HOCHSCHULE MAINZ

Courses for Incoming Students

International Civil Engineering

UNIVERSITY OF APPLIED SCIENCES MAINZ - SCHOOL OF ENGINEERING (AS OF FEBRUARY 2026)

HOCHSCHULE MAINZ

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HOCHSCHULE MAINZ

1st year of study

Physics

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
111 PH	4	1 Semester	1st Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
120	60	60

Language	Planned group size	Compulsory or elective
English	24	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Dr. Arda Öcal	Physics

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- describe natural processes and mechanical material properties mathematically.
- solve physics problems using Newtonian mechanics.
- employ conservation laws simplify mechanical problems.

2. Contents

- Kinematics: coordinates and vectors, velocity and acceleration, superposition of motions, translational and rotational motion
- Dynamics: newton's laws, mechanical forces, equilibrium of forces and moments, stress and pressure, hooke's law and elastic oscillations, mechanical work, energy, and power, law of conservation of energy, momentum and conservation of momentum law, rotational motion, angular momentum, and conservation of angular momentum
- Physical material properties: density, bulk density, bulk density, stress, pressure, shear stress, stress-strain diagram, Young's modulus, shear modulus G, transverse strain, Poisson's ratio, relationship between elastic constants

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

none

6. Type and scope of examination

100% written exam (120 min)

Prerequisites for participating in final exam

none

7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** Lecture Notes in OLAT 10 problem sheets with solutions on OLAT D. Giancolli, Physics for Scientists and Engineers, Pearson, Boston, 2023
11.	**Other information** This module is compulsory for degree seeking students.
12.	**Last edited** 2/5/2026

Building Construction

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
112 BC	6	1	1st Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	60	120

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr.-Ing. Kay-Uwe Schober	Building Construction

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- comprehend load-bearing elements for building structures and to design buildings using both planar and three-dimensional support structures

2. Contents

- From design to model: actions and requirements, forces and loads, modeling of structures
- Structural systems: plane structural systems, spatial structural systems, spatial bracing and stability, design actions on structures
- Safety concept in civil engineering: the structure of the verification concept, verification of ultimate and serviceability limit state, the design value of actions. simplified combination rule for building construction
- Fundamentals of technical representation: dimensional tolerances, module order, and dimensional order, structural drawings, scale levels, drawing sizes, plan content and title block, views, sectional planes, dimensioning and labelling
- Building materials: classification and characteristics of building materials, masonry, concrete, binders, steel, wood and wood-based materials, glass, plastics, fundamentals of building physics (heat and moisture protection, structural fire protection, sound insulation)
- Interaction between structure and ground: foundations and excavations, foundation underpinning and dewatering, working spaces
- Structural elements: walls, ceilings, floors, roofs, stairs

3. Teaching methods

Online lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

none

6.	**Type and scope of examination** 80% Written Exam 90 min and 20% assignment **Prerequisites for participating in final exam** none
7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/5/2026

Traffic Infrastructure

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
121 TI	4	1	2nd Semester	summer semester

Workload (total) (h)	Contact time (h)	Self-study (h)
120	60	60

Language	Planned group size	Compulsory or elective
English	24	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr.-Ing. Rainer Hess	Traffic Infrastructure

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- hold basic knowledge about planning processes and road design.
- design highways and motorways in horizontal, vertical, and 3D alignment as well as cross sections in detail and to perform the related calculations (axis and gradients)
- design interchanges and intersections.
- analyze traffic planning tasks and develop traffic concepts.
- prepare and perform each step to fulfill the necessary verifications in the
- dimensioning process for road traffic infrastructures

2. Contents

- Field of Road Design: planning principles and processes, network design, basics in driving dynamics, horizontal and vertical alignment und design of cross-sections, 3D alignment, interchange and intersection design,
- Field of Traffic Planning: planning methodology, traffic census, traffic count, traffic prognosis, principles of traffic flow, capacity and level of service of roads, design according to the German HBS

