RUHR-UNIVERSITÄT BOCHUM

RUB

FAKULTÄT FÜR
BAU- UND UMWELT-
INGENIEURWISSENSCHAFTEN

Directory of Modules

B.Sc. Civil Engineering

- Module descriptions PO 21
- Curriculum

In order to ensure proper training for students enrolled in the program as first-time students, no other students (second-time students, guest students, etc.) will be admitted to the exams for the compulsory modules BI-01 to BI-21 in accordance with §59 (1) HG NRW.

SuSe 2026 Valid: 17.03.2026

Modules

Index by areas of study

1) BSc BI Compulsory Courses, ECTS: 156

Importance of the grade for the final grade
FAK = 1,0
DIV = 192

2) BSc BI Optional Courses, ECTS: 12

Importance of the grade for the final grade
FAK = 1,0
DIV = 192

3) BSc BI Bachelor's Thesis, ECTS: 12

Importance of the grade for the final grade

FAK = 2,0

DIV = 192

Occupational Health & Safety 1

Arbeitssicherheit I – Baustellenorganisation

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-W21	2 CP	60 h	6. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Occupational Health & Safety 1	a) 2 WLH (30 h)	a) 30 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Markus Thewes

a) Prof. Dr.-Ing. Markus Thewes, Dipl.-Ing. Ralf Germann

Admission requirements

Learning outcome, core skills

Students

- Will develop a fundamental understanding of the importance of occupational health and safety on construction sites,
- are introduced to the basic knowledge of appropriate preventive measures in construction planning and execution,
- will recognise the special significance of construction management for health and safety aspects from a legal perspective,
- will learn to deal with issues in these areas in a practical manner,
- will be able to critically examine occupational health and safety issues and implement it in construction organisation

Contents

a)

The lecture comprehensively covers the basics of occupational safety. This includes:

- Fundamentals of occupational safety
- Legal and insurance aspects
- Basic knowledge of accident prevention regulations for building construction and civil engineering
- Special features of compressed air and blasting work

Educational form / Language

a) Lecture (2 WLH) / German

Examination methods

• Written exam 'Occupational Health & Safety 1' (60 min., Part of modul grade 100,0 %, Die Klausur findet im Sommersemester vorlesungsnah nach Beendigung der Veranstaltung noch während der Vorlesungszeit statt.)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering
- M.Sc. Civil Engineering

- M.Sc. Environmental Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 2,00 * 100 * FAK / DIV
FAK: The weighting factors can be taken from the table of contents.
DIV: The values can be taken from the table of contents.

Further Information

Note: With the Occupational Health & Safety 1 module, students can acquire the first part of the theoretical training to become a health and safety coordinator (SiGe coordinator) with regard to occupational safety knowledge (SiGe occupational safety – occupational safety knowledge in accordance with RAB 30, Appendix B). Continuing from this first module Occupational Health & Safety 1, the second part of the theoretical knowledge of a SiGe coordinator is taught in a further master module W22.

After consultation with the lecturer, students of the Bachelor's programme may also voluntarily participate in the Master's module W22 in order to complete this component of the theoretical training for health and safety coordinators (SiGe coordinators).

In addition to the two modules W21 and W22 on occupational health and safety, training in specific coordinator skills (in accordance with RAB 30, Annex C) is required for the complete theoretical training as a health and safety coordinator. This is not part of the W21 or W22 modules offered here.

Occupational Health & Safety 2

Arbeitssicherheit II - Arbeitsschutzfachlicher Theoriekurs

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-W22	2 CP	60 h	6. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Environmental Engineering	a) 2 WLH (30 h)	a) 30 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Markus Thewes

a) Prof. Dr.-Ing. Markus Thewes, Dipl.-Ing. Ralf Germann

Admission requirements

Recommended previous knowledge:

Participation in the Occupational Safety I module is recommended.

Learning outcome, core skills

Students

- develop an advanced understanding of the importance of occupational health and safety protection on construction sites,
- acquire further knowledge of appropriate preventive measures in construction planning and execution,
- recognise the special importance of construction management from a legal perspective,
- learn how to deal with issues in these areas in a practical manner
- are able to critically examine occupational safety issues and implement this task in construction management

Contents

a)

The lecture comprehensively covers the basics of occupational safety. This includes:

- In-depth study of legal and insurance-related aspects
- In-depth knowledge of accident prevention regulations for building construction and foundation engineering
- Fire protection during the construction phase
- Fundamentals of health and safety planning and coordination
- Tasks of the health and safety coordinator in planning and construction

Educational form / Language

a) Lecture (2 WLH) / German

Examination methods

• Written exam 'Occupational Health & Safety 2' (60 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering
- M.Sc. Civil Engineering

- M.Sc. Environmental Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 2,00 * 100 * FAK / DIV

FAK: The weighting factors can be taken from the table of contents.

DIV: The values can be taken from the table of contents.

Further Information

Note: With the Occupational Health & Safety 2 module, students can acquire the second part of the theoretical training to become a health and safety coordinator (SiGe coordinator) with regard to occupational safety knowledge (SiGe occupational safety – occupational safety knowledge in accordance with RAB 30, Appendix B). Continuing from the previous module, Occupational Health & Safety 1, the second part of the theoretical knowledge of a SiGe coordinator is taught in this master module.

In addition to the two modules W21 and W22 on occupational health and safety, training in specific coordinator skills (in accordance with RAB 30, Annex C) is required for the complete theoretical training as a health and safety coordinator. This is not part of the W21 or W22 modules offered here.

Bachelor's Thesis

Bachelorarbeit BI

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-BA	12 CP	360 h	6. Sem.	3 Monate	no limitation

Courses	Contact hours	Self-study	Frequency
a) Bachelor's Thesis		a) 360 h	a) each sem.

Module coordinator and lecturer(s)

Alle Professorinnen und Professoren des Studiengangs

a) Alle Professorinnen und Professoren des Studiengangs

Admission requirements

To be admitted to the bachelor's thesis, students must have successfully completed modules worth at least 120 credit points and provide proof of having completed an 8-week professional internship.

Learning outcome, core skills

Students

- are able to independently research a topic in the field of civil engineering using scientific methods within a specified period of 3 months (360 working hours),
- are able to research and understand international literature,
- can prepare technical topics appropriately and present them in an understandable way during the accompanying presentation,
- will acquire the necessary specialist knowledge for the transition to professional life while working on their bachelor's thesis.

Contents

a)

The bachelor thesis can be theoretical, practical, constructive, or organizational in nature. The candidate has the right to propose a topic. The topic is formulated by the examiner. The results must be presented in detail in written and visual form. This includes, in particular, a summary, an outline, and a list of the literature used in the thesis.

Educational form / Language

a) Final thesis / German / English

Examination methods

• Final thesis 'Bachelor's Thesis' (360 h., Part of modul grade 100,0 %, with final presentation)

Requirements for the award of credit points

- Passed thesis
- Completed presentation

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 12,00 * 100 * FAK / DIV

FAK: The weighting factors can be taken from the table of contents.

DIV: The values can be taken from the table of contents.

Further Information

Construction operations and construction process engineering Baubetrieb und Bauverfahrenstechnik					
Module number BI-20/UI-B12	**Credits** 8 CP	**Workload** 240 h	**Semester[s]** 5./6. Sem.	**Duration** 2 Semester[s]	**Group size** no limitation
Courses a) Construction operations and construction process engineering I b) Construction operations and construction process engineering II			**Contact hours** a) 4 WLH (60 h) b) 2 WLH (30 h)	**Self-study** a) 90 h b) 60 h	**Frequency** a) each winter b) each summer
Module coordinator and lecturer(s) Prof. Dr.-Ing. Markus Thewes a) Prof. Dr.-Ing. Markus Thewes b) Prof. Dr.-Ing. Markus Thewes					
Admission requirements Recommended previous knowledge: Basic knowledge of building materials technology, building construction, building physics, statics and structural engineering, reinforced concrete and prestressed concrete construction, steel and timber construction, as well as foundation engineering and soil mechanics.					
Learning outcome, core skills • Basic knowledge of construction operations and construction process engineering and their effects on the planning, design and execution of construction projects • Knowledge of the organisation, implementation and management of construction projects in construction management • Knowledge for solving standard tasks in the areas of project and construction management • Competence in critically assessing processes and solutions in construction operations and construction process engineering, as well as recognising interrelationships in this field.					
Contents a) The lecture covers the basics of project management and tendering, awarding contracts and invoicing in construction operations. This includes: • Unique features of construction production • Parties involved in construction • General construction organisation • Construction process • Planning phases in accordance with HOAI regulations • Basic knowledge in the fields tendering, awarding contracts, as-built documentation and invoicing • Basics of construction contracts and contract forms • Fundamentals of German regulations of VOB A/B/C, public building law • Basics of construction planning • Fundamentals of construction process engineering for buildings; conventional construction methods • Fundamentals of construction process engineering for prefabricated elements • Basic methods of cost estimation in construction					

b)
The lecture (as a block course) covers the basics of construction process engineering and its impact on construction work, continuing from the course offered in the winter semester. This includes:

- Fundamentals of construction machinery for earthworks and foundation engineering
- Fundamentals of performance assessment
- Fundamentals of construction machinery for concrete construction
- Logistics in building construction and foundation engineering
- Construction site layout and equipment

Educational form / Language
a) Tutorial (1 WLH) / Lecture (3 WLH) / German
b) Tutorial (1 WLH) / Block seminar / Lecture (1 WLH) / German

Examination methods
• Written exam 'Construction operations and construction process engineering' (150 min., Part of modul grade 100,0 %, The exam takes place in the summer semester after the block seminar has ended, but still during the lecture period (approx. end of May). In the winter semester, the exam takes place during the lecture-free period.)

Requirements for the award of credit points
- Passed module final exam: Written exam

Module applicability
- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering

Weight of the mark for the final score
Percentage of total grade [%] = 8,00 * 100 * FAK / DIV
FAK: The weighting factors can be taken from the table of contents.
DIV: The values can be taken from the table of contents.

