Module Guide
Building Products and Processes

Faculty European Campus Rottal-Inn

Examination regulations 01.10.2026

Date: Wed 28.10.2026 15:28

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BPP-01 ENGINEERING MATHEMATICS

Module code	BPP-01
Module coordination	Prof. Dr. Matthias Hümmer
Course number and name	BPP-01 Engineering Mathematics
Semester	1
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Module Objective

This module provides students with fundamental knowledge of mathematical principles and methods that are essential for engineering applications. Students will develop a solid understanding of mathematical concepts, enhance their problem-solving skills, and apply analytical techniques to engineering-related problems.

Professional Competence

Expertise

Upon successful completion of the module, students will get to:

- Recognize and retrieve fundamental mathematical concepts, including set theory, real number fields, and logarithms.
- Identify and apply standard mathematical procedures for solving engineering-related problems.
- Interpret and analyze mathematical symbols, formulas, and objects, demonstrating an understanding of their significance in engineering contexts.
- Apply numerical and graphical solution methods to mathematical and engineering problems.

- Evaluate and manipulate complex numbers, matrices, and vector operations in engineering applications.
- Solve systems of linear equations using various mathematical techniques.
- Determine the convergence or divergence of sequences and series of real numbers.

Methodological Competence

Students will be able to:

- Execute vector operations and perform calculations with matrices and determinants.
- Implement numerical methods to obtain solutions for engineering-related problems.
- Transfer theoretical knowledge into practical applications through computational exercises and problem-solving tasks.
- Demonstrate proficiency in software-based mathematical computation tools.
- Organize and structure mathematical problem-solving strategies efficiently.
- Apply mathematical modeling techniques to represent engineering systems and analyze their behavior.

Personal Competence

Students will:

- Develop an analytical and structured approach to problem-solving in mathematical contexts.
- Enhance their ability to think critically and logically when tackling engineering problems.
- Strengthen their ability to work independently and self-organize mathematical learning processes.
- Gain confidence in using mathematical tools and techniques for engineering applications.

Social competence

Students will:

- Collaborate in small, multicultural teams to solve mathematical problems, enhancing teamwork and intercultural communication skills.

- Discuss and communicate mathematical concepts effectively within a group setting.
- Engage in peer discussions to verify and refine mathematical solutions.

Practical Components

To ensure hands-on learning, the module includes:

Students work collaboratively in small groups during tutorial sessions to solve structured worksheets and engineering-related mathematical problems. Through numerical and graphical methods, they analyze mathematical structures, verify solutions, and enhance their problem-solving skills in a cooperative learning environment

Applicability in this and other Programs

BPP- 06 Building Physics: Thermal and Moisture Protection

BPP-07 Building Physics: Building and Room Acoustics

BPP-11 Building Physics: Thermal Safety

BPP-12 Building Constructions

BPP-18 Structural Engineering

BPP-20 Construction Calculation

BPP-24 Fundamentals of Project Management and Planning

BPP-25 Project Execution and -Controlling

BPP-26 Commercial Management

Entrance Requirements

General entrance qualification for universities of applied sciences (German: *Fachhochschulreife*) in mathematics

Learning Content

Content

- Set theory
- Complex numbers
- Vector calculus and analytic geometry
- Calculating determinants and matrices with applications

- Systems of linear equations
- Sequences and series (of real numbers)
- Functions of a real variable
- (Plane) curves and their mathematical description
- Functions of several variables (introduction)

Teaching Methods

- Lectures, tutorials, and problem-solving sessions.
- Hands-on exercises involving computational tools (e.g., MATLAB, Python, or engineering calculators).
- Weekly practical assignments and group discussions.
- Online learning resources (iLearn) for supplementary material and self-study.
- Interactive workshops integrating theory with real-world applications.

Recommended Literature

- J. Erven, D. Schwägerl, Mathematik für Ingenieure, Oldenbourg Verlag, 4th edition, 3rd edition, 2010
- W. Mückenheim, Mathematik für die ersten Semester, Oldenbourg Verlag, 3rd edition, 2011
- Papula: Mathematik für Ingenieure und Naturwissenschaftler, Band 1 and 2. Springer
- Vieweg 2014
- Papula: Mathematische Formelsammlung für Ingenieure und Naturwissenschaftler.
- Springer Vieweg 2014
- Meyberg; Vachenauer: Höhere Mathematik Band 1 and 2. Springer 2003 and 2005

BPP-02 CHEMISTRY OF BUILDING MATERIALS

Module code	BPP-02
Module coordination	Prof. Dr. Roland Augustin
Course number and name	BPP-02 Chemistry of Building Materials
Semester	1
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Aims of the module

In the module, students acquire the basic knowledge of general, inorganic and organic chemistry in order to understand the essential composition of substances and materials. The aim is to derive basic properties and behaviors of materials and substances.

Professional competence:

Knowledge

- Students know the structure of matter at element and molecular level.
- They are able to understand and use the language of general chemistry (symbols, formulas, equations, solutions, concentrations).
- Students understand the basic properties of elements and molecules and are able to set up simple reaction equations.
- They are able to describe simple chemical reactions (acid-base reactions, redox reactions).

- Based on their knowledge of the state and reaction possibilities of matter, students know the essential properties of selected building materials and their behavior under external influences (e.g. corrosion).
- They are able to grasp the basics of cement chemistry and have knowledge of other mineralic materials like chalk and gypsum

Skills

- Ability to perform basic chemistry-related calculations, including quantities, units and chemical symbols.
- Ability to understand chemical problems and translate them into equations and apply the principles of chemistry to solve the problems.
- Ability to analyse the context of material based technical problems and to apply this to the design and development of technical systems and processes.

Personal competences

Social competence:

Students work both independently and in inter-culturally mixed teams, learning the ability to communicate progress and results in a practical way.

They are able to work in a structured and effective manner alone or in a team. Students acquire the ability to discuss complex topics with fellow students and find joint solutions.

Methodological competence:

Students acquire theoretical knowledge of basic chemical laws and interrelationships. After participating in this module, students are able to apply the theoretical knowledge they have acquired to practical issues and material-related aspects of various building materials. They will develop an awareness of possible material-related challenges that can occur in certain construction processes or during the service life of structures and learn how these can be avoided or minimized.