3. Teaching methods

Lecture with integrated exercises

4. Participation requirements

none

5. Regulations on attendance

none

6. Type and scope of examination

Written exam (120 min) and project work

Prerequisites for participating in final exam

none

7. Requirements for the awarding of credit points (ECTS)

Successful examination performance

8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** This module is compulsory for degree seeking students.
12.	**Last edited** 2/5/2026

Building Physics

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
122 BP	5	1 Semester	2nd Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
150	60	90

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr. Alfons Buchmann	Building Physics

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- solve problems in building physics (proven by examination) with the help of standardized
- calculation methods.
- determine and evaluate the sound, thermal and moisture properties of a building
- component and the entire building structure

2. Contents

- Sound insulation: fundamentals of sound insulation, vibrations, sound waves, acoustic quantities calculation of sound levels, basics of indoor acoustics, Sabine's formula, structural sound insulation, airborne sound insulation and impact sound insulation, acoustic properties of building components, sound propagation outdoors, point and line sound sources, eigenfrequencies of plates, coincidence effect, double shell resonance and double shell sound protection
- Thermal insulation: basics of thermal insulation, heat transfer
- Thermal insulation of individual components, use of solar energy, energy saving regulations, Annual energy demand, evaluation of thermal insulation measures
- Humidity protection: fundamentals of moisture protection, ideal gas law, behavior of ideal gases and of vapors, condensation on surfaces, indoor humidity balance, water vapor diffusion, condensation inside the building component, glaser diagram

3. Teaching methods

Lecture with integrated exercises

4. Participation requirements

none

5. Regulations on attendance

none

6. Type and scope of examination

100% Written Exam 120 min

Prerequisites for participation in the final exam

none

7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement
9.	**Importance of the grade for the final grade** According to the learning agreement
10.	**Literature references** Building Physics, Hans-Peter Leimer, Fachbuchverlag Leipzig, 2016 Zenger/Buchmann: Schallschutz Zenger/Buchmann: Wärme- und Feuchtelehre Lutz, Jenisch, Klopfer, Freymuth, Krampf, Lehrbuch der Bauphysik, Teubner Verlag
11.	**Other information** This module is mandatory for degree seeking students.
12.	**Last edited** 2/4/2026

2nd year of study

Construction Project Management				
Identification number 211 CP	**ECTS credits** 5	**Duration of the module** 1 Semester	**Intended study semester** 3rd Semester	**Frequency of the course** each semester
Workload (total) (h) 150		**Contact time (h)** 60	**Self-study (h)** 90	
Language English		**Planned group size** 24	**Compulsory or elective** elective module	
Module coordinator Prof. Dr. Ing. Christina Kunkel		**Course(s) (with focus/module group if applicable)** Construction Project Management		

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- know the essential site equipment elements, basic calculation procedures for determining equipment performance and typical construction
- Know typical procedural techniques in building construction and civil engineering,
- Understand and apply the basics of construction cost estimation,
- Identify and understand essential elements of construction site setup under the conditions of occupational safety, environmental protection, and sustainability for a careful and responsible use of resources

2. Contents

- Basic elements of construction: Occupational safety, work preparation, equipment: types, costs, services, list of construction equipment, Material types
- Earthworks methods
- Methods of excavation support and special civil engineering
- Concrete and reinforced concrete construction methods, e.g.: Formwork and scaffolding, Reinforcement work
- Steel construction methods: Assembly technologies, Joining Technologies
- Methods of demolition: Equipment and tools
- The overall structure of the construction site: Site infrastructure and site logistics, planning and allocation of site equipment elements.
- Introduction to Building Information Modelling – BIM

3. Teaching methods

Lecture with integrated exercises

4. Participation requirements

Desirable: Passed modules Mathematics 1 and Mathematics 2

5. Regulations on attendance

none

6.	**Type and scope of examination** Written Exam 60 minutes **Prerequisites for participating in final exam** none
7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement
9.	**Importance of the grade for the final grade** According to the learning agreement
10.	**Literature references** These will be announced during the lecture
11.	**Other information** This module is compulsory for degree seeking students.
12.	**Last edited** 2/4/2026

