (compliance).

After completing the module in the Public Law specialisation, students will be able to independently deal with the specialist laws in energy law and identify relevant legal norms. Here, technical examples from other lectures are taken up and jointly assessed on the basis of the existing legal situation. They will also learn the sector-specific "state of the art" with examples from technical practice.

After completing the module in the specialisation Civil Law, students will be able to independently find the specialist laws and relevant standards relevant to them and solve legal issues in public procurement law, patent and trademark law and/or IT security law by working with the law. After completing the module, students are sensitised to the content of the lectures in order to be able to participate in public procurement procedures and are sufficiently qualified to ask the right questions in practice in the context of patent and trademark law procedures.

Literature

For the Public Law specialisation:

Legal texts:

- Energierecht, dtv. Beck, 17. Aufl. 2022

Textbooks:

- Kühling/Rasbach/Busch, Energierecht, 5. Aufl. 2022
- Baumgart, Energierecht, 2022

For the civil law specialisation:

Legal texts:

Public procurement law, dtv. Beck, 25th ed. 2022
Patent and design law, dtv. Beck, 16th ed. 2022
Competition law, trade mark law and antitrust law, dtv. Beck, 44th ed. 2022
Textbooks:
Naumann, Public Procurement Law, 2nd ed. 2022
Burgi, Public Procurement Law, 3rd ed. 2021
Samer, The new patent law, 2022
Ann, Patent Law, 8th ed. 2022
Hornung/Schallbruch (ed.) IT Security Law, 2020

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Related courses

Rules for the choice of courses

One of the two specialisations must be chosen (the same specialisation that was taken in the orientation must be chosen).

Public law:
Energy Law 1
Energy Law 2
Civil law: (2 of the 3 courses must be chosen)
IT security law
Patent and trade mark law
Public procurement law

Students on the Sustainable Energy Technology Master's programme can only choose the Public Law specialisation.

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Energy Law 1	2,0	Lecture	german
Energy Law 2	2,0	Lecture	german
IT Security Law	2,0	Lecture	german
Patent Law and Trademark Law	2,0	Lecture	german

Literature

- Patent- und Musterrecht (Verlag dtv-Beck)
- Wettbewerbsrecht und Kartellrecht (Verlag dtv-Beck)

Procurement Law	2,0	Lecture	german

Title	Specialisation Information Management		
Number	2222000010	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Susanne Robra-Bissantz
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements	The module “Orientation Service Information Systems” must be successfully completed.		
Recommended requirements	The prerequisite for the module is basic knowledge in economics.		
Expected performance/ Type of examination			
Course achievement			

Contents

Selected content which students apply in a practical project building on the knowledge gained in the “Orientation Service Information Systems”:

- Servicification
- Role of IT in Service Processes
- Service Dominant Logic
- Digital Products
- Value in Interaction
- E-Services
- Service Design
- Service Ecosystems and Platforms
- Digital Economy
- Digital Management
- Cooperation and Collaboration
- Digital Collaboration

Objective qualification

Students understand the strategic relevance of information systems for companies in terms of operational tasks, people and technology. They are familiar with concepts for internal and/or inter-company IT-supported co-operation as well as their objectives and strategies in the context of strategic management. A possible specialisation is the view of application systems as e-services. Students acquire the technical and methodological knowledge and skills to develop, design, critically reflect on, present and at least partially technically implement strategically relevant IT-supported innovations for companies. Through project work, they are familiarised with working in teams and with modern media and are therefore able to apply their knowledge, make it sustainably accessible for themselves and expand it independently.