Applicability in this and other Programs

- **Lectures**
- BPP-03 Building Material Characteristics
- BPP-13 Testing of Building Materials
- BPP-18 Product Development and Testing
- **Study Programs**
- Bachelor, Master Civil Engineering

- Master Healthy and Sustainable Buildings

Entrance Requirements

Knowledge of basic mathematics and natural sciences

Learning Content

- Introduction to chemistry
- The periodic table of elements
- Atomic and molecular structure
- Condition of substances, aggregate states, phase transformations, modification
- Chemical bonding
- Chemical reactions (Acid-Base reactions, Solubility)
- Principles of physical chemistry
- Composition and properties of important materials (metals, cement, concrete)
- Cement Chemist Notation
- Chalk and Gypsum, production, properties and application
- Redox-reactions and corrosion processes

Teaching Methods

Seminaristic teaching, exercises, demonstration experiments.

Recommended Literature

Bendix, "Bauchemie für das Bachelor-Studium", 3rd edition, Springer Vieweg, 2017

Wiberg, Anorganische Chemie (Band 1&2), 103. Auflage, Walter de Gruyter & Co, Berlin, New York, 2017

Hewlett (Hrsg.), Lea's Chemistry of Cement and Concrete, 4. Auflage, Elsevier Science & Techn., 2003

S.S. Zumdahl,S.A. Zumdahl, D., J. DeCoste; Chemistry; 10th edition ; Cengage Learing; Bosten 2016

J.T. Moore, Chemistry for Dummies; 2nd edition, Wiley; Hoboken; 2011

BPP-03 BUILDING MATERIAL CHARACTERISTICS

Module code	BPP-03
Module coordination	Prof. Dr. Roland Augustin
Course number and name	BPP-03 Building Material Characteristics
Semester	1
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Aims of the module

In the module, students acquire basic knowledge and practical skills in the application of modern building materials in the construction of buildings. The aim is to develop an understanding of the material-specific properties and to understand the strengths and limitations of common building materials.

Professional competence:

Knowledge

After successfully completing the module, students will have knowledge in the following areas:

- Fundamentals of the physical, chemical and mechanical properties of building materials.
- Material-specific characteristic data on strength, specific masses, deformability, ageing behavior and UV resistance, thermal conductivity and storage properties, fire resistance, water permeability.
- Assessment of building materials with regard to their physical and mechanical properties and their use in shell construction and interior finishing.

- Application of building materials/combinations of building materials in new and existing buildings

Skills:

Upon successful completion, students will have knowledge of

- the physical, chemical and mechanical properties of the most important building materials
- the production and extraction of building materials
- the determination of physical and technical properties

Personal competences

Social competence:

Students work both independently and in interculturally mixed teams, learning the ability to communicate progress and results in a practical way.

They are able to work in a structured and effective manner alone or in a team. Students acquire the ability to discuss complex topics with fellow students and find joint solutions.

Methodological competence:

Students learn to select building materials on the basis of requirement profiles, such as mechanical and physical properties. The aspects of sustainability and durability are also taken into account in the selection process.

They acquire the ability to assess building materials in existing buildings on the basis of important properties such as ageing behavior and strengthening.

Due to the increased demands on materials, basic knowledge of the selection of building materials is imparted, taking into account economic efficiency and sustainability through resource-saving material composition.

Applicability in this and other Programs

- **Lectures**
- BPP-12 Building Constructions
- BPP-13 Testing of Building Materials
- BPP-18 Product Development and Testing
- **Study Programms**
- Bachelor, Master Civil Engineering

- Master Healthy and Sustainable Buildings

Entrance Requirements

Knowledge of basic mathematics and natural sciences

Learning Content

- Principles of building materials
- General basic terms and classification
- Concrete / reinforced concrete, incl. cement, sand and aggregates
- Principles of plastics and polymer materials including baiscs of organic chemistry
- Principles of surface protection of concrete with polymers
- Bitumen and asphalt
- Wood and wood materials
- Metals and non-ferrous metals
- Mineral building materials (natural stone, glass, masonry, mortar, chalk and gypsum)
- Thermal insulation materials (synthetic and natural materials) incl. external thermal insulation composite systems
- Recycled building materials

Teaching Methods

Seminaristic teaching, exercises, demonstration experiments

Remarks

Recommended Literature

Neroth, G. / Vollenschaar, D. (2011): Wendehorst Baustoffkunde: Grundlagen - Baustoffe - Oberflächenschutz. Vieweg + Teubner, Wiesbaden.

Stark, Jochen: Zement und Kalk: Der Baustoff als Werkstoff, 2. Auflage, Springer Vieweg 2013

Stark, J., Wicht, B.:Dauerhaftigkeit von Beton 2. Auflage, Springer Vieweg 2013

Leaflets and information from Deutsche Bauchemie (DBC) and the German Cement Works Association (VdZ) as well as other trade associations (timber construction and others.)

Handouts for the course, lecture materials in iLearn

BPP-04 BUILDING INFORMATICS AND AI

Module code	BPP-04
Module coordination	Prof. Dr. Matthias Hümmer
Course number and name	BPP-04 Building Informatics and AI
Semester	1
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Module Objectives

The "Construction Informatics" learning module teaches the fundamentals of data processing, visualization, and programming in engineering. It provides practical explanations of how these techniques can be used in applications and project work to efficiently solve engineering problems. Furthermore, the possibilities offered by artificial intelligence are explained using examples and integrated into the lectures.

Knowledge:

Students will acquire

- basic knowledge about the following:
  - computer science for engineers (applied computer science)
  - implementation of engineering tasks in a table calculation
  - noting standards and guidelines in programme sequence controls
  - programming and controlling microcontrollers
- use of microcontrollers in measurement technology and automation

Skills:

With the acquired knowledge, students should be able to

- establish the fundamentals in a table calculation
- carry out calculations and analyses
- report using diagrams and tables
- program microcontrollers

Competences:

After successful completion, students will be able to:

- carry out data analyses and process series of measurements
- prepare dynamic reports
- understand standardised programming / programme sequence controls
- understand controlling via actuators and sensors
- measurement data acquisition via sensors

Social Competence

Through group project work, students learn how to work effectively in teams as well as how to manage and coordinate projects. Hybrid collaboration is specifically practiced in the first semester, combining online and offline formats to promote exchange among students and integrate modern working methods.

Methodological Competence

The "Construction Informatics" module is taught in a practical way through examples and project work to deepen skills. The goal is to understand the structure and design of applications and to successfully implement engineering tasks using Excel, programming, and AI. Students learn the basics of Excel, data analysis, visualization, and microcontroller programming. The possibilities offered by AI are integrated and illustrated with examples. In group projects, they practice teamwork, project management, and hybrid collaboration by combining online and offline formats.