Urban Planning

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
212 UP	5	1 Semester	3rd Semester	winter semester

Workload (total) (h)	Contact time (h)	Self-study (h)
150	60	90

Language	Planned group size	Compulsory or elective
English	20	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr.-Ing. Rainer Hess	Urban Planning

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- to develop design and layout concepts for urban traffic infrastructures (road space, balance of functions, and connection of traffic modes).
- to design pavement structures and choose suitable materials for each layer.
- to design the basic knowledge of the system components of railroads and their functions.
- to asset with the structural features of the rail body and the track as well as to design track track designs and constructions in terms of their functional efficiency and serviceability.

2. Contents

- Field of Urban Planning: The layout of urban traffic infrastructures, basics of geometric road design, design of roads, junctions, and connections in the urban context, design of public squares considering different functions, specific surface structures and materials, integration of sustainable traffic modes
- Field of Road Pavements: Principles of pavement structures, road materials and layers, german quality assurance concept, design of road pavements according to the German RStO, pavement monitoring concepts
- Field of Railroad Systems: Development, legal bases, and organization of railroads, railway crossings (road/rail), fundamentals of the wheel/rail system, rails and track loading, superstructure design and maintenance, track curves, alignment, and switches, cross-section design, earthworks and engineering structures for railroads
- Other at a glance (power supply, signals, control and safety technology, vehicle dynamics, railroad operation, station facilities)

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

The module Geotechnics 1 should have already been taken.

5. Regulations on attendance

none

6.	**Type and scope of examination** Written Final Exam (120 minutes) **Prerequisites for participating in final exam** none
7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement
9.	**Importance of the grade for the final grade** According to the learning agreement
10.	**Literature references** Richtlinien für die Anlage von Stadtstraßen (RASt), FGSV Nr. 200, FGSV-Verlag, Köln Richtlinien für die Standardisierung des Oberbaus von Verkehrsflächen (RStO), FGSV Nr. 499, FGSV-Verlag, Köln
11.	**Other information** This module is compulsory for degree seeking students.
12.	**Last edited** 2/4/2026

Solid Construction I

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
213 SCI	5	1 Semester	3rd Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
150	60	90

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr.-Ing. Jochen Kliver	Solid Construction I

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- know the specific properties of the composite material reinforced concrete and the
- applications derived from them
- know the basic design procedures for the verifications of load-bearing capacity,
- serviceability, and durability and can apply them to practical examples.
- be able to detail reinforced concrete components constructively

2. Contents

- Fundamentals of the composite material reinforced concrete.
- Design principles with the inclusion of durability.
- Design methods for verifying the structural safety of reinforced concrete components
- (bending design, shear force design)
- System assumption and internal force determination for design in reinforced concrete
- structures
- Reinforcement design
- Drawing representation of reinforced concrete structures

3. Teaching methods

Lecture with integrated exercises

4. Participation requirements

none

5. Regulations on attendance

none

6. Type and scope of examination

100% Written Exam 120 min

Prerequisites for participating in final exam

none

7. Requirements for the awarding of credit points (ECTS)

	Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement
9.	**Importance of the grade for the final grade** According to the learning agreement
10.	**Literature references** These will be announced during the lecture
11.	**Other information** This module is compulsory for degree seeking students.
12.	**Last edited** 2/4/2026

International Project Management

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
221 IP	5	1 Semester	4th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
150	60	90

Language	Planned group size	Compulsory or elective
English	20	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr. Ing. Christina Kunkel	International Project Management

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- understand and analyze project management techniques as well as broader management issues.
- assess the contractual, economic and social impacts of International Projects during their life cycle.
- comprehend the different stages of a project (project initiation, planning, and execution) in the context of International civil and construction engineering.