Literature

The course materials are available in Stud.IP; further reading can also be found there.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	4,0	Project	german
	2,0	Colloquium	german

Title	Specialisation Management and Organisation Science		
Number	2223110	**Module version**	
Shorttext	WW-ORGF-11	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Dietrich von der Oelsnitz
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

Objective qualification

Literature

- North, K.: Wissensorientierte Unternehmensführung, 4. Aufl., Wiesbaden 2005.
- Oelsnitz, D. von der/Hahmann, M.: Wissensmanagement, Stuttgart 2003.
- Probst, G./Raub, S./Romhardt, K.: Wissen managen, 5. Auflage, Wiesbaden 2006.
- Oelsnitz, D. von der (2005): Kooperation: Entwicklung und Verknüpfung von Kernkompetenzen, in: Zentes, J./Swoboda, B./Morschett, D. (Hrsg.): Kooperationen, Allianzen und Netzwerke, 2. Aufl., Wiesbaden, S. 183-210.

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Networkmanagement	1,3	Lecture/Exercise	german

Literature

Wird in der Vorlesung bekannt gegeben.

Knowledge Management	2,8	Lecture/Exercise	german
Literature			
• North, K.: Wissensorientierte Unternehmensführung, 4. Aufl., Wiesbaden 2005. • Oelsnitz, D. von der/Hahmann, M.: Wissensmanagement, Stuttgart 2003. • Probst, G./Raub, S./Romhardt, K.: Wissen managen, 5. Auflage, Wiesbaden 2006.			

	1,0	Colloquium	german

Team and Network Management	4,0	Lecture/Exercise	german
Literature			
Wird in der Vorlesung bekannt gegeben.			

Title	Specialisation Economics		
Number	2212170	**Module version**	V2
Shorttext	WW-VWL-17	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Volkswirtschaftslehre
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Markus Ludwig
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (90 min) or 1 term paper or 1 oral exam (30 min) or 1 take-at-home exam		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination performance: 1 written exam (90 min) or 1 term paper or 1 oral exam (30 min) or 1 take-at-home exam		

Contents

Due to a constantly growing amount of data with a socio-economic background, professional fields with a quantitative focus are becoming increasingly important. Quantitative issues include the evaluation of economic policy measures, the forecasting of economic development and the prediction of consumer behaviour based on socio-demographic characteristics.

The course Empirical Economic Research 2 takes this development into account. In the course, students acquire advanced knowledge of theoretical principles in the field of regression modelling. In particular, students are familiarised with methods from the fields of panel data and time series analysis. Furthermore, students sharpen their analytical skills in the field of empirical economic research and train statistical thinking. The lecture is practically orientated and students learn how to apply the methods using case studies from current research. The accompanying exercise takes place in the PC pool and students practise the handling of data sets and the practical application of panel data and time series methods using statistical software.

Students have in-depth knowledge of the basic methods in the field of panel data and time series analysis. They develop an intuitive approach to processing and analysing these specific forms of data. Students can apply the methods they have learnt in their own research projects and continue to interpret and classify research results in this area independently.

Selected topics:

Pooled cross-sectional data: Difference-in-differences estimation method, experiments
Panel data: Fixed-effects estimation method
Time series: AR models, ARMA models
Time series: forecasts

Objective qualification

Students have in-depth knowledge of the structure, functioning and efficiency of different market forms and can determine government measures to improve market outcomes. They are able to apply previously learnt

economic thinking to the political system. Students specialise in one area of economics and become familiar with the latest research findings.
Literature
• Wooldridge, Jeffrey: Introductory Econometrics: A Modern Approach, Cengage Learning, aktuelle Auflage. • Stock, James, Watson, Mark: Introduction to Econometrics, Pearson/Addison Wesley, aktuelle Auflage. • Hill, R. Carter, Griffiths, William E., Lim, Guay C.: Principles of Econometrics, Wiley, aktuelle Auflage.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Empirical Economics 2	4,0	Lecture/Exercise	german
Literature			
• Wooldridge, Jeffrey: Introductory Econometrics: A Modern Approach, Cengage Learning, aktuelle Auflage • Stock, James, Watson, Mark: Introduction to Econometrics, Pearson/Addison Wesley, aktuelle Auflage • Hill, R. Carter, Griffiths, William E., Lim, Guay C.: Principles of Econometrics, Wiley, aktuelle Auflage.			