Further Information

Building Constructions

Baukonstruktionen

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-05	5 CP	150 h	2. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Building Constructions	a) 4 WLH (60 h)	a) 90 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr. Roger A. Sauer

a) Prof. Dr. Roger A. Sauer

Admission requirements

Recommended previous knowledge:

Completed module in building physics

Learning outcome, core skills

Students

- understand the basic functioning of essential building structures from an engineering perspective and use this knowledge to derive the correct building construction.
- determine the basic laws of statics and apply them in conjunction with the requirements specified by the choice of building materials (as previously learned in the Building Physics module on thermal, sound, and moisture protection).
- learn and understand the essential constructions of general building construction and their standard-compliant graphic representation.

Contents

a)

The lecture covers an introduction to the subject area of general building structures. This includes:

- Building design in the context of basic static systems (beams, slabs, panels, trusses, shells)
- Foundation options
- Development of the essential building structures of buildings: pitched roofs, flat roofs, exterior and basement walls, windows, lightweight interior walls, ceilings, and stairs
- Spatial stability of buildings in wall and skeleton construction methods

Building on this, the exercise then elaborates on the central structural details of different connections in detail and presents them in drawings.

Educational form / Language

a) Tutorial (2 WLH) / Lecture (2 WLH) / German

Examination methods

• Written exam 'Building Constructions' (120 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 5,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information Please note: • Last lecture offered by Prof. Willems: Summer semester 25 • Last exam offered by Prof. Willems: Winter semester 25/26

Building Physics
Bauphysik

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-03/UI-B02	5 CP	150 h	1. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Building Physics	a) 4 WLH (60 h)	a) 90 h	a) each winter

Module coordinator and lecturer(s)
Prof. Dr.-Ing. Wolfgang Willems
a) Prof. Dr.-Ing. Wolfgang Willems

Admission requirements

Learning outcome, core skills
Students

- learn the building physics functioning of building key component cross-sections in general building construction
- assign different building materials to their primary functions,
- differentiate and utilize material-specific parameters from standards and construction tables,
- master basic design approaches for thermal, moisture, and sound insulation according to the relevant DIN standards,
- identify the relationship between structural design and building physics function.

Contents
a)
The lecture introduces the fundamentals of general building physics.

These include:

- Thermal insulation
- Moisture protection
- Room acoustics
- Building acoustics
- Fire protection (informative)

The relevant design and verification methods will be presented and applied in the practical exercises.

Educational form / Language
a) Tutorial (2 WLH) / Lecture (2 WLH) / German

Examination methods
• Written exam 'Building Physics' (120 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed final module exam: Written exam

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 5,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information Please note: • Last lecture offered by Prof. Willems: Winter Semester 25/26 • Last exam offered by Prof. Willems: Special audit date Winter Semester 25/26

Construction Materials

Baustofftechnik

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-04	10 CP	300 h	1./2. Sem.	2 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Construction Materials I	a) 4 WLH (60 h)	a) 60 h	a) each winter
b) Construction Materials II	b) 4 WLH (60 h)	b) 120 h	b) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. habil. Iurie Curosu

a) Prof. Dr.-Ing. habil. Iurie Curosu

b) Prof. Dr.-Ing. habil. Iurie Curosu

Admission requirements

Learning outcome, core skills

The students

- have basic knowledge of the relevant construction materials in the field of civil and industrial engineering.
- can determine the essential properties of construction materials and assess their potential and application limits,
- are able to determine the best materials for specific exploitation conditions.

Contents

a)

The course covers the fundamentals of construction materials science, but cement-based construction materials are primarily dealt with. Fundamentals of materials testing and evaluation:

- Chemical and physical principles
- Strength and deformations
- Testing methods

Cement-based construction materials

- Raw materials (binders, aggregates, additives)
- Concrete (fundamentals and design)
- Production and placement of concrete
- Hydration of cement and hardening of concrete

In the theoretical exercises, concrete designs are conducted using real design examples. The application-oriented material behaviour of concrete is explained.
In the laboratory exercises, the examination methods developed in the lectures are applied and explained in a practical manner and based on live experiments.

b)

The 2nd part of the module deals - in addition to concrete - with other common construction materials used in civil engineering. In particular, their mechanical properties and durability are discussed.

- Mechanical properties (strength and deformations)
- Durability (interactions, requirements, tests)

- Construction materials (hardened concrete, masonry, wood, bituminous
- construction materials, glass)
- Metallic materials and polymer materials:

1. Steel / non-ferrous metals
2. Polymers / resins
3. Composite materials

In the theoretical exercises, concrete designs are conducted using real design examples and the application-oriented material behaviour of various construction materials is considered.
In the laboratory exercises, the examination methods developed in the lectures are applied and explained in a practical manner based on live experiments.

Educational form / Language

a) Tutorial (2 WLH) / Lecture (2 WLH) / German
b) Tutorial (2 WLH) / Lecture (2 WLH) / German

Examination methods

• Written exam 'Construction Materials' (150 min., Part of modul grade 100,0 %)
• a) Optional laboratory exercises to achieve bonus points for the examination 3 exercises, 4.5 hours at the end of the summer semester
• b) Optional laboratory exercises to achieve bonus points for the examination 2 exercises, 3 hours at the end of the summer semester

Requirements for the award of credit points

- Passed written examination of the module

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 10,00 * 100 * FAK / DIV
FAK: The weighting factors can be taken from the table of contents.
DIV: The values can be taken from the table of contents.

Further Information

Literature:

- Detailed lecture notes of the chair on the individual construction materials (approx. 650 pages)
- Reprints of tutorials and laboratory exercises

Construction Contract and Environmental Law

Bauvertrags- und Umweltrecht

Module number	Credits	Workload	Semester[s]	Duration	Group size
W07	2 CP	60 h	6. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Construction Contract Law	a) 1 WLH (15 h)	a) 15 h	a) each summer
b) Environmental Law	b) 1 WLH (15 h)	b) 15 h	b) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Markus Thewes

a) Prof. Dr. jur. M.M. Lederer

b) Dr. jur. Till Elgeti

Admission requirements

Learning outcome, core skills

Students

- are introduced to the fundamentals of construction contract law and environmental law,
- acquire the necessary basic knowledge for engineering tasks and their contractual implementation, as well as the contractual implications for construction work,
- learn to recognise the different interests of clients and contractors as well as the authorities and organisations involved and to incorporate these into the contracts,
- work independently on standard tasks from these areas, develop a basic understanding of how to deal with regulations and laws, and recognise problems in the application of the law.

Contents

a)

The lecture comprehensively covers the basics of construction contract law based on the German Civil Code (BGB) and the German Construction Contract Procedures (VOB). This includes:

- Basics from the BGB and VOB
- The contract for work and services and the VOB for construction work
- Obligations of the contracting parties until acceptance of the construction work
- Acceptance of construction work
- Defects and claims for defects
- The remuneration owed by the client.

b)

The lecture covers the basics of German environmental law based on federal environmental protection regulations, with reference to state regulations and administrative responsibilities.

This includes:

- General environmental law (German, European and international environmental law)
- Special environmental law (spatial planning, nature conservation and landscape management, soil protection, water protection, immission control, nuclear, radiation protection, genetic engineering, hazardous substances, recycling and waste

Educational form / Language

a) Lecture (1 WLH) / German
b) Block seminar / Lecture (1 WLH) / German

Examination methods

• Written exam 'Construction Contract and Environmental Law' (60 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil engineering
- M.Sc. Civil engineering

Weight of the mark for the final score

Percentage of total grade [%] = 2,00 * 100 * FAK / DIV
FAK: The weighting factors can be taken from the table of contents.
DIV: The values can be taken from the table of contents.

Further Information

The block course on environmental law takes place during the lecture-free period.

Soil Mechanics and Foundation Engineering

Bodenmechanik und Grundbau

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-12	8 CP	240 h	3. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Soil Mechanics	a) 3 WLH (45 h)	a) 75 h	a) each winter
b) Foundation engineering	b) 3 WLH (45 h)	b) 75 h	b) each winter

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Torsten Wichtmann

a) Prof. Dr.-Ing. Torsten Wichtmann

b) Prof. Dr.-Ing. Torsten Wichtmann

Admission requirements

Recommended previous knowledge:

Completed module in mechanics

Learning outcome, core skills

The students

- know how to describe and classify soils
- know the fundamental behaviour of soils and its mathematically idealised description
- are able to apply these concepts to the design of geotechnial structures
- are able to critically evaluate calculation outcomes

Contents

a)

The course deals with the basic knowledge of soil mechanics. In detail the following topics are addressed:

- Description and classification of soils
- Soil properties and parameters
- Site investigation
- Effects of groundwater in soils
- Stress distribution in ground
- Settlement and consolidation calculations
- Shear strength
- Earth pressure on walls and retaining walls

b)

The course deals with the basic knowledge necessary for the design of geotechnical structures. In detail the following topics are addressed:

- Slope stability
- Shallow foundations
- Retaining structures
- Lowering of groundwater by well systems
- Construction pits
- Pile foundations

- Soil improvement
- Special solutions for foundations and construction pits

Educational form / Language

a) Tutorial (1 WLH) / Lecture (2 WLH) / German

b) Tutorial (2 WLH) / Lecture (1 WLH) / German

Examination methods

• Written exam 'Soil Mechanics and Foundation Engineering' (180 min., Part of modul grade 100,0 %)

• Optional homework assignment to earn bonus points for the exam (35 hours, submission deadline to be announced at the beginning of the semester)

Requirements for the award of credit points

- Passed final module examination: written examination

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 8,00 * 100 * FAK / DIV

FAK: The weighting factors can be taken from the table of contents.

DIV: The values can be taken from the table of contents.