2. Contents

- Fundamentals of Project management: Project management standards and methods
- Project organization: structures, processes
- Project Organization: Goals and structuring, Structural and process organization, Information, communication, documentation, Management systems, and tools Time planning
- Project planning
- Cost Management: Cost determination, Cost controlling
- Schedule Management: Schedules and their hierarchies, Forms of presentation, Creation of schedules, Deadline controlling.
- Project Control & Audit: Contract relationships and types of contracts, Project execution forms, Construction contracts
- New tools and methods: Building Information Modeling and Agile Project Management

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

none

6. Type and scope of examination

Written Exam 60 minutes

Prerequisites for participating in final exam

none

7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement
9.	**Importance of the grade for the final grade** According to the learning agreement
10.	**Literature references** These will be announced during the lecture
11.	**Other information** This module is compulsory for degree seeking students.
12.	**Last edited** 2/4/2026

Steel Construction

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
222 SC	5	1 Semester	4th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
150	60	90

Language	Planned group size	Compulsory or elective
English	20	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
M. Eng. Christian Müller	Steel Construction

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- develop, evaluate, select and calculate regular steel structures.
- use the Eurocode methods and have the required background and knowledge base in steel contruction.
- identify and justify the advantages and disadvantages of different design solutions

2. Contents

- Steel construction in history
- Material properties of steel: material constants, fabrication and constitutive law
- Elastic and plastic material behavior
- Basics of the second order theory and the theory of stability of elastic and rigid beams for different support conditions
- Basics of the torsional buckling of beams
- Code calculation of beams by using first and second order theory beyond the ultimate and serviceability limit states
- Basics auf bolts and weldings
- Capacity of flexible bolted and welded connections
- Construction concepts of steelwork connections
- Steel construction bracings and its structural design

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

The modules Technical Mechanics 1 and 2 and Structural Analysis 1 should already have been taken.

5. Regulations on attendance

none

6. Type and scope of examination

Written Final Exam (120 minutes)

Prerequisites for participating in final exam

	none
7.	**Requirements for the awarding of credit points (ECTS)** Passed exam Steel Construction
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement
9.	**Importance of the grade for the final grade** According to the learning agreement
10.	**Literature references** Stahlbau-Praxis nach Eurocode 3: Band 1 und Band 2, Gerd Wagenknecht, Bauwerk BBB Beuth, current edition Stahlbau kompakt, Rolf Kindmann et al., Stahleisen-Verlag, current edition Schneider - Bautabellen für Ingenieure, Bundesanzeiger Verlag, current edition
11.	**Other information** This module is compulsory for degree seeking students.
12.	**Last edited** 2/4/2026

Solid Construction II

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
223 SCII	5	1 Semester	4th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
150	60	90

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr.-Ing. Jochen Kliver	Solid Construction II

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- carry out the design and construction of reinforced concrete components using practical examples (e.g., uniaxially tensioned slabs, beams, columns, and foundation components).
- apply the serviceability checks (e.g., deflection limitation and crack width limitation).
- apply the design procedures and extended verifications for resource optimization in a meaningful way.

2. Contents

- Supplementary verifications in the ultimate limit state of reinforced concrete components.
- Optimization of reinforcement: tension and shear force cover line.
- Design of components subjected to compressive loads
- Design of foundation components
- Serviceability limit state design: deflection limit, crack width design
- Complex verifications for resource conservation
- Drawing representation of reinforced concrete structures

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

The modules Technical Mechanics 1 and 2 should already have been taken, preferably passed.

5. Regulations on attendance

none

6. Type and scope of examination

Written examination in the form of a final exam (120 minutes)

Prerequisites for participating in final exam

none

7. Requirements for the awarding of credit points (ECTS)

Successful examination and project performance.