Title	Scientific Working - Seminar		
Number	2299820	**Module version**	
Shorttext	Wiwi-Seminare-Master	**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	2	**Institution**	Department Wirtschaftswissenschaften
Hours per Week / ECTS	6 / 8,0	**Module owner**	Studiendekan der Wirtschaftswissenschaften
Workload (h)	240		
Class attendance (h)	84	**Self studying (h)**	156
Compulsory requirements			
Expected performance/ Type of examination	Either 2 term papers (each worth 4 CP) or 1 term paper (worth 8 CP)		
Course achievement			

Contents
The content of the seminar depends on the topic to be dealt with.
Objective qualification
Independent familiarization, preparation and presentation of a topic. Learning key qualifications such as presentation techniques and rhetoric.
Literature
depending on the chosen course and the specific task

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Related courses
Rules for the choice of courses
The following assignments are possible: 1. two seminars with a scope of 4 CP or 2. one seminar with the scope of 8 CP or 3. a research project with a scope of 8 CP from the range of courses offered by the Department of Economics must be completed. The seminars must be selected in the chosen Master's specializations. As an additional requirement for financial and business mathematics, financial economics must be included. Please note that the completion of certain coursework (e.g. orientation, coursework for the specialization, etc.) may be expected in advance. Please contact the individual institutes for the exact conditions.
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**

Master-Seminar Economics 1	3,0	Seminar	german
Master-Seminar Management Control and Business Accounting	3,0	Seminar	german
Master-Seminar Finance	3,0	Seminar	german
Literature			
vergleiche Homepage des Lehrstuhls			
Master-Seminar Law	3,0	Seminar	german
Master-Seminar Decision Support	3,0	Seminar	english german
Literature			
themenabhängig			
	3,0	Seminar	german
Literature			
Wird in der Veranstaltung bekannt gegeben.			
Master-Seminar Services Management	3,0	Seminar	german
Literature			
Wird in der Veranstaltung bekannt gegeben.			
Master-Seminar Marketing	3,0	Seminar	german
Literature			
Die Literaturempfehlungen sind themenabhängig und werden in der Veranstaltung mitgeteilt.			
Master-Seminar Service Information Systems	3,0	Seminar	german
Master-Seminar Management and Organisation Science	3,0	Seminar	english german
Master-Seminar Data-Driven Enterprise	3,0	Seminar	german
Master-Seminar Decision Support	3,0	Seminar	english german
Literature			
themenabhängig			
Master-Seminar Business Ethics	3,0	Seminar	english german

Integrated Subject Area

Title	Construction Methods and Strategies		
Number	4321000	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Bauwirtschaft und Baubetrieb
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Patrick Schwerdtner
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written exam (120 min) or oral exam (20 min)		
Course achievement			

Contents

Methodical Approach for Construction Method Selection:
After introductory remarks on the importance of construction process decisions and relevant production factors, as well as ideas on the basics of risk management, various construction process engineering concepts of in-situ production are presented. In addition to equipment-intensive processes (including special civil engineering and demolition measures, including possibilities for reuse), labour-intensive processes in the shell and extension phases of construction and civil engineering are also covered. Building on this, options for pre-production (on-site/off-site) and automation will be presented, with particular emphasis on additive manufacturing (3D printing). Process comparisons will be carried out in different scenarios and their impact on production factors, resilience of the processes to framework conditions and other criteria (including occupational safety) will be discussed.

Construction Safety and Health:
Students will learn how statutory accident insurance works and basic aspects of health and safety at work. After an introduction to the organisation of health and safety at work, different regulations for different construction activities (excavation, earthworks, building construction) are presented. The handling of hazardous substances and the design of workplaces and traffic routes are also discussed. An introduction to risk assessment and the use of personal protective equipment is provided for practical application. On successful completion of the course, you will have the opportunity to take part in a multi-day course to become a health and safety coordinator (not part of a university course; limited number of participants).