Applicability in this and other Programs

- Lectures:
  - BPP-14 Digital Building Process (BIM 4D to 6D)
  - BPP-08 CAD 2D / 3D (BIM)
- Study Programs:
  - Bachelor, Master Civil Engineering
  - Bachelor, Master Architecture
  - Master Healthy and Sustainable Buildings

Entrance Requirements

Learning Content

Basics of building informatics

- Basics in a table calculation
- Import and adjust data series (e.g. measurement data)
- Reporting with diagrams and tables
- Standardised programming (programme sequence control)
- Automation with macros / VBA
- Programming microcontrollers (e.g. Arduino, SPS)
- Controlling and switching via actuators, sensors, humidity protection

Teaching Methods

Lecture, exercises and examples, practice project

Remarks

Recommended Literature

References:
Stephan Nelles: Excel im Controlling, Rheinwerk Computing; 4. Edition (28 April 2019)
Harald Nahrstedt: Excel + VBA für Ingenieure: Programmieren erlernen und technische Fragestellungen lösen, Springer Vieweg; 6th current and revised 2021 edition (11 February 2021)
Danny Schreiter: Arduino: Kompendium: Elektronik, Programmierung und Projekte; BMU Verlag (5 July 2019)

Course handouts

https://support.microsoft.com/de-de/office/
o https://learn.microsoft.com/de-de/office/vba/library-reference/concepts/getting-started-with-vba-in-office
o https://www.tinkercad.com/
o https://docs.arduino.cc

BPP-05 GERMAN A1

Module code	BPP-05
Module coordination	Tanja Mertadana
Course number and name	BPP-05 German A1
Semester	1
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	8
ECTS	10
Workload	Time of attendance: 0hours self-study: 180hours virtual learning: 120hours Total: 300hours
Type of Examination	See examination schedule AWP and languages, written ex. 120 min.
Duration of Examination	120min.
Weighting of the grade	10/240
Language of Instruction	German

Module Objective

The German A1 module aims to enable students to understand and use simple written and oral information.

The four skills (listening, reading, writing and speaking) are introduced: The course aims to enable students to read and understand elementary texts and dialogues. Students should also be able to understand particularly slow and clearly spoken utterances. The course also introduces oral communication skills allowing students to deal with everyday topics with the help of the conversation partner. Students should be able to write short sentences and messages.

As part of this module, basic vocabulary and elementary grammar are introduced. In addition, the language skills are used and developed in real-life situations, such as asking and answering simple questions on everyday topics, describing familiar topics in short sentences, engaging in simple interactions in everyday life, such as going shopping, placing orders in restaurants or asking for directions.

Specifically, students completing the module will achieve the following learning outcomes:

Professional skills

At Level A1, students should be able to:

- Understand and answer simple instructions, questions and queries with the help of the conversation partner.
- Discuss basic everyday topics with the help of the conversation partner.
- Read short and simple texts and grasp basic information contained in them.
- Write simple sentences and messages, e.g. a short e-mail or a postcard.

Methodological skills

Methodological skills here refer to students' ability to apply a variety of learning and working methods so that they may further build on their linguistic and professional knowledge.

- Application of basic learning strategies in order to learn and consolidate vocabulary and grammar structures.
- The use of dictionaries and online resources in order to understand unknown terms and expressions.
- Completion of elementary written exercises and tasks in order to consolidate what they have learned.
- Comprehend simple listening exercise.
- Interact and exchange views with other students in learning groups.

Social skills

Social skills here refer to students' ability to conduct themselves appropriately, communicate effectively and work in groups when engaging in social interactions.

- Polite, respectful communication in simple everyday situations, e.g. when asking for information or exchanging views and opinions.
- Collaboration when completing group exercises and working with a partner in order to solve tasks.
- Participating in basic projects and sharing their own experiences and ideas.

Personal skills

Personal skills here refer to students' individual abilities, attitudes and traits that enable them to achieve their goals, develop personally and work successfully.

- Motivation for and commitment to learning German.

- Openness and curiosity to tackle new topics.
- Sense of responsibility for their own learning development and achievement of the learning goals.
- Ability to self-reflect and identify their own strengths and weaknesses.
- Willingness to ask questions to resolve uncertainties.

Applicability in this and other Programs

Not applicable in other degree programmes.

Entrance Requirements

None.

Learning Content

Grammar and vocabulary are the core elements of this course. Important aspects that are addressed in the course are: Regional studies, intercultural competence and pronunciation. Numbers, hobbies, daily routines, food, leisure activities, illnesses and professions are some of the topics covered in the course. Additional topics will be included in line with current literature and real-life developments. Below is an extract of the grammar topics that will be covered:

- Present and perfect tense
- Sentence structure
- Prepositions
- Accusative and dative
- Parataxis (main clause connectors)

Teaching Methods

The teaching methods applied will focus on improving the four skills (listening, speaking, reading and writing). Examples of the applied learning methods include various forms of group, individual and collaborative work, mini-presentations, exercises involving intensive reading and listening, role plays and grammar games, loci method, dictation exercises, translations, peer feedback, working with learning stations, and various writing activities designed to consolidate the content learnt. It is also envisaged that projects will be carried out using the scenario method.

Students will be given weekly assignments for self-study.

Remarks

All language courses require a compulsory attendance rate of 75% in order to be allowed to take the examination.

Recommended Literature

Textbooks:

Netzwerk neu A1.1, Kurs- und Übungsbuch mit Audios und Videos, Klett Verlag, Lektionen 1-6 (ISBN 978-3-12-607154-3)

Netzwerk neu A1.2, Kurs- und Übungsbuch mit Audios und Videos, Klett Verlag, Lektionen 7-12 (ISBN 978-3-12-607155-0)

Recommended reading:

Grammatik Intensivtrainer A1. Langenscheidt (ISBN 978-3-12-606359-3)

A-Grammatik (Niveau A1-A2). Schubert (ISBN 978-3-941323-09-4)

Einfach Grammatik Übungsgrammatik Deutsch A1 - B1. Langenscheidt (ISBN 978-3-12-606368-5)

Wortschatz & Grammatik A1: Buch, Hueber (ISBN 978-3-19-397493-8)

Deutsch intensiv Wortschatz A1: Das Training, Klett (ISBN 978-3-12-675069-1)

Prüfungstraining Start Deutsch 1, 2. Auflage Cornelsen Verlag (ISBN 978-3-06-020747-3)

BPP-06 BUILDING PHYSICS: THERMAL AND MOISTURE PROTECTION

Module code	BPP-06
Module coordination	Prof. Dr. Markus Hainthaler
Course number and name	BPP-06 Building Physics: Thermal and Moisture Protection
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Aims of the module

The learning objective of this module is to gain a practical understanding of thermal and hygric building physics. Students will develop the ability to design functional constructions while considering legal requirements in both planning and execution.