8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** This module is compulsory for degree seeking students.
12.	**Last edited** 2/4/2026

Railway Engineering

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
224 RE	6	1 Semester	4th Semester	summer semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	30	150

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr. Alfons Buchmann	Railway Engineering

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- have basic knowledge of the system components of railroads and their functions.
- familiar with the structural features of the rail body and the track and be able to assess track designs and constructions in terms of their functional efficiency and serviceability

2. Contents

- Fundamentals of the wheel-rail system: rail guidance principle, rail-wheel contact interaction, sinusoidal wheelset motion
- Force on tracks: vertical, horizontal, longitudinal forces, moving load dynamics, Prud' homme derailment criterion
- Track design: track elasticity and load distribution, rail bending curve, Winkler's model (beam on an elastic foundation), Zimmermann's model
- Driving dynamics: Z-v diagrams, driving resistances, superelevation in curves, switch radii and limiting velocity criteria
- Environmental advantages of railway systems: land use, energy consumption, CO2 emissions, airborne sound and groundborne vibration emissions, capacity

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

none

6. Type and scope of examination

Group project presentation and written exam (120 min)

Prerequisites for participating in final exam

none

7. Requirements for the awarding of credit points (ECTS)

Successful examination performance

8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

Sustainable Built Environment

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
225 SB	6	1 Semester	4th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	60	120

Language	Planned group size	Compulsory or elective
English	20	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr. Alfons Buchmann	Sustainable Built Environment

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- understand the importance of sustainability for the environment.
- identify the potential for sustainable construction operations in civil engineering.
- assess the carbon footprint of buildings and infrastructure.
- assess sustainable materials based on their mechanical properties.
- offer design and construction solutions to achieve sustainable development goals.
- work within an international team for a joint project

2. Contents

- Sustainability concept
- Systems-oriented thinking
- Carbon footprints, energy and water considerations
- Technology in building with sustainable materials (bamboo, clay, and wood)
- How to research material beyond approval limits
- How to work transdisciplinary in another language
- Collaborative online international learning (COIL) projects with partner universities

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

none

6. Type and scope of examination

A group project presentation, research report, written exam (120 min)

Prerequisites for participating in final exam

none

7. Requirements for the awarding of credit points (ECTS)

	passed exam
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** Lecture Notes in OLAT
11.	**Other information** The ECTS gained through this course will count towards the practical project and overall score for degree seeking ICE students.
12.	**Last edited** 2/4/2026

3rd year of study

Study Skills				
Identification number 311 SK	**ECTS credits** 5	**Duration of the module** 1 Semester	**Intended study semester** 5th Semester	**Frequency of the course** each semester
Workload (total) (h) 150		**Contact time (h)** 30	**Self-study (h)** 120	
Language English		**Planned group size** 12	**Compulsory or elective** elective module	
Module coordinator Dr. Arda Öcal Prof. Dr. Alfons Buchmann		**Course(s) (with focus/module group if applicable)** Study Skills		

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- understand the basics of scientific research.
- learn the steps of research paper preparation.
- compare and understand the different citation approaches.
- perform the literature survey using various citation databases.
- analyse, evaluate and present their research findings.

2. Contents

- Introduction of scientific work and research methodology
- Types of research methods
- Ethics and plagiarism concepts
- Literature survey
- Citation techniques and implementations
- Presentation of research findings
- Manuscript preparations

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

none

6. Type and scope of examination

A research report and presentation

Prerequisites for participating in final exam

none

7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

Introduction to Hydrology

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
312 IH	6	1 Semester	5th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	60	120

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr.-Ing. Stephan Mai	Introduction to Hydrology

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- understand the importance of engineering hydrology.
- be familiar with the different phases of the earth's water and associated processes.
- understand the concepts of surface and groundwater hydrology.
- use topographical maps to perform fundamental hydrological analysis.
- use and analyze hydrological data for the real-world engineering problems

2. Contents

- Introduction and scope of Hydrology
- Hydrologic cycle
- Hydrological data sources, measurements, and monitoring approaches
- Surface water hydrology; runoff and catchment, hydrographs, hydrographs routing, and reservoir panning.
- Groundwater hydrology; groundwater, wells, and aquifers

3. Teaching methods

Lecture with integrated classroom exercises

4. Participation requirements

none

5. Regulations on attendance

none

6. Type and scope of examination

Written examination in the form of a final exam (120 min)

Prerequisites for participating in final exam

none

7. Requirements for the awarding of credit points (ECTS)

Successful examination.