Objective qualification

Students will gain in-depth knowledge of specific issues in construction process engineering. They know the underlying processes and principles as well as the resources required for their implementation. Of particular importance are methodological comparisons of construction method variants, taking into account relevant health and safety regulations and relevant technical risks. Students will be able to make engineering considerations and decisions in the planning of construction production, and then implement and control the processes operationally. Students will also be able to make links with other sustainability objectives (including the environmental impact of processes and the requirements of the circular economy) in order to make decisions on the basis of holistic considerations and to optimise processes in terms of the best possible resource efficiency (including the reuse/recycling of building materials). This also includes the possibility of

shifting construction processes to stationary (pre)production. Through intensive instruction in the fundamentals of occupational safety, students will acquire a sound knowledge of accident prevention and will be able to deal responsibly with related issues of liability and the organisation of construction processes.
Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Lecture	german

Title	Digitalization in the Operation and Valuation of Real Estate		
Number	3341000030	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Tanja Kessel
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Facility Management: 1 written exam (60 min.) Value Assessment of Real Estate: 1 written exam (60 min.)		
Course achievement			

Contents

In the lecture **Facility Management**, the focus is on the roles/functions, tasks/services and the operational organization form in the usage phase of real estate. In particular, digital processes, e.g., ticketing, fault reports, maintenance, are presented as part of a digital FM laboratory with in-depth insights into CAFM software and the resulting management tasks are derived.

In the lecture **Value Assessment of Real Estate**, the various methods of value assessment in Germany and internationally are presented and applied using case studies. The basics of real estate market-related analyses are also taught.

Objective qualification

In **Facility Management**, students acquire in-depth knowledge of operator responsibility, roles, functions and processes in the operating phase for different types of use of real estate.

In **Value Assessment of Real Estate**, students learn how to determine the market value of real estate using various calculation methods and are familiar with the parameters required for valuation.

Literature

Presentation slides of the lecture, exercises, bibliography

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language

	2,0	Lecture	german
	2,0	Block course	german

Title	Development and Realization of Real Estate		
Number	3341000010	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	2	**Institution**	
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Tanja Kessel
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Real Estate Project Development: 1 written exam (60 min.) Project Management in Construction: 1 oral exam+ (15 min.)		
Course achievement			

Contents

Decisions in real estate project development are the trigger for planning and construction measures and have a considerable influence on the subsequent phases through to operation and demolition by defining different objectives. In the lecture **Real Estate Project Development**, the areas of development, revitalization and redevelopment are discussed in the field of tension between economic efficiency, ecological sustainability and social/sociocultural compatibility. Based on the determination of requirements and basic principles, in-depth insights into project development processes and fields of action are provided and development calculations are carried out. The impact of real estate on the SDGs is deepened through insights into the circular economy and sustainability assessment.

The lecture **Project Management in Construction** shows the organizational, structural and methodological connections for successful project implementation. In addition to an effective client organization, various methods, concepts and tools for stakeholder and risk management, scheduling and cost planning and control as well as quality management are presented. While some of the students apply what they have learned in role plays, students of waterway engineering gain an in-depth insight into the processes and organization of the waterways and shipping administration as well as the technical and legal challenges of water transport construction projects.

Objective qualification

In the lecture **Real Estate Project Development**, students gain well-founded knowledge about real estate in the area of conflict between economy, ecology and society from the perspectives of the various stakeholders. They learn tools and methods to deal with opportunities and risks in this early planning phase and to arrive at a holistic and responsible decision.

In the lecture **Project Management in Construction**, students acquire in-depth knowledge of the initiation, management and completion of projects in construction. They are taught operational methods and tools with which a construction project can be implemented and completed in a goal-oriented manner from an organizational, legal, technical, economical and scheduling perspective.