Further Information

Building Information Modeling

Building Information Modeling

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-21	5 CP	150 h	6. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Building Information Modeling	a) 4 WLH (60 h)	a) 90 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Markus König

a) Prof. Dr.-Ing. Markus König

Admission requirements

Learning outcome, core skills

The students:

- acquire competencies for planning construction projects using modern information and communication technologies,
- learn and apply common methods of BIM-based information management,
- use standard software tools to solve planning tasks,
- develop a deeper understanding of the individual roles involved in a BIM-based planning process,
- are able to critically assess current scientific developments in the field of Building Information Modeling and transfer them into practice.

Contents

a)

The lecture content covers the following topics:

- Fundamentals of Building Information Modeling
- Object-oriented modeling
- Geometric modeling
- Project management in BIM projects
- 4D and 5D BIM modeling
- Information management
- Tools for BIM-based planning

Educational form / Language

a) Tutorial (2 WLH) / Block seminar / Lecture (2 WLH) / German

Examination methods

• Written exam 'Building Information Modeling' (120 min., Part of modul grade 100,0 %, The exam takes place in the summer semester close to the end of the block seminar and still during the lecture period (around the end of May). In the winter semester, the exam is held during the lecture-free period)

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Requirements for the award of credit points

- Passed final module examination: Written exam

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score
Percentage of total grade [%] = 5,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information
Literature: Borrmann, A., König, M., Koch, C., Beetz, J. (Ed.): Building Information Modeling – Technology Foundations and Industry Practice Springer International ISBN 978-3-319-92861-6

Communication for civil engineers

Communication for civil engineers

Module number	Credits	Workload	Semester[s]	Duration	Group size
W14	2 CP	60 h	ab dem 2. Sem.	Semester[s]	20

Courses	Contact hours	Self-study	Frequency
a) Communication for civil engineers	a) 2 WLH (30 h)	a) 30 h	a) each summer

Module coordinator and lecturer(s)

M.A. Julia Salzinger

a) M.A. Julia Salzinger

Admission requirements

Recommended previous knowledge:

Level B2 (Common European Framework of Reference for Languages)

Learning outcome, core skills

Students

- enhance their language skills in technical areas.
- practise expressing technical content using appropriate technical vocabulary for experts.
- learn to express technical contexts in simple language for non-specialists.
- will be enabled to act in the foreign language with a view to their future professional activities.
- can work on a manageable task conceptually and independently in technical English within a given time frame.
- can discuss subject-related content.

Contents

a)

In the seminar, participants practice talking about specialist topics with experts and non-experts in regard to their future professional life. Pair and group work, TED talks and discussions integrated in the course.

Educational form / Language

a) Seminar / German / English

Examination methods

• Compulsory attendance 'Communication for civil engineers - Compulsory attendance' (<Ohne>, ungraded, Attendance at least 75% of the appointments, Preliminary requirement for participation in the oral examination)

• Oral exam 'Communication for civil engineers' (15 min., Part of modul grade 100,0 %, Presentation)

Requirements for the award of credit points

- Passed module final exam: Written exam
- Attendance at at least 75% of the appointments

Module applicability

- BSc. Civil Emgineering
- MSc. Civil Emgineering
- BSc. Environmental Engineering
- MSc. Environmental Engineering

Weight of the mark for the final score Percentage of total grade [%] = 2,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information Additional material will be provided on Moodle.

Geodesy and geoinformation

Geodäsie und Geoinformation

Module number	Credits	Workload	Semester[s]	Duration	Group size
W03	3 CP	90 h	ab dem 2. Sem.	1 Semester[s]	50

Courses	Contact hours	Self-study	Frequency
a) Geodesy and geoinformation	a) 2 WLH (30 h)	a) 60 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Peter Mark

a) Dr.-Ing. Hanns-Florian Schuster

Admission requirements

Advanced Mathematics A passed

Learning outcome, core skills

Students

- are familiar with surveying terminology
- are familiar with geodetic measurement techniques
- are familiar with the tasks and uses of geoinformation and its application in construction
- are capable of communicating with surveyors in professional collaborations.

Contents

a)

The lecture covers the basics of surveying, in particular:

- Coordinate systems, elevation systems
- Measuring angles, distances, elevations
- Measurement errors, accuracy, tolerance, error propagation
- Coordinate calculations (small point calculation)
- Use of GPS
- Photogrammetry (terrestrial, airborne)
- Laser scanning (terrestrial, mobile, airborne)
- Property registration systems (land registry, cadastre)
- GIS, geodata (use of geodata infrastructure)

Educational form / Language

a) Lecture (2 WLH) / German

Examination methods

• Written exam 'Geodesy and geoinformation' (60 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 3,00 * 100 * FAK / DIV

FAK: The weighting factors can be taken from the table of contents.

DIV: The values can be taken from the table of contents.
Further Information Due to the limited size of the group, registration for the course via Moodle is required.

Hydrology and Water Resources Management

Hydrologie und Wasserwirtschaft

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-13/UI-B04	7 CP	210 h	3./4. Sem.	2 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Fundamentals of Hydrology	a) 2 WLH (30 h)	a) 60 h	a) each winter
b) Fundamentals of hydraulic engineering	b) 1 WLH (15 h)	b) 45 h	b) each summer
c) Fundamentals of water management	c) 2 WLH (30 h)	c) 30 h	c) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Martina Flörke

a) Prof. Dr.-Ing. Martina Flörke

b) Prof. Dr.-Ing. Martina Flörke

c) Prof. Dr.-Ing. Martina Flörke

Admission requirements

Recommended previous knowledge:

Knowledge of advanced mathematics and fluid mechanics

Learning outcome, core skills

Students

- know and describe the various characteristics of the elements of the hydrological cycle and the respective hydrological processes
- characterize core areas of water management in the field of planning, structural design, and operation of water management facilities
- can carry out basic hydrological investigations for water extraction facilities and flood protection facilities
- apply fundamental knowledge of engineering work techniques and approaches to interdisciplinary work.

Contents

a)

The course provides basic knowledge of hydrological processes that are relevant to engineering issues in hydraulic engineering and water management.

These include:

- Water cycle and water balance, recording and calculation of precipitation, evaporation and runoff
- River catchments and their effect on the spatial and temporal distribution of runoff
- Mathematical procedures and methods for calculating flood formation, (runoff formation and runoff concentration) as base for flood forecasting
- Approaches to calculating flood wave propagation
- Extreme value statistics for low water and high water stages for water management calculations
- Climate change and climate impacts on the water balance.

b)

The course covers the most important hydraulic structures and hydraulic engineering tasks. Hydraulic engineering structures are explained in terms of their common structural designs.

These include:

- Dams: retaining walls, embankments, and the respective operating facilities
- Weirs: fixed weirs, movable weirs
- Hydropower plants: low-, medium-, and high-pressure power plants
- Agricultural hydraulic engineering: irrigation and drainage systems
- Planning and construction of flood protection facilities
- Elements of navigational hydraulic engineering

c)
a) The course covers the key issues involved in the planning and operation of water management facilities and systems. It provides basic knowledge on the planning and design of dams, flood protection facilities, and hydroelectric power plants. This includes profitability calculations and selected issues related to spatial planning.

The following topics are covered:

- Dam management: Determination of the required storage capacity, design based on simulations, dam operating plans
- Flood protection planning, flood protection options, assessment of flood damage, design of uncontrolled flood control reservoirs, design of controlled flood control reservoirs, river dikes
- Economic evaluation of water management projects: capital and present values, internal rate of return, cost-benefit ratio, project evaluation with payment series
- Utility analysis, cost-effectiveness analysis
- Fundamentals of spatial planning.

The various methods are practiced using practical examples in seminars.

Educational form / Language

a) Tutorial (1 WLH) / Lecture (1 WLH) / German
b) Lecture (1 WLH) / German
c) Tutorial (1 WLH) / Lecture (1 WLH) / German

Examination methods

• Written exam 'Hydrology and Water Resources Management' (120 min., Part of modul grade 100,0 %)
• Optional term paper to earn bonus points for the exam (30 hours, deadline to be announced at the beginning of the semester)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 7,00 * 100 * FAK / DIV
FAK: The weighting factors can be taken from the table of contents.
DIV: The values can be taken from the table of contents.

Further Information

Semester-long learning progress assessment with DGBL (*digital game-based learning*)

Advanced Mathematics A

Höhere Mathematik A

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-01/UI-01	8 CP	240 h	1. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Mathematics 1	a) 6 WLH (90 h)	a) 150 h	a) each winter

Module coordinator and lecturer(s)

N.N.

a) Prof. Dr. G. Laures, Prof. Dr. Jörg Winkelmann, Prof. Dr. rer. nat. Peter Heinzner, Prof. Dr. Markus Reinecke

Admission requirements

Recommended previous knowledge:

Participation in the two-week “Preliminary Course for Future Engineering Students” before the start of studies in September

Learning outcome, core skills

After successfully completing the module

- students will be familiar with the most important methods of engineering mathematics
- students will be able to identify and solve mathematical problems in physical systems
- students will practice initial approaches to scientific learning and thinking
- students will have interdisciplinary methodological skills

Contents

a)

Mathematical methods of analysis of one variable:

- Complex numbers: definition, properties, and calculation rules
- Matrices, determinants, and methods for solving linear systems of equations
- Vector spaces, subspaces, and basis change
- Eigenvalues, eigenvectors, and principal axis transformation
- Sequences and series and their convergence; convergence criteria
- Differential calculus for functions of a real and complex variable (differentiation techniques, mean value theorems, Taylor formulas, applications)
- Integral calculus of one variable (integration techniques, primitive functions, mean value theorems, applications)

Educational form / Language

a) Tutorial (2 WLH) / Lecture (4 WLH) / German

Examination methods

• Written exam 'Advanced Mathematics A' (180 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering

Weight of the mark for the final score
Percentage of total grade [%] = 8,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Advanced Mathematics B