8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

Reinforced Concrete Design

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
313 RC	6	1 Semester	5th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	60	120

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr.-Ing. Jochen Kliver	Reinforced Concrete Design

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- know the specific properties of the composite material reinforced concrete and the applications derived from them.
- know the basic design procedures for the verifications of load-bearing capacity, serviceability, and durability and can apply them to practical examples.
- detail reinforced concrete components constructively.

2. Contents

- Fundamentals of the composite material reinforced concrete.
- Design principles with the inclusion of durability.
- Design methods for verifying the structural safety of reinforced concrete components (bending design, shear force design)
- System assumption and internal force determination for design in reinforced concrete structures
- Reinforcement design
- Drawing representation of reinforced concrete structures

3. Teaching methods

Lecture with integrated classroom exercises

4. Participation requirements

The modules Technical Mechanics 1 and 2 should already have been taken, preferably passed. PL in Technical Mechanics 1 and 2

5. Regulations on attendance

none

6. Type and scope of examination

Written examination in the form of a final exam (120 min)

Prerequisites for participating in final exam

none

7. Requirements for the awarding of credit points (ECTS)

	Successful examination and project performance.
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

Geotechnical Engineering

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
314 GE	6	1 Semester	5th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	60	120

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Dr. Arda Öcal	Geotechnical Engineering

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- understand the essential characteristics and phase relationships of soil.
- differentiate and classify the various types of soils.
- calculate total, effective, and pore water pressures under different conditions of loading and underground water.
- understand the idea behind the compaction process and solve related problems.
- comprehend the water flow theory in soils and solve corresponding one- and two-dimensional seepage problems.
- calculate the consolidation settlement of soils.
- evaluate the shear strength properties of soils for drained and undrained cases.
- identify the laboratory experiments to investigate the strength properties of soils.
- Calculate the active and passive lateral earth pressures.
- identify the different types of landslides and perform stability analysis.

2. Contents

- General overview of geotechnical engineering
- Index properties, classification, and phase relations of the soil mass
- Concept of total and effective stresses in soils
- Compaction of soils
- Permeability and seepage in soils
- Consolidation of soils
- Lateral earth pressure concepts
- Shear strength of soils
- Stability of slopes

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

	none
6.	**Type and scope of examination** Final exam (120 min) and a project with a presentation **Prerequisites for participating in final exam** none
7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

Geographical Information Systems

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
315 GI	6	1 Semester	5th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	60	120

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Dr. Arda Öcal	Geographical Information Systems

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- understand the basics of GIS and its components.
- comprehend the map generation processes, including projections and coordinate systems.
- identify the use of GPS and UAVs in engineering implementations.
- Create and update a geodatabase.
- perform queries in the geodatabase.
- perform geospatial analysis with the vector and raster data.
- produce GIS-based solutions to engineering problems that require geospatial analysis.
- use QGIS software.

2. Contents

- Definition and components of Geographical Information Systems (GIS)
- Applications of GIS in engineering
- Map projections and coordinate systems
- Global Positioning System (GPS)
- Data acquisition with unmanned air vehicles (UAVs)
- Geospatial data types and their basic properties
- Geospatial database systems
- Visualization of spatial data
- Spatial data query and analysis
- Geospatial data analysis
- Application of an open-source GIS software QGIS

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

none

6.	**Type and scope of examination** Final Exam (120 min), project, and computer exercises **Prerequisites for participating in final exam** none
7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

Internship

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
321 IN	6 or 12	1 Semester	6th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180 or 360	120 or 240	20 or 40

Language	Planned group size	Compulsory or elective
English	0	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr. Alfons Buchmann	Internship

1. Qualification goals/ competences/ learning outcomes

During the internship, students acquire knowledge and skills of professional practice. This will contribute to their understanding of technical, economic, social, and legal interrelationships in building operation and construction.