Literature

Presentation slides of the lecture, exercises, bibliography

Remark

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german

Title	Financing and Sustainable Management of Real Estate		
Number	3341000020	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	2	**Institution**	
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Tanja Kessel
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Real Estate Management: 1 written exam (60 min.) ESG in Real Estate Practice: 1 written exam (60 min.)		
Course achievement			

Contents

The **Real Estate Management** lecture focuses on the roles, primary objectives and strategies of the real estate activities and investments of different portfolio holders. Operational instruments for investment decisions and the financing of real estate are presented and explained using case studies.

With the EU's Green Deal, real estate is subject to considerable influence from the financial sector in the areas of environmental, social and governance. This influence, the effects and correlations on the various life cycle phases of a property and on property valuation in the existing portfolio are presented to students in an in-depth analysis in the lecture **ESG in Real Estate Practice**.

Objective qualification

In the lecture **Real Estate Management**, students acquire in-depth knowledge of the sustainable management of real estate portfolios of different types of use and from the perspective of different portfolio holders. The focus is on questions of financing and investment decisions. For this, students acquire the skills to develop proposals for solutions and prepare decisions.

The aim of the **ESG in Real Estate Practice** lecture is to provide students with well-founded knowledge and strategies for implementing ESG criteria (environmental, social, governance) along the real estate life cycle.

Literature

Presentation slides of the lecture, exercises, bibliography

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
ESG in Real Estate Practice	2,0	Lecture	german

Title	Infrastructure Management		
Number	3341000000	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	2	**Institution**	
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Tanja Kessel
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Infrastructure and Project Financing: 1 written exam (60 min.) Management of Transportation Infrastructure Networks: 1 oral exam (15 min.)		
Course achievement			

Contents

The lecture **Infrastructure and Project Financing** focuses on the transfer of knowledge about operational instruments as well as the role and function of financing in the entire life cycle of infrastructure networks, especially road networks. The conflicting priorities between the economical and efficient use of taxpayers' money and the (ecological) sustainability of construction and maintenance measures are highlighted. Special attention is paid to the different incentive mechanisms of the actors and financing participants as well as the different public and private understanding of financing and sustainable action in the context of the normative framework.

In the lecture **Management of Transport Infrastructure Networks**, the connections between organizational and social structures as well as the influences of the various stakeholders on the orientation and implementation of network management tasks with a focus on transport infrastructure are shown. Based on this, various (ecological) sustainability and digitalization strategies of the three main modes of transport in maintenance management as well as methods and tools for application and evaluation are presented. Topics of the resilience of structures in climate change are discussed in the context of ecological sustainability assessment and the economical and efficient use of taxpayers' money.

Objective qualification

In the **Infrastructure and Project Financing** lecture, students learn about various financing structures in infrastructure management and are able to establish the role of financing in the life cycle and in the economic efficiency analysis of infrastructures. They acquire the skills to develop proposed solutions and prepare decisions.

In the lecture **Management of Transportation Infrastructure Networks**, students acquire in-depth knowledge of strategic management activities throughout the life cycle of transportation infrastructure networks. Students acquire the skills to develop a holistic decision-making basis for responsible engineering action in the utilization phase as well as in the feedback to other life cycle phases.

Literature

Presentation slides of the lecture, exercises, bibliography

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Block course	german
	2,0	Lecture	german

Title	Integrated Production Planning in Construction		
Number	4321070	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Bauwirtschaft und Baubetrieb
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Patrick Schwerdtner
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written exam (120 min) or oral exam (20 min)		
Course achievement			

Contents

Lean Construction Management:
After learning the basics of construction production planning, with a focus on scheduling and resource planning, students are introduced to the methods of lean (construction) management. The difficulties and trade-offs involved in planning and optimising construction production are illustrated, always taking into account the (sub)project objectives. Of particular importance are the project-specific influencing factors, which significantly determine the planned course of construction production and must be taken into account during planning. In this context, the special importance of dealing with interfaces is also made clear. Exercises and team-oriented workshops will be used to explain cycle planning and the last planner method using practical construction scenarios. The face-to-face meetings will take place on the Digital Construction Site to create a real connection and to discuss the possibilities and limitations of digital solutions.