Höhere Mathematik B

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-06/UI-06	8 CP	240 h	2. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Mathematics 2	a) 6 WLH (90 h)	a) 150 h	a) each summer

Module coordinator and lecturer(s)

N.N.

a) Prof. Dr. G. Laures, Prof. Dr. Jörg Winkelmann, Prof. Dr. rer. nat. Peter Heinzner, Prof. Dr. Markus Reinecke

Admission requirements

Recommended previous knowledge:

Mathematics 1

Learning outcome, core skills

After successfully completing the module

- students will be familiar with the most important methods of engineering mathematics
- students will be able to identify and solve mathematical problems in physical systems
- students will practice initial approaches to scientific learning and thinking
- students will have interdisciplinary methodological skills

Contents

a)

Mathematical methods of analysis of several variables:

- Power series (convergence criteria, applications)
- Differential calculus for functions of several variables (total derivative, directional derivative, partial derivatives and relationships, differentiation techniques, applications, including extrema with and without constraints)
- Integral calculus for functions of several variables (area, volume, and surface integrals, Green's, Gauss's, and Stokes's theorems with applications)
- Ordinary differential equations and solution techniques (separation of variables, variation of constants, exact differential equations and integrating factors, special types of differential equations, systems of ordinary differential equations)

Educational form / Language

a) Tutorial (2 WLH) / Lecture (4 WLH) / German

Examination methods

• Written exam 'Advanced Mathematics B' (180 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 8,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Advanced Mathematics C

Höhere Mathematik C

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-09/UI-11	5 CP	150 h	3. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Advanced Mathematics C	a) 4 WLH (60 h)	a) 90 h	a) each winter

Module coordinator and lecturer(s)

Prof. Dr. rer. nat. Herold Dehling

a) Prof. Dr. rer. nat. Herold Dehling

Admission requirements

Recommended previous knowledge:

Knowledge of advanced mathematics

Learning outcome, core skills

Students

- are familiar with the basic concepts of probability theory and statistics,
- are able to understand and independently solve standard problems,
- are familiar with the occurrence and significance of randomness in nature and technology and are able to model random phenomena using standard methods,
- can apply what they have learned to specific engineering problems.

Contents

a)

The course covers the basic knowledge of probability theory and statistics required for understanding and modeling random phenomena in engineering sciences. In the field of probability theory, this includes: modeling random experiments, probability space, conditional probabilities, independence, discrete and continuous random variables, density and distribution functions, important probability distributions (including binomial, Poisson, geometric, normal, exponential, chi-square, F-distribution), expected value, variance, covariance, correlation coefficient, joint distribution, convolution formula, and in the field of statistics: descriptive statistics methods, statistical modeling, fundamentals of estimation theory (including maximum likelihood method), confidence intervals, fundamentals of test theory, type 1 and type 2 errors, level of a test, tests for normally distributed samples (t-test, F-test), linear regression models (least squares method, t-test), chi-square test for discrete data, 1-factor ANOVA. The concepts and methods are always illustrated with application examples and simulations using the statistical package R.

Educational form / Language

a) Tutorial (2 WLH) / Lecture (2 WLH) / German

Examination methods

• Written exam 'Advanced Mathematics C' (90 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering

• B.Sc. Mechanical Engineering
Weight of the mark for the final score Percentage of total grade [%] = 5,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Engineering Informatics

Ingenieurinformatik

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-08/UI-08	5 CP	150 h	2. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Engineering Informatics	a) 4 WLH (60 h)	a) 90 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Markus König

a) Prof. Dr.-Ing. Markus König

Admission requirements

Recommended previous knowledge:

Knowledge of higher mathematics and mechanics

Learning outcome, core skills

the students

- will be able to carry out a systematic analysis of complex problems, introducing the computer as a modern tool in engineering.
- will learn skills for solving simple engineering-specific problems using a programming language.
- will be able to organize themselves independently and implement a small application.

Contents

a)

The lecture content covers the following topics:

- Fundamentals of computer science and a programming language
- Numerical representation
- Data types and variables
- Control structures
- Algorithms
- Object-oriented programming
- Tools for developing IT applications

Educational form / Language

a) Tutorial (2 WLH) / Lecture (2 WLH) / German

Examination methods

• Written exam 'Engineering Informatics' (120 min., Part of modul grade 100,0 %, likely as an e-exam)

• Voluntary assignments 'Introduction to Programming' (20 hours, ungraded, computer-based assignments accompanying the exercises, dates will be announced at the beginning of the semester, bonus points for the exam amounting to approximately 20% of the points required to pass the exam)

Requirements for the award of credit points

- Passed final module examination: written

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering

Weight of the mark for the final score Percentage of total grade [%] = 5,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Mechanics A

Mechanik A

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-02/UI-02	9 CP	270 h	1. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Mechanics A	a) 7 WLH (105 h)	a) 165 h	a) each winter

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Daniel Balzani

a) Prof. Dr.-Ing. Daniel Balzani, Prof. Dr.-Ing. Johanna Waimann

Admission requirements

Learning outcome, core skills

The students

- are familiar with the terminology and ways of thinking regarding the mechanics of rigid bodies that are essential for advanced courses,
- are able to abstract static conditions, reduce them to their essentials and process these results using mathematical methods,
- are able to describe and mathematically analyze systems of forces and bodies as well as the effects these force systems have on a body at rest and in motion.

Contents

a)

- General basics: physical quantities, reference systems, properties of bodies and forces, SI units
- Concurrent coplanar and spatial systems of forces: reduction, equilibrium
- General coplanar and spatial systems of forces: equivalence theorems for forces, moment of a force, force couples, reduction, equilibrium
- General kinetics: basic terms of kinematics, fundamental laws of mechanics
- Metric quantities of bodies, areas, lines: zeroth and first moment, center of gravity, idealized body
- Supported bodies: statically determinate loading conditions, support reactions, static and kinetic friction
- Stress resultants: principle of intersection, differential relations for straight bars, distributions and diagrams of stress resultants
- Systems of bodies: kinematic and static determinacy, distributions and diagrams of stress resultants, truss constructions
- Concept of stress and multidimensional stress states.

Educational form / Language

a) Lecture (3 WLH) / Tutorial (4 WLH) / German

Examination methods

• Written exam 'Mechanics A' (120 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: written exam

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Mechanical Engineering

• B.Sc. Environmental Engineering • B.Sc. Material Science
Weight of the mark for the final score Percentage of total grade [%] = 9,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Mechanics B

Mechanik B

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-07	8 CP	240 h	2. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Mechanics B	a) 6 WLH (90 h)	a) 150 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Johanna Waimann

a) Prof. Dr.-Ing. Daniel Balzani, Prof. Dr.-Ing. Johanna Waimann

Admission requirements

Recommended previous knowledge:

Mechanics A, Mathematics A

Learning outcome, core skills

The students

- are familiar with the terminology and ways of thinking regarding the mechanics of deformable bodies that are essential for advanced courses,
- are able to abstract elastostatic conditions, reduce them to their essentials and process these results using mathematical methods,
- are able to describe and mathematically analyze deformations, strains and stresses in beam structures under general load conditions.

Contents

a)

- Fundamental Mechanics of deformable bodies: strains
- Material law: linear-elastic bodies, strength hypotheses
- Fundamental theory on the strength of materials for three-dimensional bending beams under general load conditions: normal stresses, areal moment of inertia, shear stress due to shear force, differential equation of the deflection curve, composite sections
- Shear center and torsion of prismatic bars
- Energy methods in the field of elastostatics: principal of virtual work, calculation of statically indeterminate systems
- Equilibrium of deformed bodies, buckling

The lecture is supplemented by numerous applications and examples.

Educational form / Language

a) Tutorial (3 WLH) / Lecture (3 WLH) / German

Examination methods

• Written exam 'Mechanics B' (120 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering

• B.Sc. Mechanical Engineering
Weight of the mark for the final score Percentage of total grade [%] = 8,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Physics for Engineers

Physik

Module number	Credits	Workload	Semester[s]	Duration	Group size
W01	4 CP	120 h	1. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Physics for Engineers (Civil Engineering, UI, SEPM)	a) 3 WLH (45 h)	a) 75 h	a) each winter

Module coordinator and lecturer(s)

Servicezentrum Physik

a) Servicezentrum Physik

Admission requirements

Learning outcome, core skills

Through an introduction to the basic concepts of classical physics, students will be able to

- understand the fundamentals of mechanical, electrical, magnetic, optical, and thermodynamic phenomena
- assign practical problems from everyday life and technology to specific areas of physics
- understand the most important physical principles of mechanical engineering
- analyze physical problems, describe them using appropriate basic principles, and independently formulate solutions
- idealize concrete problems to the point of mathematical abstraction
- handle physical quantities and units professionally
- understand the usefulness of physical conservation laws

Contents

a)

- Introduction: Mathematical fundamentals, units of measurement
- Kinematics: Kinematics of point masses (trajectory, velocity, acceleration)
- Dynamics: Dynamics of point masses (force addition and force decomposition, conservation of energy and momentum, power, friction) Harmonic oscillators, oscillations, waves Gravitational force Mechanics of rigid bodies, rotational motion
- Hydrostatics/hydrodynamics: pressure, Bernoulli's equation, viscosity
- Thermodynamics: temperature, thermal expansion, ideal gas law, phase transitions, heat transfer, non-ideal gases, heat engines
- Electrical engineering: Electrons, electric potential and voltage, currents and electrical resistance, capacitance of a capacitor, electric circuit, magnetic fields, inductance
- Optics: Refraction, total reflection, optical imaging, polarized light, interference
- Fundamentals of the structure of matter: Atoms, molecules, orbitals, box potential, Schrödinger equation

Educational form / Language

a) Tutorial (1 WLH) / Lecture (2 WLH) / German

Examination methods

• Written exam 'Physics for Engineers' (120 min., Part of modul grade 100,0 %)

Requirements for the award of credit points • Passed module final exam: Written exam
Module applicability • B.Sc. Civil Engineering • B.Sc. Environmental Engineering
Weight of the mark for the final score Percentage of total grade [%] = 4,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Planning, Speaking, Writing : project management and scientific work in engineering

Planen, Sprechen, Schreiben: Projektmanagement und wissenschaftliches Arbeiten im Ingenieurwesen

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-W28	3 CP	90 h	ab dem 2. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Planning, Speaking, Writing : project management and scientific work in engineering	a) 3 WLH (45 h)	a) 45 h	a) each sem.