A particular focus is on understanding heat and moisture transport processes in building components and applying this knowledge to create energy-efficient and durable structures.

Additionally, the module covers summer and winter thermal protection to ensure climate comfort and energy efficiency. Students will also become familiar with relevant standards and regulations to ensure compliance with legal requirements.

Professional competence:

Knowledge

After successfully completing the module, students will have knowledge in the following areas:

Fundamentals of:

- Heat and moisture transport
- Heat and moisture storage in building components

Measurement techniques for building component and building analysis:

- Heat transfer
- Moisture measurements
- Airtightness testing
- Requirements for legally mandated thermal insulation and the development of practical solutions for new and existing buildings
- Building envelope planning
- Focus on airtightness and the prevention of thermal bridges to minimize energy loss and prevent structural damage
- Evaluation criteria for indoor climate assessment
- Fundamentals of building ventilation
- Natural and mechanical ventilation
- Moisture protection in building components
- Considerations for usage, rain protection, and prevention of rising damp

Skills:

Upon successful completion, students will have knowledge of

- Preparation and verification of thermal insulation reports in accordance with legal requirements.
- Development and optimization of building component designs with a focus on thermal and moisture protection, ensuring energy-efficient, durable, and damage-free structures.
- Calculation of economic efficiency, including payback period analysis, to evaluate and demonstrate the cost-effectiveness of construction and renovation measures.

Personal competences

Social competence:

Through group project work, students learn effective teamwork, as well as project management and coordination. Starting in the first semester, hybrid collaboration is specifically practiced by combining online and offline formats. This approach fosters student interaction and integrates modern working methods into the learning process.

Methodological competence:

The teaching in the Building Physics module provides practical methodological skills through examples, experiments, and project work, giving students a realistic insight into professional practice.

Through group work, different concepts are compared and subsequently discussed, fostering critical thinking and teamwork.

Applicability in this and other Programs

- **Lectures**
  - BPP-03 Building Materials Characterstics
  - BPP-12 Building Constructions
  - BPP-29 Sustainable Building
  - BPP-30 Building Envelope and Supporting Structures
  - BPP-36 Building in Existing Structures and Deconstruction
- **Study Programs**
  - Bachelor, Master Civil Engineering
  - Master Healthy and Sustainable Buildings

Entrance Requirements

Learning Content

Fundamentals of Thermal and Moisture Protection:

- Legal requirements
- Computational assessment of construction products and building structures
- Steady-state and transient heat conduction

- Planning and verification of airtightness
- Ventilation concepts
- Requirements for summer thermal protection
- Moisture transport in building components
- Moisture protection

Teaching Methods

Seminaristic teaching, exercises, demonstration experiments

Remarks

Recommended Literature

- Reguvis Fachmedien GmbH; Schneider Bautabellen
- Gebäudemodernisierungsgesetz (GModG)
- DIN 4108, DIN EN ISO 6946, DIN EN ISO 7345, DIN EN ISO 9229, DIN EN ISO 9972, DIN EN ISO 10077. DIN EN ISO 10456
- Bauphysikalische Formeln und Tabellen, Werner Verlag, Hrsg. Hohmann, Setzer, Wehling

BPP-07 BUILDING PHYSICS: BUILDING AND ROOM ACOUSTICS

Module code	BPP-07
Module coordination	Prof. Dr. Markus Hainthaler
Course number and name	BPP-07 Building Physics: Building and Room Acoustics
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/210
Language of Instruction	English

Module Objective

Aims of the module

The learning objective is to acquire the fundamentals of building and room acoustics to design building components and structures in accordance with acoustic requirements.

The module covers both the minimum sound insulation requirements and higher performance standards.

In addition to building design, students receive hands-on training in acoustic measurement techniques in the laboratory, including airborne and impact sound measurements as well as room acoustic assessments.

Professional competence:

Knowledge

After successfully completing the module, students will have knowledge in the following areas:

Fundamentals of:

- Acoustics
- Noise protection
- Building acoustics Planning and requirements
- Room acoustics Planning and requirements
- Acoustic properties of building components and materials
- Measurement techniques in building and room acoustics:
- Building service systems noise assessment

Requirements for legal regulations

Requirements for noise protection and emissions control

Skills:

Upon successful completion, students will have knowledge of

- Preparation and verification of sound insulation reports, including the calculation and evaluation of constructions
- Development and optimization of building component designs
- Room acoustic planning and assessment
- Evaluation of noise impact forecasts

Personal competences

Social competence:

Through group project work, students learn effective teamwork, as well as project management and coordination. From the first semester, hybrid collaboration is specifically practiced by combining online and offline formats. This approach promotes student interaction and integrates modern working methods into the learning process.

Methodological competence:

The teaching in the Building Physics module provides practical methodological skills through examples, experiments, and project work, giving students a realistic insight into professional practice.

Through group work, different concepts are compared and subsequently discussed, fostering critical thinking and teamwork.

Applicability in this and other Programs

- **Lectures**
  - BPP-03 Building Material Characteristics
  - BPP-12 Building Constructions
  - BPP-29 Sustainable Buildings
  - BPP-30 Building Envelope and Supporting Structures
  - BPP-36 Building in Existing Structures abd Deconstruction
- **Study Programs**
  - Bachelor, Master Civil Engineering
  - Master Healthy and Sustainable Buildings

Entrance Requirements

Learning Content

Fundamentals of Building and Room Acoustics

- Basic principles of acoustics
- Noise protection and emission control
- Legal requirements
- Preparation of sound insulation reports
- Room acoustics planning
- Acoustic measurements
- Impact and airborne sound insulation
- Building service systems noise assessment

- Room acoustics

Teaching Methods

Seminaristic teaching, exercises, demonstration experiments

Remarks

Recommended Literature

- DIN 1320, DIN 4109, DIN 18005, DIN 18041, DIN EN 12354, DIN EN ISO 3382, DIN EN ISO 10052, DIN EN ISO 354, DIN EN ISO 717, DIN EN ISO 16283, DIN EN ISO 9613, VDI 2569, VDI 2720
- TA-Lärm Technische Anleitung zum Schutz gegen Lärm
- Bauphysikalische Formeln und Tabellen, Werner Verlag, Hrsg. Hohmann, Setzer, Wehling

BPP-08 CAD 2D / 3D (BIM)

Module code	BPP-08
Module coordination	Prof. Dr. Ahmed Khoja
Course number and name	BPP-08 CAD 2D / 3D (BIM)
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	6
Workload	Time of attendance: 60hours self-study: 120hours Total: 180hours
Type of Examination	Portfolio
Weighting of the grade	6/240
Language of Instruction	English

Module Objective

Qualification goals:

Students will acquire fundamental knowledge and practical skills in construction and architectural drawings, the application of 2D-CAD, and 3D Building Information Modeling (BIM). The goal is to develop a comprehensive understanding of technical drawings, the structuring and management of CAD and BIM files, and the interaction between them, as well as the use of drawing symbols and abbreviations according to common standards.