Construction Logistics:
Based on the model of a 'mobile factory', construction logistics tasks in the context of supply, production and waste disposal in the different phases and stages of a construction project are first explained - including their significance from a sustainability perspective (including increasing resource efficiency), Based on this, various construction logistics models are presented (including the department store concept) Digital solutions based on the BIM methodology are also presented The application of various principles of lean construction management leads to an examination of relevant parameters for the planning and control of construction logistics This also includes the determination and visualisation of resource requirements based on an overlay of the quantity take-off and a schedule On this basis, the necessary construction site equipment is analysed in detail, including the dimensioning of the key elements The in-depth exercises are based on real scenarios from construction practice.

Objective qualification

Based on the philosophy and principles of Lean Construction, students will be able to carry out construction production planning taking into account construction logistics requirements. Students will have mastered the basics of scheduling and cycle planning and will be able to determine the resources required. To this end, students will be able to identify different requirements of construction processes and create a project breakdown structure as a basis for scheduling. In addition to the technological interdependencies to be considered, students will gain in-depth knowledge of the accompanying consideration of logistical constraints. By learning the conceptual principles of supply, production and disposal logistics, students will be able to plan and optimise construction production holistically and identify potential bottlenecks in the relevant production factors at an early stage. Furthermore, students will be able to assess the specific importance of sup-

ply chains in the supply of building materials and products to construction production and in reuse and recycling in the context of disposal. To this end, students will be familiar with relevant regulatory requirements and current solutions in the DIY market.
Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german

Title	Public Building Law		
Number	4318260	**Module version**	
Shorttext		**Language**	german
Frequency of offer	every term	**Teaching unit**	
Module duration	2	**Institution**	Institut für Verkehr und Stadtbauwesen
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Bernhard Friedrich
Workload (h)	180 h		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 Min.) or oral exam (approx. 30 Min.)		
Course achievement			

Contents

[Bauplanungsrecht(VÜ)]
- Fundamentals and objectives of building planning law
- Legal bases: BauGB, BauNVO, BauPlZVO
- Urban land use planning: stages and preparation procedures
- Privatization and security instruments in urban land use planning
- Admissibility of projects
- Consideration and protection of neighbors
- Secured development

[Bauordnungsrecht(VÜ)]
- Fundamentals and goals of the building code
- Legal bases
- Landesbauordnung
- Musterbauordnung
- Implementing ordinance
- special building regulations
- ancillary building regulations
- Types of procedures and approvals
- building documents and responsibilities
- material requirements in the building code
- Regulatory content of the building permit
- protection of neighbors
- ancillary building law
- monument protection law
- immission control law
- Law governing places of assembly
- Workplace law

Objective qualification

Students receive basic knowledge of public building law. This includes the teaching of basic knowledge of building planning law as well as building regulations and ancillary building law (including special regulations). The overarching goal is to teach the relevant sources of law and how to apply them to selected

examples. The students thus acquire the competence to comprehend and understanding basic legal system interrelationships in relation to public construction.
Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german

Title	Economic Assessment and Procurement of Construction Services		
Number	4321090	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Bauwirtschaft und Baubetrieb
Hours per Week / ECTS	6 / 6,0	**Module owner**	Prof. Dr. Patrick Schwerdtner
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Written exam (120 min) or oral exam (20 min) or Written exam (60 min) or oral exam (15 min) and Course Achievement (successfull participation simulation game)		
Course achievement			

Contents

Public Tender and Contract Award:
Starting with the service description as the link between architecture/planning/construction on the one hand and construction on the other, the importance of clear and complete tender documents is explained. After a brief overview of the procurement of design services, different procurement procedures (national and European) and the rules of legal protection for public procurement are explained from the perspective of the client and contractor for construction services, and a possible transferability to privately financed projects is discussed. Sustainability requirements for design and construction processes are also addressed. Considerations are also given on how to draft a contract that fully describes the performance objective and all the rights and obligations of the contracting parties.