Module coordinator and lecturer(s)

Dr.-Ing. Sandra Greassidis

a) Dr.-Ing. Sandra Greassidis, Vertr.-Prof.'in Dr.-Ing. Nina Nytus, Dr.-Ing. Christian Jolk

Admission requirements

Learning outcome, core skills

In addition to their technical training, students who complete this module will have acquired knowledge of project planning and independent project management to prepare them for upcoming projects and final theses.

After successfully completing the module

- students will plan their final theses according to the rules of efficient time and project management
- students will have acquired techniques for scientific work and presentation
- students will write scientific texts with the help of learned writing techniques
- students will research, manage, and organize literature with the help of current software

Contents

a)

In cooperation with the Project Office for Construction and Environment, the course treats the topics of project management and scientific working techniques as a “simulated engineering office” and with the involvement of experts. This includes, among other things:

- Time and project management
- Structure of an exposé
- Structure and characteristics of a scientific paper
- Literature research and management
- Writing training
- Presentation techniques and criteria for a professional oral presentation The content is not only taught “theoretically,” but also tested and practiced under realistic conditions.

Educational form / Language

a) Lecture (3 WLH) / German

Examination methods

• Term paper 'Planning, Speaking, Writing : project management and scientific work in engineering' (15 h., ungraded, with final oral exam (30 min.))

Requirements for the award of credit points

- Passed module final exam: Term paper with oral exam

Module applicability

- M.Sc. Civil Engineering
- M.Sc. Environmental Engineering
- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 0, ungraded

Further Information

Block seminar at the end of the semester

Project

Projektarbeit

Module number	Credits	Workload	Semester[s]	Duration	Group size
W09	6 CP	180 h	6. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Project		a) 180 h	a) each sem.

Module coordinator and lecturer(s)

Alle Professorinnen und Professoren des Studiengangs

a) Alle Professorinnen und Professoren des Studiengangs

Admission requirements

Recommended previous knowledge:

Course content of the modules included in the interdisciplinary project work

Learning outcome, core skills

Students acquire the ability to

- apply creativity, imagination, team spirit, and social skills to work on the technical content of the selected modules and apply networked thinking
- structure complex tasks
- design solutions to problems
- work in a team
- distribute responsibilities among the various team members
- present results

Contents

a)

The content of the project work varies from semester to semester so that current issues in civil engineering can be addressed. The content defined by the task is formulated in such a way that the following aspects are taken into account:

- Identifying and describing problems
- Formulating objectives
- Distributing and coordinating tasks
- Group dynamic problem solving
- Organizing and optimizing time and work allocation
- Interdisciplinary problem solving
- Literature procurement and evaluation as well as expert interviews
- Documentation (digital and paper), preparation, and presentation of work results

Educational form / Language

a) Project / German

Examination methods

• Term paper 'Project' (180 h., Part of modul grade 100,0 %, with presentation)

Requirements for the award of credit points

- Completed project work

• Completed presentation
Module applicability • B.Sc. Civil Engineering
Weight of the mark for the final score Percentage of total grade [%] = 6,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Urban Water Management

Siedlungswasserwirtschaft

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-18	8 CP	240 h	4./5. Sem.	2 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Fundamentals of urban water management	a) 4 WLH (60 h)	a) 90 h	a) each summer
b) Wastewater treatment (municipal)	b) 2 WLH (30 h)	b) 60 h	b) each winter

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Marc Wichern

a) Prof. Dr.-Ing. Marc Wichern

b) Prof. Dr.-Ing. Marc Wichern

Admission requirements

Recommended previous knowledge:

Advanced Mathematics A

Learning outcome, core skills

The students

- have fundamental knowledge of the supply and disposal of water, and of waste disposal,
- know the biological and chemical relationships in order to understand the principle of drinking water supply and wastewater technology,
- know the essential scientific and engineering principles in order to dimension the corresponding systems.
- have in-depth knowledge of municipal wastewater treatment,
- are able to recognize the relationships between physical, biological and chemical processes,
- are able to dimension and design the various process stages of awastewater treatment plant in accordance with German guidelines
- have a basic understanding of sustainable methods in wastewater treatment.

Contents

a)

The subject of the lecture is the supply and disposal of water. In detail, it deals with:

- Tasks and objectives of urban water management
- sewer calculation methods
- Basics of drinking water treatment, pumping and distribution
- Wastewater generation and its risk to humans and the environment against the background of the historical development of cities and settlements
- Function and significance of structures for wastewater discharge
- Basics of chemical and biological wastewater treatment in sewage treatment plants
- Overview of water quality management and waste management

b)

The subject of the lecture and exercise are the physical and chemical fundamentals of wastewater treatment and sewage sludge treatment. The following topics are covered in detail:

- Wastewater treatment processes

- various activated sludge processes, biofilm processes
- membrane technology
- anaerobic technology in sludge treatment
- Fundamentals of biological carbon, nitrogen and phosphorus elimination
- Plants and processes for sewage sludge treatment

Educational form / Language

a) Tutorial (2 WLH) / Lecture (2 WLH) / German

b) Tutorial (1 WLH) / Lecture (1 WLH) / German

Examination methods

• Written exam 'Urban Water Management' (120 min., Part of modul grade 100,0 %)

• Optional term paper to achieve bonus points for the written exam (20 hours)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 8,00 * 100 * FAK / DIV

FAK: The weighting factors can be taken from the table of contents.

DIV: The values can be taken from the table of contents.

Further Information

Steel and Timber Structures

Stahl- und Holzbau

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-17	12 CP	360 h	4./5. Sem.	2 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Steel structures I	a) 4 WLH (60 h)	a) 90 h	a) each summer
b) Steel structures II	b) 4 WLH (60 h)	b) 60 h	b) each winter
c) Timber structures	c) 2 WLH (30 h)	c) 60 h	c) each winter

Module coordinator and lecturer(s)

Vertr.-Prof.'in Dr.-Ing. Rebekka Winkler

a) Vertr.-Prof.'in Dr.-Ing. Rebekka Winkler

b) Vertr.-Prof.'in Dr.-Ing. Rebekka Winkler

c) Vertr.-Prof.'in Dr.-Ing. Rebekka Winkler

Admission requirements

Recommended previous knowledge:

Mechanics, statics and structural engineering

Learning outcome, core skills

The students

- possess fundamental knowledge for the design, analysis, and execution of steel, steel-concrete composite, and timber structures.
- understand the basic behavior of rod-shaped components and connections in load transfer.
- are able to independently apply analytical and numerical solution methods to design, analysis, and construction tasks in buildings and industrial structures.

Contents

a)

The course covers the fundamental knowledge required for the structural design of steel structures and the analysis of members and frameworks in steel structures. This includes:

- Areas of application in steel structures
- Typical components and structures in buildings and industrial structures
- Steel as a material: material properties and design assumptions
- Material mechanics fundamentals of steel structures: deformations, material failure, notch effects, fatigue strength
- Member theory, cross-sectional properties, and stress verification
- Plastic load-bearing capacity of cross-sections
- Bolted and welded connections
- Pinned joints, rigid splices, and frame corners
- Fundamentals of stability theory
- Second-order stress theory
- Structural safety verifications

b)

The course provides additional knowledge and skills for the structural detailing and analysis of rod-shaped components, as well as the execution of steel and steel-concrete composite structures. The specific topics covered include:

- Stability cases: flexural buckling, lateral-torsional buckling, and plate buckling
- Buckling and thin-walled components
- Structures, components, and load transfer
- Execution of columns, frames, and bracings
- Execution of solid-web and truss girders
- Bracing and stabilization of structures
- Introduction and redirection of forces
- Composite beams, columns, and floors
- Design verifications according to DIN EN 1993-1-1, DIN EN 1993-1-5, DIN EN 1993-1-8, DIN EN 1994-1-1

c)
The course conveys the fundamentals for the design, analysis, and execution of timber structures engineering. This includes:

- Areas of application in timber structures
- Structures and components in timber engineering
- Wood as a material: physical and mechanical properties of wood and engineered wood products
- Connections and fasteners
- Stability verifications for buckling and lateral buckling
- Structural aspects of timber structures
- Limit states and design according to DIN EN 1995-1-1

Educational form / Language

a) Tutorial (2 WLH) / Lecture (2 WLH) / German
b) Tutorial (2 WLH) / Lecture (2 WLH) / German
c) Tutorial (1 WLH) / Lecture (1 WLH) / German

Examination methods

• Written exam 'Steel and Timber Structures' (180 min., Part of modul grade 100,0 %)
• Term paper 'Steel structures I - Homework' (20 h., ungraded, regular successful completion of exercises required; submission deadlines will be announced at the beginning of the semester; must be passed before taking the exam)
• Term paper 'Steel structures II - Homework' (20 h., ungraded, regular successful completion of exercises required; submission deadlines will be announced at the beginning of the semester; must be passed before taking the exam)
• Term paper 'Timber structures' (20 h., ungraded, regular successful completion of exercises required; submission deadlines will be announced at the beginning of the semester; must be passed before taking the exam)

Requirements for the award of credit points

- Passed module final exam: Written exam
- Passed term paper: Successful completion of exercises

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score
Percentage of total grade [%] = 12,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Reinforced and Prestressed Concrete Structures