2. Contents

- variable

3. Teaching methods

variable

4. Participation requirements

A study abroad period of two semesters is required. For organizational reasons, the internship can be completed in the second semester.

5. Regulations on attendance

none

6. Type and scope of examination

Written report

Prerequisites for participating in final exam

none

7. Requirements for the awarding of credit points (ECTS)

Contract with company/ accepted report

8. Applicability of the module (in other degree programmes)

Bachelor's degree programmes in Civil Engineering according to the learning agreement.

9. Importance of the grade for the final grade

According to the learning agreement.

10. Literature references

	none
11.	**Other information** none
12.	**Last edited** 2/4/2026

Facility Management

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
322 FM	5	1 Semester	6th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
150	60	90

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr.-Ing. Benjamin Wolf-Zdekauer Prof. Dr. Nadja Bishara	Facility Management

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- cognizant of the planning process involved in facility management;
- able to develop an Operation Plan including cost, schedule, and resources.

2. Contents

- Applied Facilities Management Introduction
- Building Services Space and Weight
- Cooling, Heating, and Ventilation Loads
- Building Services Design (Elec & Water)
- Operational plans
- Maintenance planning
- Repair Planning
- Work control strategies
- Occupant support and customer service
- Regulatory environment
- Indoor environmental health
- Energy management
- Trends in sustainable (green') building design, operation, and maintenance.

3. Teaching methods

Lecture with integrated classroom exercises

4. Participation requirements

none

5. Regulations on attendance

none

6.	**Type and scope of examination** Written examination in the form of a final exam (120 min) and a project **Prerequisites for participating in final exam** none
7.	**Requirements for the awarding of credit points (ECTS)** Successful examination and project performance.
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

Foundations and Earth Structures

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
323 FE	6	1 Semester	6th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	60	120

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Dr. Arda Öcal	Foundations and Earth Structures

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- understand the basic concepts in foundations and earth structures.
- be familiar with the concept of limit state design and implementation of Eurocode to the design instances.
- comprehend the different types of site investigation techniques and analyze the data collected from the field.
- analyze and design retaining walls, shallow and deep foundations.
- understand the importance of the groundwater concept and methods utilized to control groundwater.
- evaluate the stability of slopes and understand the basics of the stabilization structures.

2. Contents

- General overview of foundations and earth structures
- Limit State Design
- Introduction to Eurocodes
- Site investigations and soil testing
- Lateral earth pressure concepts
- Retaining walls and earth structures
- Shallow & Deep Foundations
- Groundwater Control
- Stability of slopes

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

Students who are taking this course must have passed the soil mechanics (or geotechnical engineering) course

6.	**Type and scope of examination** Midterm (45 min) and Final Exam (120 min) **Prerequisites for participating in final exam** none
7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

Bachelor´s Thesis

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
324 BT	12	12 weeks	6th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
360	0	360

Language	Planned group size	Compulsory or elective
English	0	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr. Alfons Buchmann	Bachelor´s Thesis

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- In a bachelor's thesis students demonstrate their ability to work independently on a practical problem using scientific methods and to present their results in an understandable and coherent fashion.

2. Contents

- Students carry out a research project under supervision in any area of Civil Engineering. A supervisor will outline the main steps of the research project and students will carry out the actual research work. Regular follow-up meetings will monitor students' work progress.

3. Teaching methods

variable

4. Participation requirements

Participation depends on the individual learning agreement of the student.

5. Regulations on attendance

none

6. Type and scope of examination

A research report and presentation

Prerequisites for participating in final exam

none

7. Requirements for the awarding of credit points (ECTS)

Passed exam

8. Applicability of the module (in other degree programmes)

Bachelor's degree programmes in Civil Engineering according to the learning agreement.

9. Importance of the grade for the final grade

	According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

4th year of study

Operations Research

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
411 OR	6	1 Semester	7. Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	60	120

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr. Alfons Buchmann	Operations Research

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- apply system theoretical methods for the analysis and solution of complex technical tasks.
- apply the methods of sensitivity analysis, optimization, graph theory, and game theory to concrete practical problems.