Professional Competence

Knowledge

Upon completing this module, students will gain:

- Fundamentals of freehand and construction drawing.
- Basic and applied knowledge in 2D-CAD planning and construction using software applications for 2D/3D design and construction.
- Essential foundations and methods of 2D/3D CAD construction and 3D BIM modeling, including:
- Types of construction drawings and representation methods.
- Scales and scaling in technical drawings and CAD models.

- Digital drafting, tools, data structures, and data management.
- A fundamental understanding of Building Information Modeling (BIM) and its applications in the planning and construction process.
- Basics of common data exchange formats in CAD and BIM

Skills:

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

- Understand the basics of construction and architectural drawings, including symbols for building drawings, and correctly apply them in drawings.
- Independently configure user interfaces of CAD and BIM software.
- Apply 2D-CAD drawing and construction methods as well as 3D-BIM modeling to create 2D construction drawings and 3D models while managing data in a structured manner.
- Create simple and complex visualizations in CAD and BIM, including scale-accurate annotations and the generation of floor plans, sections, and views.
- Comprehend and implement building design tasks using both 2D-CAD and 3D-BIM models, model objects based on requirements, and optimize them.
- Understand BIM processes in construction planning and execution and create, edit, and manage 3D-BIM models.
- Identify and apply relevant guidelines and standards for construction plans.

Personal Competences:

Students work individually or in small teams on internal 2D-CAD and 3D-BIM projects to learn how to efficiently solve problems both independently and collaboratively. This strengthens their teamwork and problem-solving skills. Additionally, these groups are composed of multicultural teams to foster and refine students intercultural interaction abilities.

Methodological Competence

Students learn to apply theoretical knowledge to 2D-CAD and 3D-BIM projects in construction and building products, enhancing their theoretical understanding and practical skill transfer. They gain a comprehensive overview of different competencies and theories, enabling them to choose the most efficient approach for applying 2D-CAD and 3D-BIM projects.

Furthermore, students develop analytical and system-oriented thinking, allowing them to independently use AutoCAD and BIM for effective construction and modeling tasks.

Applicability in this and other Programs

- Lectures:
  - BPP-14 Digital Construction Process (BIM 4D to 6D)
  - BPP-32 Seminar on Product Development
  - BPP-33 Project Seminar
- Degree Programs:
  - Bachelors and Masters in Civil Engineering
  - Bachelors and Masters in Architecture
  - Masters in Healthy and Sustainable Buildings

Entrance Requirements

Learning Content

Principles of 2D/3D-CAD - Planning:

- Technical drawing standards, including paper formats, layouts, abbreviations, and symbols.
- Basics of professional practice in architectural drawing, including freehand and hand-drawing techniques.
- Introduction to CAD software user interface: basic orientation and workspace setup.
- Fundamentals of working with CAD software: 2D and 3D construction (visualization).
- Logical structure of CAD drawings up to scale-accurate printing.
- Understanding scales and scaling in technical drawings and their application in CAD models.
- Fundamentals of parametric planning and model-based data acquisition through 2D sketching and the creation of initial object-oriented 3D models.
- Creation of construction drawings (annotations, line types, dimensioning, modification techniques).

Fundamentals of Planning and Construction with BIM:

- Introduction to BIM software user interface: basic orientation and workspace setup.
- Key concepts and terms (phases, model, information, collaboration).
- Differences between 2D-CAD and 3D-BIM.
- Creating and editing 3D models.
- Development of building data and components.
- Modeling of architecture, structure, and technical systems (M&E).
- Surface, wireframe, and volume models.
- Floor plan creation, views, dimensioning, hatching, and layer structures.
- Generation of building components such as masonry, reinforced concrete, and timber walls, as well as windows, doors, roofs, stairs, etc.
- Execution planning (detailed construction drawings).
- Creation of construction drawings in the form of floor plans, elevations, sections, and details.
- Data exchange and compatibility between various BIM tool

Teaching Methods

Lecture, exercises and examples, practice project, CAD software, BIM software, PowerPoint presentations, whiteboard

Remarks

Recommended Literature

- Manuals from CAD software manufacturers such as Autodesk
- Skript und Unterlagen aus der Vorlesung
- Benton, B. C., & Omura, G. (2023). Mastering AutoCAD 2023 and AutoCAD LT 2023. Wiley.
- Yori, R., Kim, M., & Kirby, L. (2019). Mastering Autodesk Revit 2020. John Wiley & Sons.
- Neufert, E. (2019). Architects data. John Wiley & Sons.

- Wakita, Osamu A., Linde, Richard M.: The Professional Practice of Architectural Working Drawings, 6th Edition, 2024
- Astour, Habeb, and Henriette Strotmann. Lehrbuch Grundlagen der BIM-Arbeitsmethode. Springer Fachmedien Wiesbaden, Wiesbaden, 2022.
- Handbücher der CAD und BIM Software Hersteller wie z.B. Autodesk oder Revit
- Weitere Literatur wird in der Vorlesung bekanntgegeben

BPP-09 INTERCULTURAL COMPETENCES AND SELF-ORGANIZATION

Module code	BPP-09
Module coordination	Prof. Dr. Michelle Cummings-Koether
Course number and name	BPP-09 Intercultural Competences and Self-Organization
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	4
Workload	Time of attendance: 60hours self-study: 60hours Total: 120hours
Type of Examination	Portfolio
Weighting of the grade	4/240
Language of Instruction	English

Module Objective

Acting across cultures and the necessary capabilities to do so is an important part of social skills that are required to act in a global world. These skills are also an important component for managers who focus on international matters within their companies, whether it's the management of international teams, customer support, or other processes within the company.

Cross-cultural differences can have an impact on effective collaboration, and these differences are often not recognised until misunderstandings have taken place. Recognising or countering such situations before they arise, and then resolving them, is a key part of cross-cultural skills and effective management. This ability to recognise cultural differences and to react appropriately to them can lead to more successful working relationships. Cross-cultural awareness is the ability to see your own cultural pattern and to understand the cultural patterns of other people, as well as to find ways of reducing misunderstandings and conflicts for future cultural interactions.