Stahlbeton- und Spannbetonbau

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-16	12 CP	360 h	4./5. Sem.	2 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Reinforced and Prestressed Concrete Structures I b) Reinforced and Prestressed Concrete Structures II	a) 5 WLH (75 h) b) 5 WLH (75 h)	a) 75 h b) 135 h	a) each summer b) each winter

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Peter Mark

a) Prof. Dr.-Ing. Peter Mark

b) Prof. Dr.-Ing. Peter Mark

Admission requirements

Recommended previous knowledge:

Knowledge of Mechanics, Building Materials and Structural Analysis

Learning outcome, core skills

The Students:

- are able to fully design reinforced concrete structures of conventional buildings and to construct them down to the details of the reinforcement layout. The structural elements include (T-) beams, frames and (slender) columns, as well as slabs and wall panels
- are proficient in the graphic realisation of structures by means of construction drawings like formwork and reinforcement plans
- have basic knowledge of prestressed concrete construction, can calculate simple prestressed concrete structures and assess complex structures

Contents

a)

The course imparts basic knowledge of the design and structural realisation of uniaxial reinforced concrete components. This includes:

- Bending design of reinforced concrete cross-sections
- Design against shear forces, torsion and punching shear
- Crack width limitation, stress and deflection limitations

b)

The course deals with the design and constructive detailing of uniaxial and planar reinforced concrete components as well as the basics of prestressed concrete construction. In detail, the course covers:

- Design of slabs and wall-like members
- Fundamentals of prestressed concrete construction
- Compression members and frames
- Construction details and connections
- Reinforcement of plane components

- Truss models
- Basics of guidance, anchoring and selection of bar reinforcement

Educational form / Language

a) Tutorial (2 WLH) / Lecture (3 WLH) / German

b) Tutorial (3 WLH) / Lecture (2 WLH) / German

Examination methods

• Written exam 'Reinforced and Prestressed Concrete Structures' (180 min., Part of modul grade 100,0 %)

• Term paper 'Design and Construction' (30 h., ungraded, deadline will be announced at the beginning of the semester, must be passed before taking the exam, offered every semester)

• Term paper 'Building structure' (30 h., ungraded, deadline will be announced at the beginning of the semester, must be passed before taking the exam, offered every semester)

Requirements for the award of credit points

- Passed final module examination: written examination
- Passed homework ‚Design and Construction‘
- Passed homework ‚Building Structure‘

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 12,00 * 100 * FAK / DIV

FAK: The weighting factors can be taken from the table of contents.

DIV: The values can be taken from the table of contents.

Further Information

Structural Analysis A

Statik und Tragwerkslehre A

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-11/UI-B03	5 CP	150 h	3. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Structural Analysis A	a) 4 WLH (60 h)	a) 90 h	a) each winter

Module coordinator and lecturer(s)

Prof. Dr. Roger A. Sauer

a) Prof. Dr. Roger A. Sauer

Admission requirements

Completed Mechanics A module

Learning outcome, core skills

Students

- have a basic understanding of key engineering structures, their function, and the overall load transfer mechanisms,
- understand the function and structural behaviour of individual components within complete structural systems,
- are able to convert load-bearing structures into linear structural analysis models and to comparatively analyse different structural systems (static systems),
- understand the essential concepts of structural analysis / the flow forces through structures and buildings
- as part of the group case study 'Structural Analysis', they have gained a comprehensive understanding of structures, the ability to work in a team, to communicate in working groups and to prepare and present the findings they have obtained.

Contents

a)

The course covers the following topics:

- Fundamentals of the structural design process and description of the basic modes of action of load-bearing structures (cables, columns, trusses, beam, slab, and shell structures),
- Beam theory for plane and spatial shear-rigid and shear-flexible beam elements
- Principles of virtual work and their application to compute displacements and stress resultants
- Calculating stress resultants of statically indeterminate structures using the force method.

Educational form / Language

a) Tutorial (2 WLH) / Lecture (2 WLH) / German

Examination methods

• Term paper 'Structural Analysis A - Homework' (40 h., ungraded, partly with presentations or discussions; submission deadlines will be announced at the beginning of the semester; must be passed before participating in the exam; offered every semester)

• Written exam 'Structural Analysis A' (90 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam

• Passed term paper
Module applicability • B.Sc. Civil Engineering • B.Sc. Environmental Engineering
Weight of the mark for the final score Percentage of total grade [%] = 5,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Structural Analysis B

Statik und Tragwerkslehre B

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-15	8 CP	240 h	4. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Structural Analysis B	a) 6 WLH (90 h)	a) 150 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr. Roger A. Sauer

a) Prof. Dr. Roger A. Sauer

Admission requirements

Completed Mechanics A module

Recommended previous knowledge:

Mechanics B, Structural Analysis A

Learning outcome, core skills

After successfully completing the module the students

- can perform structural analyses according to 1st and 2nd order theory,
- know the basic principles of the classical and modern concepts of structural analysis,
- have the basic knowledge to perform simple structural analyses via linear finite element method,
- develop analytical thinking and the abstraction capability to solve problems in the field of structural design, independently.

Contents

a)

The module includes the following topics:

- Computation of influence lines for internal forces within statically determinate and statically indeterminate systems
- Displacement method according to 1st and 2nd order theory
- Basic principles of stability theory
- Ritz-Galerkin method
- Basic principles of plate theory
- Introduction to the finite element method

Educational form / Language

a) Tutorial (3 WLH) / Lecture (3 WLH) / German

Examination methods

• Test 'Structural Analysis B - Pre-exam' (45 min., ungraded, date will be announced at the start of the semester; must be passed before participating in the exam; offered every semester)

• Written exam 'Structural Analysis B' (90 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam
- Passed pre-exam

Module applicability

• B.Sc. Civil Engineering
Weight of the mark for the final score Percentage of total grade [%] = 8,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Pavement Construction and Maintenance

Straßenbau und -erhaltung

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-19	7 CP	210 h	5. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Pavement Construction	a) 2 WLH (30 h)	a) 60 h	a) each winter
b) Road Planning	b) 2 WLH (30 h)	b) 60 h	b) each winter
c) Maintenance	c) 1 WLH (15 h)	c) 15 h	c) each winter

Module coordinator and lecturer(s)

Vertr.-Prof.'in Dr.-Ing. Nina Nytus

a) Vertr.-Prof.'in Dr.-Ing. Nina Nytus

b) Vertr.-Prof.'in Dr.-Ing. Nina Nytus

c) Vertr.-Prof.'in Dr.-Ing. Nina Nytus

Admission requirements

Learning outcome, core skills

After successfully completing the module, students will be able to:

- apply the technical regulations applicable to the planning, construction and maintenance of roads
- assess the physical-mechanical properties of a road that are important for the road user and the construction authority
- analyse and assess the criteria for selecting suitable alignment parameters
- distinguish between the different construction methods and their special features and specifically differentiate and assign the aspects relevant to maintenance to construction methods.

Contents

a)

The course deals with the basics of the construction of road pavements and the various construction material criteria and construction techniques.

In detail the course covers:

- Subsoil and subgrade
- Standardised construction methods
- Aggregates
- Layers without binders
- Hydraulic binders
- Layers with hydraulic binders
- Paving and slabs
- Bitumen and binders
- Asphalt layers

b)

The course teaches the basics of road planning and road design. The following topics are covered in detail:

- The laws of driving dynamics
- factors influencing the driver, vehicle and road
- basic features of financing and the planning process

- road administration
- laws and the planning process
- alignment elements in the site and elevation plan and in the cross-section.
- Problems of nature conservation and landscape management in road planning.
- Junction design on the open road
- Safety aspects in road planning

c)
The course deals with the basics of the structural maintenance of asphalt and concrete roads. The following topics are covered in detail

- Road damage and its causes
- Condition assessment and evaluation
- Road maintenance planning
- Road maintenance management systems
- Winter Road maintenance

Educational form / Language

a) Tutorial (1 WLH) / Lecture (1 WLH) / German
b) Tutorial (1 WLH) / Lecture (1 WLH) / German
c) Lecture (1 WLH) / German

Examination methods

• Written exam 'Pavement Construction and Maintenance' (120 min., Part of modul grade 100,0 %)
• Optional term paper to achieve bonus points amounting to approx. 20 % of the points required to pass the written exam (40 hours, submission deadline will be announced at the beginning of the semester)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 7,00 * 100 * FAK / DIV
FAK: The weighting factors can be taken from the table of contents.
DIV: The values can be taken from the table of contents.

Further Information

Fluid Mechanics

Strömungsmechanik

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-10/UI-10	5 CP	150 h	3. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Fluid Mechanics	a) 4 WLH (60 h)	a) 90 h	a) each winter

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Rüdiger Höffer

a) Prof. Dr.-Ing. Rüdiger Höffer

Admission requirements

Recommended previous knowledge:

Knowledge of advanced mathematics and mechanics

Learning outcome, core skills

After successfully completing the module, students will be able to

- recognize and explain fluid mechanics relationships from different subject areas and work with them mathematically.
- independently find solutions to fundamental problems in civil and environmental engineering based on the knowledge gained, solve the problems, and analyze the results.

Contents

a)

The lectures and exercises cover the necessary fundamentals of fluid mechanics and highlight practical problems and solutions with an emphasis on computational methods. The lecture covers the following topics:

- Fluid statics (hydrostatics, aerostatics)
- Dynamics of primarily incompressible, steady flows (conservation of mass, energy, and momentum)
- Incompressible, stationary pipe flows with friction and energy input
- Channel flow
- Potential theory
- Turbulent flow
- Flow around bodies and fluid dynamic surface pressures
- Brief introduction to computational fluid dynamics

Educational form / Language

a) Tutorial (2 WLH) / Lecture (2 WLH) / German

Examination methods

• Written exam 'Fluid Mechanics' (120 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed module final exam: Written exam

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 5,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Technical English for Civil Engineering I

Technical English for Civil Engineering I

Module number	Credits	Workload	Semester[s]	Duration	Group size
W04	5 CP	150 h	5. Sem.	1 Semester[s]	20

Courses	Contact hours	Self-study	Frequency
a) Technical English for Civil Engineering I	a) 4 WLH (60 h)	a) 150 h	a) each winter

Module coordinator and lecturer(s)

M.A. Julia Salzinger

a) M.A. Julia Salzinger

Admission requirements

Recommended previous knowledge:

Level B1 (Common European Framework of Reference for Languages)

Learning outcome, core skills

Students

- acquire language skills and knowledge required to communicate with business partners in the field of civil engineering in English-speaking countries and/or learn how to use English as a lingua franca. The focus is on developing and improving listening, reading, writing and speaking skills. To support and complete the acquisition of the content, important grammatical structures and special linguistic features will be repeated – partly through self-study.
- can effectively use appropriate strategies and linguistic structures to develop, write and present subject-specific issues.