BIM-based Acquisition of Construction Projects (Role-Playing Game): The interactive and hands-on course presents and practises the essential steps of a tendering process. Students are divided into several teams and compete as (virtual) construction companies for a construction contract. The preparation of a tender based on a given specification is supported by the Building Information Modelling (BIM) methodology, after the basics of the methodology and the necessary software have been presented in self-developed tutorials. The construction companies and their indicative bids are presented by the respective teams to the potential clients (IBBs) in face-to-face meetings. In a second face-to-face meeting, additional information has to be integrated and the binding offers have to be negotiated in terms of financial and legal conditions before the contract is awarded to the best construction company.

Objective qualification

Students will acquire in-depth knowledge of the design of tender processes and specifications by the client, and of cost estimation and pricing by the contractor. Students will be familiar with the objectives and methods of costing as a planning task, as well as cost and performance accounting under the responsibility of executing companies. Different forms of planner and contractor deployment and remuneration models are considered. This will enable students to differentiate between the planner's or project manager's perspective (cost planning) and the contractor's perspective (cost accounting) and to understand the specific characteristics of each project phase. Students will also be able to take into account the constraints and specifications for the implementation of public sector projects and the specific implications for the tendering and awarding process and the drafting of contracts. In this context, students will also learn about the opportunities and consequences of integrating specific environmental and social requirements, including the import-

ance of supply chains. Alternatively, students can either take the perspective of a construction company in a planning and role-playing exercise, and then use BIM methodology to actively accompany a procurement process in construction projects with regard to calculating the bid price and negotiating the legal framework.
Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture/Exercise	german
	2,0	Lecture/Exercise	german
	2,0	Lecture	german

Title	Organisation and Management of Construction and Business Processes		
Number	4321080	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Bauwirtschaft und Baubetrieb
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Patrick Schwerdtner
Workload (h)	180		
Class attendance (h)	84	**Self studying (h)**	96
Compulsory requirements			
Expected performance/ Type of examination	Written exam (60 min) or Exam (30 min)		
Course achievement			

Contents

Construction Business Management:
The course presents and practises the three levels of business management and explores them in depth in a variety of scenarios with current references. While normative management explains the development of a vision and mission as well as the development of a corporate culture and corresponding goals, strategic management deals with fundamental questions and methods of strategy development as well as strategic tools. Operational management focuses on organisation and process management. Finally, problem-solving methods are presented.

Construction Site Management:
The course focuses on the typical responsibilities and tasks of construction management from the perspective of a contractor. The topics covered are based on the phases of construction management activities. Firstly, there are the preparatory considerations with clarification of the performance target and the agreed remuneration, as well as the project team and other parties involved. This is followed by the start-up phase, which involves scheduling and the procurement of goods and services. During implementation, processes need to be monitored and controlled for quality, time and cost. In this context, lean construction management methods are also presented. In the event of changes, the handling of additional offers and agreements is shown - accompanied by explanations on communication and documentation.

Private Construction and Architectural Law:
Contractual agreements form the basis for the provision of services in the course of the implementation of construction projects. After an explanation of the main features of public construction law and private construction contracts, special features of general terms and conditions are presented. This is followed by a discussion of the contractor's right to remuneration, distinguishing between contracts governed by the German Civil Code (BGB) and contracts governed by the German Construction Contract Procedures (VOB/B). This distinction also applies to the treatment of warranty rights, with acceptance being of particular importance and therefore treated separately. As further aspects of contract design and implementation, security and penalty clauses are also dealt with separately.