Upon completing the course, students should have the following capabilities and skills:

Theoretical competences and skills:

- Knowledge and understanding of the most important theories, concepts, and models in intercultural communication and management.
- The ability to collaborate with other cultures to achieve a shared level of understanding, based on analysis of similarities and differences.
- Being effective in international environments, particularly the international realm of the construction industry.
- Understand, resolve, and recognise cultural issues and how these can have an impact on a working and management level.
- Recognise how stereotypes and prejudices can arise in interactions between cultures.
- The ability to distinguish between the different types of culture and leadership styles.

Methodological skills:
Students will be able to understand how cultures develop and change over time. They can consider and recognise specific types of behaviour and recognise which cultural standards drive such behaviour, and can adapt their own conduct so that they can react appropriately. They are able to analyse the effectiveness of collaboration with others on different levels, which go beyond mere capabilities, and to look for cultural patterns that fit well with their own.

- Students will have developed oral and written presentation skills. They demonstrate teamwork, the ability to ask questions and to listen.
- They show understanding of how cultural factors can have an impact on certain situations within the international realm of the construction industry.

The module explores intercultural skills, cultural identity and cultural diversity from a strategic, organisational and und business perspective, as well as how these are visible in various sectors.

Personal and social skills:

- The ability to understand your own cultural patterns and attitudes.
- The ability to improve your own tolerance of cultural differences.
- Increased cultural and emotional intelligence.

Applicability in this and other Programs

none

Entrance Requirements

Learning Content

Students will be able to work more effectively in international environments, and also to communicate more effectively with colleagues from cultures that are different to their own. This is a skill that is useful for all aspects of the construction industry.

Application of intercultural theory to management attitudes. The students are better equipped to successfully resolve cross-cultural issues and conflicts as well as potential misunderstandings. The students can recognise and apply the most common management methods for intercultural and international situations. This can be applied on various management courses.

Teaching Methods

- Group discussion
- Interactive discussion
- Interactive exercises
- Presentations
- Case studies
- Independent research and analysis

Recommended Literature

Recommended reading (if possible in the most current edition):

- Deresky, H. (2017). *International Management: Managing across Borders and Cultures*. New Jersey: Pearson.
- Hofstede, G. (2010). *Cultures and Organizations: Software of the Mind*. New York: Mcgraw-Hill.
- Kawamura, K.M. (2015). *Cross Cultural Competence. A Field Guide for Developing Global Leaders and Managers*. Bingley: Emerald Group Publishing.

- Lewis, R.D. (2005). *When Cultures Collide: Leading Across Cultures*. Boston, MA: Nicholas Brealey International.
- Meyer, E. (2016). *The Culture Map*. New York: Public Affairs.
- Moran, R.T.; Harris, P.R.; Moran, S.V. (2010). *Managing Cultural Differences: Global Leadership Strategies for Cross-Cultural Business Success.* London: Routledge.
- Smith, P.B. (2006). When Elephants Fight, the Grass Gets Trampled: The GLOBE and Hofstede Projects: Commentary. *Journal of International Business Studies*, 37(6), pp. 915-921.
- Sowell, T. (2019). *Discrimination and Disparities*. New York: Basic Books.
- Trompenaars, F. & Hampden-Turner, C. (2011). *Riding the Waves of Culture: Understanding Diversity in Global Business*. Boston, MA: Nicholas Brealey International.

BPP-10 GERMAN A2

Module code	BPP-10
Module coordination	Tanja Mertadana
Course number and name	BPP -10 German A2
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	8
ECTS	10
Workload	Time of attendance: 180hours self-study: 120hours Total: 300hours
Type of Examination	See examination schedule AWP and languages, written ex. 120 min.
Duration of Examination	120min.
Weighting of the grade	10/240
Language of Instruction	German

Module Objective

The German A2 module aims to enable students to understand basic information communicated orally and in writing.

It aims to enable students to read and understand elementary texts and dialogues. They will simultaneously develop their listening skills so as to allow them to hold conversations and oral presentations. Students will improve their verbal communication skills, enabling them to deal with everyday topics, and will develop the ability to write simple texts and brief statements.

The module also builds a basic vocabulary range and knowledge of basic grammar. Students will also apply the acquired linguistic knowledge in practical activities, such as discussions, presentations or role plays. Intercultural skills will also be developed.

Specifically, students completing the module will achieve the following learning outcomes:

Subject-specific skills

At Level A2, students should be able to:

o Comprehend and respond to basic instructions, questions and enquiries.

- Engage in conversations on basic everyday topics.
- Read short texts and grasp basic information contained in such texts.
- Write texts in a basic form, e.g. descriptions or expressions of opinion.

Methodological skills

Methodological skills here refer to students' ability to apply a variety of learning and working methods so that they may further build on their linguistic and subject-specific knowledge.

- Application of basic learning strategies in order to learn and consolidate vocabulary and grammar structures.
- The use of dictionaries and online resources in order to understand unknown terms and expressions.
- Completion of elementary written exercises and tasks in order to consolidate what they have learned.
- Comprehend elementary listening exercises.
- Discuss and exchange views with other students in learning groups.

Social skills

Social skills here refer to students' ability to conduct themselves appropriately, communicating effectively and working successfully in groups when engaging in social interactions.

- Polite, respectful communication in elementary everyday situations, e.g. when asking for information or exchanging views and opinions.
- Collaboration when completing group exercises and working with a partner in order to solve tasks.
- Participating in basic discussions and sharing their own experiences and ideas.

Personal skills

Personal skills here refer to students' individual abilities, attitudes and traits that enable them to achieve their goals, further their personal development and to work successfully.

- Motivation for and commitment to learning German.
- Openness and curiosity to tackle new topics.
- Sense of responsibility for their own learning development and achievement of the learning goals.

- Ability to self-reflect and identify their own strengths and weaknesses.
- Willingness to ask questions in order to resolve uncertainties.

Applicability in this and other Programs

Not applicable in other degree programmes.

Entrance Requirements

To participate in this module, students need to pass the examination German A1 first.