Contents

a)

- Application of construction-related technical language in realistic and task-related role plays and discussions
- Reading and understanding simple technical texts
- Writing of short technical texts
- Grammar and vocabulary - needs-oriented expansion of the basics, subject-specific structures, e.g. the tenses, active and passive voice, if-clauses, etc.

Educational form / Language

a) Seminar / English / German

Examination methods

• Written exam 'Technical English for Civil Engineering I' (90 min., Part of modul grade 100,0 %)

• Compulsory attendance 'Technical English for Civil Engineering I - Course attendance' (0 h., ungraded, Preliminary work for the exam)

Requirements for the award of credit points

- Course attendance (75%)
- Passing the final module examination: written exa

Module applicability

- B.Sc. Civil Engineering

- B.Sc. Environmental Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 5,00 * 100 * FAK / DIV

FAK: The weighting factors can be taken from the table of contents.

DIV: The values can be taken from the table of contents.

Further Information

- Contact time: 2 hours per week in presence, 2 hours per week asynchronously via Moodle
- Forms of media: Power-Point presentations, handouts, board, interactive tasks on Moodle
- Literature: Will be provided on Moodle

Technical English for Civil Engineering II

Technical English for Civil Engineering II

Module number	Credits	Workload	Semester[s]	Duration	Group size
W05	6 CP	180 h	6. Sem.	1 Semester[s]	20

Courses	Contact hours	Self-study	Frequency
a) Technical English for Civil Engineering II	a) 4 WLH (60 h)	a) 120 h	a) each summer

Module coordinator and lecturer(s)

M.A. Julia Salzinger

a) M.A. Julia Salzinger

Admission requirements

Recommended previous knowledge:

Level B2 (Common European Framework of Reference for Languages)

Learning outcome, core skills

Students

- acquire foreign language skills at level C1 of the Common European Framework of Reference for Languages.
- develop the four communication skills - listening, reading, speaking and writing - in the area of Technical English.
- expand their knowledge of oral and written communication.
- are enabled to act in the foreign language in regard to their future professional activities.
- can work independently on a manageable task conceptually in English within a given time frame.
- acquire skills that are important for the realization of practice-relevant projects in an international context. The results are presented by the students in English in final presentations.

Contents

a)

The seminar will provide practice in effective language skills in professional situations: conducting technical discussions and negotiations as well as giving lectures and presentations. Pair and group work, role-playing, and discussions will be integrated. During the seminar, students will work on consolidating their subject-specific written communication skills through the preparation of reports, emails for everyday work situations, business letters, and correspondence in English. Grammar review and relevant fundamentals for academic writing and presentations in English are integrated into the course.

Students work on their project in small groups. The distribution of tasks among the students is determined in each group individually. The lecturer is responsible as supervisor and advisor and checks the results at specified intervals. The presentations are given by the students in English.

Educational form / Language

a) Seminar / English / German

Examination methods

• Term paper 'Technical English for Civil Engineering II - Homework' (60 h., Part of modul grade 100,0 %, Written project work (15 hours, 50%) and oral presentation (30 minutes, 50%))

• Compulsory attendance 'Technical English for Civil Engineering II - Course attendance' (0 h., ungraded, Course attendance (75%), Preliminary work for the homework)

Requirements for the award of credit points • Passed module final exam: Project work and oral presentation • Attendance at at least 75% of classes
Module applicability • B.Sc. Civil Engineering • B.Sc. Environmental Engineering
Weight of the mark for the final score Percentage of total grade [%] = 6,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Technical Microbiology

Technische Mikrobiologie

Module number	Credits	Workload	Semester[s]	Duration	Group size
UI-12	5 CP	150 h	6. Sem.	1 Semester[s]	120

Courses	Contact hours	Self-study	Frequency
a) Technical Microbiology	a) 4 WLH (60 h)	a) 90 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Marc Wichern

a) Prof. Dr.-Ing. Marc Wichern, Dr. rer. nat. Eva Heinz

Admission requirements

Recommended previous knowledge:

Urban water management

Learning outcome, core skills

The students

- are familiar with the main application areas of technical microbiology and the relevant microbial principles and processes,
- develop an understanding of the interrelationships and influencing factors of microbiology in urban water management and can apply this to further processes,
- can apply the knowledge gained from the lecture at a practical level and transfer it to specific problems,
- have the competence to plan and carry out experiments independently,
- practice initial approaches to scientific learning and thinking by preparing experiment protocols and analyzing the results,
- can deepen their understanding of the lecture content through individual or group calculation exercises and practice exemplary calculations.

Contents

a)

The course covers the basics of microbiology in technical systems:

- Significance of microbiology and the diverse application areas of microbial processes
- Introduction to microbiology and bacteria
- Microbiological degradation processes (aerobic and anaerobic)
- Enzymes (basics, influencing factors)
- Enzyme kinetics (regulation, inhibition)
- Degradability of substances
- Kinetics of microbial systems and reactor technology
- Sewage treatment plants (structure, function, biomass, biofilm, activated sludge, sludge age)
- Biological wastewater treatment (elimination of carbon, nitrogen compounds,and phosphorus)
- Current developments in wastewater treatment (e.g., microbial fuel cells)

The exercises deepen the lecture content and sample calculations are carried out for practice e.g. from enzyme kinetics.

The research exercise on technical microbiology that accompanies the lecture is intended to illustrate and deepen the knowledge acquired in the lecture.

Educational form / Language a) Tutorial (3 WLH) / Lecture (1 WLH) / German
Examination methods • Written exam 'Technical Microbiology' (60 min., Part of modul grade 100,0 %) • Term paper 'Training Technical Microbiology - Report research exercise' (15 h., Part of modul grade 0,0 %)
Requirements for the award of credit points • Passed module final exam: Written exam • Passed research exercise: Research exercise report • Attendance: Research exercise
Module applicability • B.Sc. Civil Engineering • B.Sc. Environmental Engineering
Weight of the mark for the final score Percentage of total grade [%] = 5,00 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information

Environmental law (excursion)

Umweltrecht (Exkursion)

Module number	Credits	Workload	Semester[s]	Duration	Group size
W10	1 CP	30 h	6. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Environmental law (excursion)	a) 1 WLH (15 h)	a) 30 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Marc Wichern

a) Dr. jur. Till Elgeti

Admission requirements

Recommended previous knowledge:

Lecture on environmental law

Learning outcome, core skills

The students

- know the main areas of application of general environmental law,
- have in-depth knowledge of special environmental law through concrete examples (spatial planning, nature conservation and landscape management, soil protection-, water protection-, pollution control-, water-, mining- and recycling management law).

Contents

a)

The course illustrates

- the basic requirements for authorisations set out in environmental law.
- specific installations which are relevant under environmental law in detail regarding authorisation and monitoring requirements.
- these installations under expert lead.

Educational form / Language

a) Excursion / German

Examination methods

• Seminar 'Environmental law (excursion)' (15 h., ungraded, participation in theexcursion with prior presentation [ungraded])

Requirements for the award of credit points

- Participation in the excursion and preliminary meeting

Module applicability

- B.Sc. Civil Engineering
- B.Sc. Environmental Engineering
- M.Sc. Civil Engineering
- M.Sc. Environmental Engineering
- M.Sc. Geoscience

Weight of the mark for the final score

Percentage of total grade [%] = 0, ungraded

Further Information
Registration takes place via the Chair of Urban Water Management and Environmental Technology. Students will be informed in good time via the Moodle course “Environmental Law.”

Environmental Engineering and Ecology

Umwelttechnik und Ökologie

Module number	Credits	Workload	Semester[s]	Duration	Group size
W06	3 CP	90 h	6. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Environmental Engineering and Ecology	a) 2 WLH (30 h)	a) 60 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Annette Hafner

a) Prof. Dr.-Ing. Annette Hafner

Admission requirements

Learning outcome, core skills

Students

- have a basic understanding of the fields of environmental technology and environmental planning,
- can characterize material flows in ecosystems
- learn the basics of the environmental assessment of building structures and can determine their relevance to sustainability and service life

Contents

a)

The lecture covers the fundamentals and strategies of sustainable development. The focus is on:

- global, European, and regional aspects (Sustainable Development Goals, Brundtland Report, European Sustainability Strategy, German Sustainability Strategy, etc.)
- conceptual and theoretical approaches (2000-watt society, sufficiency strategy, efficiency strategy, etc.) and their applicability to the construction industry
- aspects of water, waste, and vulnerability to environmental disasters

Educational form / Language

a) Tutorial (1 WLH) / Lecture (1 WLH) / German

Examination methods

• Written exam 'Environmental Engineering and Ecology' (60 min., Part of modul grade 100,0 %)

Requirements for the award of credit points

- Passed final module examination: written exam

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 3,00 * 100 * FAK / DIV

FAK: The weighting factors can be taken from the table of contents.

DIV: The values can be taken from the table of contents.