Objective qualification

Upon completion of the module, students will be able to take on company or site-specific management tasks in technical, organisational and economic terms for simple and medium-sized projects. On the one hand, students will learn to differentiate between the different perspectives and responsibilities of the client and contractor in the management of construction projects. On the other hand, students are familiarised with

the different levels of construction management and learn how to use strategic tools and problem-solving methods. The structure of the courses takes into account the content previously developed in other modules, so that students have a particular systemic understanding. Alternatively, students will acquire legal skills for drafting and implementing contracts based on the provisions of the German Civil Code (BGB) and the German Construction Contract Procedures (VOB) for assessing the resulting rights and obligations or claims.
Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Lecture	german
	2,0	Lecture	german

Title	Systemic Principles of Construction Project Delivery		
Number	4321020	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	
Module duration	1	**Institution**	Institut für Bauwirtschaft und Baubetrieb
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Patrick Schwerdtner
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	Written Exam (120 min) or oral exam (20 min)		
Course achievement			

Contents

Developments and Mechanisms in the Construction:
Industry First, the characteristics of the construction market and construction production are explained and justified on the basis of the specific structures of the construction market. Responsibilities and interfaces are discussed in more detail on the basis of different roles, focusing on the respective contribution of different actors to the planning and implementation of construction production. In this context, the role of the public sector in the implementation of construction projects as a commissioning and licensing authority is also examined in more detail. The specific current and future challenges of the construction industry will be addressed in particular through selected aspects of the three dimensions of sustainability and the philosophy of lean management. Based on this, the basic requirements for the planning and execution process will be derived from contractual and regulatory constraints as a starting point for further courses and modules.

Project Delivery Systems:
At the start of a project, in the initiation phase, essential constraints and requirements are defined. Building on this, the German construction market offers various guiding principles for project management. These are presented with their specific characteristics - supplemented by insights into international models - and examined from different perspectives. From the unit-price contract with sole proprietors to the general contractor and partnering model to integrated project management, responsibilities, rights and obligations are defined and the appropriate projects or project types are assessed. The focus is on assessing opportunities and risks through early integration of execution expertise into the planning process and the importance of collaboration between project stakeholders. Particular attention is paid to the remuneration model, risk allocation and dispute resolution procedures.

Objective qualification

Students will have an in-depth knowledge of the structures of the construction industry and the organisation of planning and execution processes. They will be familiar with the basic requirements for the implementation of construction projects based on the demands of particular interests and social or regulatory expectations for the sustainability of construction production. Particular attention will be paid to explaining the interaction of the various participants against the background of their respective responsibilities for the preparation and implementation of the construction production process, so that students are enabled to think in their respective roles and to recognise the emerging interfaces. In this context, students will be able to identify suitable models of project management in construction from different perspectives and evaluate their impact on responsibilities and opportunities for efficient and goal-oriented implementation of the planning

and execution phases. Due to the range of models presented, students will be familiar with both conventional models and alternative models of project management based on increased levels of collaboration.
Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Lecture	german

Key Qualifications

Title	Key Qualifications		
Number	4398540	**Module version**	
Shorttext	BAU-STD5-5	**Language**	german
Frequency of offer		**Teaching unit**	Fakultät Architektur, Bauingenieurwesen und Umweltwissenschaften
Module duration	1	**Institution**	
Hours per Week / ECTS	3 / 3,0	**Module owner**	
Workload (h)			
Class attendance (h)	42	**Self studying (h)**	138
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Study Project

Title	Study Project		
Number	4310800	**Module version**	
Shorttext	BAU-STD-38	**Language**	german
Frequency of offer	every term	**Teaching unit**	Fakultät Architektur, Bauingenieurwesen und Umweltwissenschaften
Module duration	1	**Institution**	
Hours per Week / ECTS	0 / 10,0	**Module owner**	
Workload (h)	300		
Class attendance (h)	1	**Self studying (h)**	300
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**

Master`s Thesis

Title	Master`s Thesis		
Number	4399370	**Module version**	
Shorttext	BAU-STD-37	**Language**	german
Frequency of offer	every term	**Teaching unit**	Fakultät Architektur, Bauingenieurwesen und Umweltwissenschaften
Module duration		**Institution**	
Hours per Week / ECTS	0 / 20,0	**Module owner**	
Workload (h)	600		
Class attendance (h)		**Self studying (h)**	600
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			
abhängig von der konkreten Aufgabenstellung			

↑

Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**