Learning Content

Grammar and vocabulary form the core elements of this course. The following key aspects are covered during the course: regional studies, intercultural skills and pronunciation. Media, functions and events, jobs, transport sport and leisure are just some of the topics treated in this course. Additional topics will furthermore be incorporated in keeping with current literature and real-life developments. The following is an extract of the grammar topics that will be covered:

- Past tense
- Subordinate clauses
- Declension of adjectives
- Dual-case prepositions
- Indirect questions

Teaching Methods

The teaching methods applied will focus on improving the four main language skills (listening, speaking, reading and writing). Examples of the applied learning methods include various forms of group, individual and collaborative work, mini-presentations, exercises involving intensive reading and listening, role plays and grammar games, loci method, dictation exercises, translations, peer feedback, working with learning stations, and various writing activities designed to consolidate the content learnt. It is also envisaged that projects will be carried out using the scenario method.

Students will be given weekly assignments for self-study.

Remarks

In all language courses, students will be required to meet a minimum attendance rate of 75%.

Recommended Literature

Textbooks:

Netzwerk neu A2.1, Kurs- und Übungsbuch mit Audios und Videos, Klett Verlag, Lektionen 1-6 (ISBN 978-3-12-607162-8)

Netzwerk neu A2.2, Kurs- und Übungsbuch mit Audios und Videos, Klett Verlag, Lektionen 7-12 (ISBN 978-3-12-607163-5)

Recommended reading:

Grammatik Intensivtrainer A2. Langenscheidt (ISBN 978-3126063609)

A-Grammatik (Niveau A1-A2). Schubert (ISBN 978-3-941323-09-4)

Einfach Grammatik Übungsgrammatik Deutsch A1 - B1. Langenscheidt (ISBN 978-3-12-606368-5)

Wortschatz & Grammatik A2: Buch, Hueber (ISBN 978-3198574935)

Deutsch intensiv Wortschatz A2: Das Training, Klett (ISBN 978-3126750745)

Prüfungstraining DaF: A2 - Fit in Deutsch 2, Cornelsen Verlag (ISBN 978-3-06-121261-2)

BPP-11 BUILDING PHYSICS: FIRE PROTECTION

Module code	BPP-11
Module coordination	Prof. Dr. Ahmed Khoja
Course number and name	BPP-11 Building Physics Fire Protection
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

The objective of this module is to provide a fundemnetal understanding of fire protection. The focus is on the legal requirements for buildings as well as the fire protection properties of building components and materials. Special attention is given to the requirements for escape routes, fire alarm systems, and fire extinguishing equipment. Additionally, smart firefighting technologies, intelligent building monitoring systems and structural measures to limit fire spread, including compartmentation and structural protection mechanisms are examined. To enhance practical understanding real-world examples are discussed.

Professional Competence

Knowledge

Upon completion of the module, students will gain knowledge in:

- Fundamentals of fire behavior: ignition, flame propagation, and fire management.
- Fire and smoke control systems: detection, smoke management, and fire suppression systems.
- Influence of building structure, usage, and environmental factors on fire protection measures.
- Standard temperature curves.

- Building classifications and requirements.
- Special buildings and their specific requirements.
- Compartmentation and structural measures to limit fire spread.
- Fire resistance classes and testing methods.
- Verification of usability for building components and materials according to national and European regulations.
- Smart firefighting technologies and real-world case studies from recent fire incidents.
- Intelligent fire protection systems and digital technologies for firefighting operations.
- Regulatory frameworks such as Eurocode, BayBo, and MBO.
- System knowledge of fire-resistant constructions for building structures, interior finishes, building envelopes, and fireproofing of technical installations.
- Laboratory tests for fire resistance evaluation.

Skills

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

- Understand and implement fire protection concepts.
- Assess fire risks in building structures and develop preventive measures.
- Plan escape and rescue routes.
- Understand the application of fire detection and extinguishing systems.
- Evaluate and integrate fire protection measures based on current regulatory requirements and intelligent fire protection systems.
- Understand methods to limit fire spread and prevent structural collap

Personal Competence

Social Competence

Through group project work, students learn effective teamwork as well as project management and coordination. Starting in the first semester, hybrid collaboration is intentionally practiced by combining online and offline formats to enhance student interaction and integrate modern working methods.

Methodological Competence

The teaching of building physics provides practical methodological competencies through examples, experiments, and project work to give students realistic insights into professional practice. Group work involves comparing and discussing different concepts, fostering critical thinking and teamwork skills.

Applicability in this and other Programs

- **Lectures:**
  - BPP-03 Building Materials Science
  - BPP-12 Building Construction
  - BPP-30 Building Envelope
  - BPP-29 Sustainable Building
  - BPP-36 Building in Existing Structures and Deconstruction
- **Degree Programs:**
  - Bachelors and Masters in Civil Engineering
  - Bachelors and Masters in Architecture
  - Masters in Healthy and Sustainable Building

Entrance Requirements

Learning Content

Fundamentals of Fire Protection:

- Fundamentals of fire behavior: ignition, flame propagation, and fire management.
- Legal regulations for fire protection: current MBO, LBO, technical building regulations, VVTB, DIN 4102-4, special construction regulations (high-rise buildings, accommodation facilities, assembly buildings, etc.), officially introduced fire protection guidelines, and Eurocode.
- Building structure, usage, and environmental factors for optimized fire protection concepts.
- Structural fire protection for escape routes (required corridors/stairwells).
- Fire-resistant building components for structural, interior, and facade applications, along with verification of usability.

- Fire behavior of materials and building components, including national and European testing procedures and classification systems.
- Design of fire protection reinforcement measures for load-bearing steel and timber columns and beams.
- Fireproofing solutions for technical building services, such as electrical, piping, and ventilation systems.
- Digital technologies for fire simulation and evacuation planning.

Teaching Methods

PowerPoint presentations, whiteboard, exercises, and project work.

Remarks

Recommended Literature

- Huang, X., & Tam, W. C. (Eds.). (2024). Intelligent Building Fire Safety and Smart Firefighting. Springer.
- International Code Council. (2021). Fire Safety for Very Tall Buildings: Engineering Guide. Springer Nature.
- Zehfuß, Jochen. (2020). Guideline Fire Protection Engineering - TR04-01. 4th revised edition, GFPA (Vfdb).
- BayBo, MBO, DIN 4102-4, Brandschutzatlas.
- Additional literature will be announced in the lecture.

BPP-12 BUILDING CONSTRUCTIONS

Module code	BPP-12
Module coordination	Prof. Dr. Ahmed Khoja
Course number and name	BPP-12 Building Constructions
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Aims of the module

The aim of the module is to provide students with a fundamental understanding of how building structures work. Students learn to trace vertical and horizontal load paths and explain how structural strength, stiffness and overall stability are achieved. They also develop an understanding of the roles of foundations and load-bearing and non-load-bearing elements within a building. The module introduces the students to various structural systems, and to the properties , applications and limitation of common structural materials, such as steel, timber and concrete, as well as their use in hybrid systems. Through practical exercises, lectures and case study analysis, students develop the ability to select an appropriate structural system for a given building task, justify their choice and analyse how and why a structure may deform or fail.