Further Information

Transportation and Traffic Engineering

Verkehrsplanung und -technik

Module number	Credits	Workload	Semester[s]	Duration	Group size
BI-14	8 CP	240 h	3./4. Sem.	2 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Fundamentals in Transportation and Traffic Engineering b) Design of Traffic Facilities	a) 4 WLH (60 h) b) 2 WLH (30 h)	a) 90 h b) 60 h	a) each winter b) each summer

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Justin Geistefeldt

a) Prof. Dr.-Ing. Justin Geistefeldt

b) Prof. Dr.-Ing. Justin Geistefeldt

Admission requirements

Recommended previous knowledge:

Advanced Mathematics A

Learning outcome, core skills

Students

- have a basic understanding of the interrelationships between traffic planning, road traffic ngineering, urban land-use planning, and urban road design,
- can reflect on and critically evaluate theories, methods, and empirical findings in transportation planning, traffic engineering, urban development, and road design,
- are able to understand and independently complete standard tasks,
- can assess the quality of calculation methods and results and evaluate the limitations of procedures.

Contents

a)

The course covers basic knowledge in traffic planning and road traffic engineering. This includes:

- Traffic analysis (survey and counting methods)
- 4-step algorithm of classic traffic planning:

1. Traffic generation models and forecasting methods
2. Traffic distribution
3. Modal split
4. Traffic assignment

- Kinematic fundamentals of traffic engineering
- Basic statistical concepts, queueing theory
- Traffic flow on roads, fundamental diagram
- Traffic engineering design of motorways and rural roads
- Traffic engineering design of intersections with right-of-way rules
- Planning and traffic engineering design of intersections with traffic lights
- Traffic noise
- Traffic safety
- Procedures for calculating the economic efficiency of infrastructure planning

b)
The lecture covers the design and traffic-oriented layout of road traffic facilities, including local public transport, primarily for urban areas. The following topics are covered in detail:

- Land use and urban development
- Road cross-sections
- Design of grade-separated intersections
- Facilities for pedestrian and bicycle traffic
- Facilities for stationary traffic

The technical fundamentals of traffic facility design are covered in lectures and discussed in relation to the objectives of safety, performance, environmental compatibility, and economic efficiency. Design techniques are practiced using practical examples in the exercises.

Educational form / Language
a) Tutorial (2 WLH) / Lecture (2 WLH) / German
b) Tutorial (1 WLH) / Lecture (1 WLH) / German

Examination methods
• Written exam 'Transportation and Traffic Engineering' (120 min., Part of modul grade 100,0 %)
• Optional homework to earn bonus points for the written exam (30 hours, deadline to be announced at the beginning of the semester)

Requirements for the award of credit points
- Passed module final exam: written exam

Module applicability
- B.Sc. Civil Engineering

Weight of the mark for the final score
Percentage of total grade [%] = 8,00 * 100 * FAK / DIV
FAK: The weighting factors can be taken from the table of contents.
DIV: The values can be taken from the table of contents.

Further Information

Materials Chemistry

Werkstoffchemie

Module number	Credits	Workload	Semester[s]	Duration	Group size
W02	2 CP	60 h	1. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) General Chemistry for Students of Geosciences, Biology, and Physics	a) 2 WLH (30 h)	a) 30 h	a) each winter

Module coordinator and lecturer(s)

Prof. Dr.-Ing. habil. Iurie Curosu

a) Prof. Dr. Dr. h.c. Anjana Devi, Prof. Dr.-Ing. habil. Iurie Curosu

Admission requirements

Learning outcome, core skills

Students

- explain and implement the fundamentals that are responsible for the behavior of materials based on atomic and molecular relationships.

Contents

a)

The lectures and exercises cover an introduction to the fundamentals of chemistry in relation to the material properties of matter. These include:

- Atomic/molecular structure
- Metals/non-metals
- Acids, bases, salts
- Redox reactions

Educational form / Language

a) Tutorial (1 WLH) / Lecture (1 WLH) / English

Examination methods

• Written exam 'Materials Chemistry' (60 min., Part of modul grade 100,0 %, Exam in the second half of the lecture period in the winter semester)

Requirements for the award of credit points

- Passed module final exam: Written exam (ungraded)

Module applicability

- B.Sc. Civil Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 2,00 * 100 * FAK / DIV

FAK: The weighting factors can be taken from the table of contents.

DIV: The values can be taken from the table of contents.

Further Information

Please note: This module is part of the Chemistry Department's lecture series “General Chemistry for Students of Earth Sciences, Biology, and Physics.” The courses for this module (civil engineers) only take

place during the first half of the winter semester (from the start of lectures until shortly before the end of the year).
Literature:

- beliebiges Schulbuch „Allgemeine anorganische Chemie“
- Henning/Knöfel, Baustoffchemie, Verlag für Bauwesen, Berlin 2002
- Scholz, Baustoffkenntnis, Wernerverlag, Düsseldorf 2003

Academic Writing

Wissenschaftliches Schreiben

Module number	Credits	Workload	Semester[s]	Duration	Group size
W12	3 CP	90 h	ab dem 4. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Academic Writing	a) 2 WLH (30 h)	a) 60 h	a) each sem.

Module coordinator and lecturer(s)

Dr. Janelle Pötzsch

a) Dr. Janelle Pötzsch

Admission requirements

Learning outcome, core skills

After successfully completing the module, students will be familiar with the basics of academic work and writing and will be able to

- develop goals
- convey messages
- formulate precisely and comprehensibly in a manner appropriate to the target audience
- visualize content
- document work and research steps
- use technical language
- present information appropriately
- separate facts and evaluations
- work in a goal- and results-oriented manner
- critically evaluate their own results

Contents

a)

The seminar introduces students to the basics of academic writing and is therefore highly practice-oriented. The aim of the seminar is to practice the writing skills necessary for producing an academic paper. Over the course of a semester, the following aspects are discussed and explored in depth both in the seminar and in the compulsory assignments:

- Text types and their respective conventions
- Standard structure of academic texts
- Outline of an academic paper
- Use of specialist literature
- Importance of citation
- Citation rules and bibliography
- Characteristics of academic language

Educational form / Language

a) Seminar / German

Examination methods

• Exercises 'Academic Writing' (45 h., ungraded, Moodle course accompanying the study program with mandatory exercises (details will be announced in the seminar))

Requirements for the award of credit points • Mandatory attendance at face-to-face sessions and completion of assignments
Module applicability • B.Sc. Civil Engineering
Weight of the mark for the final score Percentage of total grade [%] = 0, ungraded
Further Information every 14 days

Bachelor's degree program “Civil Engineering”
Curriculum

Status: 25.09.25

Module code	Module title	CP of the Module	Preper-formance	1. Semester				2. Semester				3. Semester				4. Semester				5. Semester				6. Semester			
				WiSe				SuSe				WiSe				SuSe				WiSe				SuSe			
				V	Ü	P	CP	V	Ü	P	CP	V	Ü	P	CP	V	Ü	P	CP	V	Ü	P	CP	V	Ü	P	CP
Compulsory modules																											
BI-01	Advanced Mathematics A	**8**		4	2	**K**	**8**																				
BI-02	Mechanics A	**9**		3	4	**K**	**9**																				
BI-03	Building Physics	**5**		2	2	**K**	**5**																				
BI-04	Construction Materials	**10**		2	2		**6**	2	2	**K**	**4**																
BI-05	Building Constructions	**5**						2	2	**K**	**5**																
BI-06	Advanced Mathematics B	**8**						4	2	**K**	**8**																
BI-07	Mechanics B	**8**						3	3	**K**	**8**																
BI-08	Engineering Informatics	**5**						2	2	**K**	**5**																
BI-09	Advanced Mathematics C	**5**										2	2	**K**	**5**												
BI-10	Fluid Mechanics	**5**										2	2	**K**	**5**												
BI-11	Structural Analysis A	**5**	**X**									2	2	**K**	**5**												
BI-12	Soil Mechanics and Foundation Engineering	**8**										3	3	**K**	**8**												
BI-13	Hydrology and Water Resources Management	**7**										1	1		**2**	2	1	**K**	**5**								
BI-14	Transportation and Traffic Engineering	**8**										2	2		**5**	1	1	**K**	**3**								
BI-15	Structural Analysis B	**8**	**X**													3	3	**K**	**8**								
BI-16	Reinforced and Prestressed Concrete Structures	**12**	**X**													3	2		**5**	2	3	**K**	**7**				
BI-17	Steel and Timber Structures	**12**	**X**													2	2		**4**	3	3	**K**	**8**				
BI-18	Urban Water Management	**8**														2	2		**5**	1	1	**K**	**3**				
BI-19	Pavement Construction and Maintenance	**7**																		3	2	**K**	**7**				
BI-20	Constr. operations a. construction process engin.	**8**																		3	1		**5**	1	1	**K**	**3**
BI-21	Building Information Modeling	**5**																						2	2	**K**	**5**
Bachelor's Thesis																											
BI-BA	Bachelor's Thesis	**12**																									**12**
Optional modules																											
	Physics for Engineers	**12**		2	1	**K**	**4**																				
	Materials Chemistry			1	1	**K**	**2**																				
	Geodesy and geoinformation							2	0	**K**	**3**																
	Technical English I		**X**																	2	2	**K**	**5**				
	Technical English II		**X**																					2	2	**S**	**6**
	Environmental Engineering and Ecology																							1	1	**K**	**3**
	Technical Microbiology																							1	3	**K**	**5**
	Construction Contract and Environmental Law																							2	0	**K**	**2**
	Occupational Health & Safety																							2	0	**K**	**2**
	Project																									**P**	**6**
	Foreign languages																										
	Modules from other Bachelor's degree programs																										
Total credit points		**180**																									
Total credit points (without optional modules)		**168**		**28**				**30**				**30**				**30**				**30**				**20**			
Total credit points (incl. optional modules, example)		**180**		**30**				**30**				**30**				**30**				**30**				**30**			

V / Ü **Weekly semester hours of the lecture / exercise**

P **Examination form of the final module examination:**

- **K** Written exam
- **S** Study related tasks
- **P** Project