2. Contents

- Systemic thinking (methods): working aids for systemic thinking (sensitivity analysis), criteria matrix, cross impact matrix and consensus matrix, effect graph structure and sub-scenarios, simulations and policy tests, applications and examples
- Optimizing systems: from the real world to the plan, analytical methods for solving optimization problems, optimization problems with constraints, linear Optimization, the simplex method with application examples, the Lagrange multiplier method
- Graph theoretical methods and their applications: system structure and graphs, eulerian and Hamiltonian graphs, traveling Salesman Problem, Kruskal and Greedy Algorithms, the Shortest Path and Dijkstra's Algorithm, chinese Postman Problem and solution methods, assignment problems, matchings and perfect matchings, vertex colouring and conflict graphs
- Game theory: matrix games and their applications, pure and mixed strategies, formulation as a linear optimisation problem, approximation methods, queueing theory
- Practical lectures by guest lecturers

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

none

6.	**Type and scope of examination** Written Exam 120 min **Prerequisites for participating in final exam** none
7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

Optimization in Civil Engineering

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
412 OC	6	1 Semester	7. Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	60	120

Language	Planned group size	Compulsory or elective
English	12	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Dr. Arda Öcal Prof. Dr. Alfons Buchmann	Optimization in Civil Engineering

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- understand the optimization concept and its importance in civil engineering.
- learn different optimization algorithms and their implementations for engineering problems that have different characteristics.
- gain the ability to construct mathematical formulations and solution steps for the engineering optimization problems.
- acquire programming abilities in Python language and develop their computer codes to solve optimization problems.

2. Contents

- Introduction to the “optimization” concept in civil engineering and current applications in different sub-branches.
- Critical aspects of optimum design for engineering structures
- Size, shape, and topology optimizations
- Conventional and unconventional optimization methods
- Constrained and unconstrained optimizations
- Utilization of Excel solver and Python programming language in solving the optimization problems

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

Basic understanding of computer programming and familiarity with Microsoft Excel

5. Regulations on attendance

none

6. Type and scope of examination

Final Exam (120 min), assignments, and computer exercises

Prerequisites for participating in final exam

none

7.	**Requirements for the awarding of credit points (ECTS)** Successful examination performance
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026

Planning and Building in the Era of Climate Change and Digitalization

Identification number	ECTS credits	Duration of the module	Intended study semester	Frequency of the course
413 PB	6	1 Semester	7th Semester	each semester

Workload (total) (h)	Contact time (h)	Self-study (h)
180	60	120

Language	Planned group size	Compulsory or elective
English	24	elective module

Module coordinator	Course(s) (with focus/module group if applicable)
Prof. Dr. Alfons Buchmann	Planning and Building in the Era of Climate Change and Digitalization

1. Qualification goals/ competences/ learning outcomes

After completing the module, students will be able to:

- develop sustainable solutions in the building sector.
- employ different IT tools to find more sustainable solutions.
- collaborate across different disciplines and between different nationalities.

Furthermore, students will improve their communication skills and heighten their awareness of social responsibility

2. Contents

- From point cloud to surface model
- Building and living
- Digital building survey
- Structural design
- The building takes shape
- Disruptions in AEC
- Architectural principles in a historical perspective
- The paths to and from the building
- From planning to reality
- Building Information Modeling (BIM)
- Importance of the “as built model” for operation

3. Teaching methods

Lecture with integrated exercises, e-learning

4. Participation requirements

none

5. Regulations on attendance

none

6.	**Type and scope of examination** Research report, presentation and final exam (120 min) **Prerequisites for participating in final exam** none
7.	**Requirements for the awarding of credit points (ECTS)** Passed exam
8.	**Applicability of the module (in other degree programmes)** Bachelor's degree programmes in Civil Engineering according to the learning agreement.
9.	**Importance of the grade for the final grade** According to the learning agreement.
10.	**Literature references** These will be announced during the lecture
11.	**Other information** none
12.	**Last edited** 2/4/2026