Professional competence:

Knowledge

After successfully completing the module, students will have knowledge in the following areas:

Fundamentals of:

- Construction principles
- Soil and foundation types for structures
- Structural requirements for constructions
- Material selection
- Types of building loads
- Load-bearing and non-load-bearing elements

Skills:

Upon successful completion, students will have knowledge to

- Identify and distinguish between common structural systems and their principal elements
- Select an appropriate structural system and material for a simple building task
- Develop simple structural concepts and represent them through sketches and physical models
- Explain and justify structural and material choices in relation to loads, spans and intended use
- Identify possible causes of deformation or structural failure and propose appropriate improvements

Personal competences

Social competence:

Through group project work, students learn effective teamwork, as well as project management and coordination. Moreover, they learn how to communicate technical ideas clearly by presenting and discussing alternative structural solutions, they develop the ability to give and receive constructive feedback and to reach reasoned decisions as a group.

Methodological competence:

The Building Construction module develops practical methodological skills through examples, experiments, and individual and group project work, providing students with realistic insights into professional practice. Students either independently or in a group develop structural solutions and compare and discuss different concepts in groups, fostering critical thinking, personal responsibility, and teamwork.

Applicability in this and other Programs

- **Lectures**
  - BPP-13 Testing of Building Materials
  - BPP-18 Structual Engineering
  - BPP-30 Building Envelope
  - BPP-36 Building in Existing Buildings
- **Study Programs**
  - Bachelor, Master Civil Engineering / Architecture
  - Master Healthy and Sustainable Buildings

Entrance Requirements

Successful completion of the following modules is recommended:
o BPP 06 Building Physics: Thermal and Moisture Protection
o BPP 07 Building Physics: Building and Room Acoustics
o BPP 11 Building Physics: Fire Protection
o BPP 03 Building Material Characteristics

Learning Content

Fundamentals of

- Structural principles and structural families, including load paths.
- Building loads and structural behaviour under tension, compression, bending, shear, and buckling.
- Failure mechanisms of structural systems and elements.
- Common structural systems, including wall, frame, truss, arch, cable, tensile, and beam-and-slab systems.

- Building cores and their role in high-rise buildings, including lateral stability, vertical circulation, service integration, and spatial organisation.
- Soil and foundation principles.
- Load-bearing and non-load-bearing elements and the interaction between the structure and building envelope.
- Construction principles and material behaviour of masonry, reinforced concrete, timber, steel, glass, and hybrid systems.
- Structural and material selection, basic construction processes, and construction-site implementation.

Teaching Methods

Lectures / exercises / tutorials / homework and demonstration experiments

Whiteboard, PowerPoint presentation, document camera (visualiser) and additional lecture materials in iLearn

Experiments in small groups using training material that relays on professional computer-based experimentation system where multimedia combines cognitive and hands-on training units into a comprehensive unified concept enabling students to consolidate theoretical building blocks and practical skills for a maximum learning effectiveness.

Remarks

Recommended Literature

Lecture scripts and materials.

Moro, José Luis. Baukonstruktion-vom Prinzip zum Detail: Band 1 Grundlagen. Springer-Verlag, 2024.

Moro, José Luis. Baukonstruktion-vom Prinzip zum Detail: Band 2 · Konzeption Springer-Verlag, 2024.

Moro, José Luis. *Baukonstruktion-vom Prinzip zum Detail: Band 4 Prinzipien*. Springer-Verlag, 2024.

Schittich, C., Staib, G., Balkow, D., Schuler, M., & Sobek, W. (2012). Glass construction manual. Walter de Gruyter.

Engel, Heino. Tragsysteme: Structure systems. Germany, Hatje Cantz Verlag GmbH, 2030.

BPP-13 TESTING OF BUILDING MATERIALS

Module code	BPP-13
Module coordination	Prof. Dr. Roland Augustin
Course number and name	BPP-13 Testing of Building Materials
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Aims of the module

In this module, students acquire basic knowledge and practical skills in the testing of materials for the construction sector. The aim is to understand the process of materials testing from the selection of test specimens, the selection of the correct test parameters through to the evaluation of the results.

Professional Competence:

Knowledge

After successfully completing the module, students will have basic knowledge of the following areas:

- mechanical technological testing methods
- destructive and non-destructive testing
- determination of building physics characteristics
- Laboratory knowledge and handling of test equipment (calibration, etc.)
- Fundamentals of measurement uncertainty and test equipment monitoring

Skills:

Students should use the knowledge they have acquired to

- be able to make decision criteria for the selection of tests;
- be able to define selection criteria for test specimen selection;
- be able to evaluate, present and interpret measurement results

Personal competences

Social competence:

Students work both independently and in intercultural mixed teams and learn the ability to communicate progress and results in practice. They acquire the knowledge to discuss and evaluate different interpretations of the results.

They are able to work in a structured and effective manner alone or in a team. Students acquire the ability to discuss the complex issues of the examinations and the correct use of measuring equipment with fellow students and to find joint solutions. This team-oriented work is encouraged through experiments and practical applications.

Methodological competence

After successfully completing the course, students will be able to understand the basic requirements of material testing. Through the practical application and execution of tests, they will learn the basics of handling test equipment, the correct selection of test specimens and the interpretation of test results. They are able to define monitoring plans for material and quality control and also carry out statistical evaluations. As a result, they are also able to deal with measurement uncertainties and take these into account in the classification.

Applicability in this and other Programs

- **Lectures**
  - BPP-18 Product Development and Testing
  - BPP-23 Seminar Product Development
- **Study Programs**
  - Bachelor, Master Civil Engineering

Entrance Requirements

Successful completion of the following modules is recommended.

BPP-01: Engineering Mathematics

BPP-03: Building Material Characteristics

Learning Content

- Basics of mechanical and technological testing methods
- Basics of building physics testing
- Basics of destructive and non-destructive testing
- Selection, preparation and handling of test specimens
- Handling laboratory equipment, calibration and function control
- Determination of measurement uncertainties
- Basics of quality management according to DIN EN ISO 17025
- Evaluation and interpretation of measurement data
- Statistical evaluations

Teaching Methods

Lecture, exercises and examples, practical experiments

Remarks

Recommended Literature

Measurement and testing standards (national and international) of the respective materials;

Classification of the materials according to the areas of application and description of the tests in the national and international regulations (DIBt, DAStB, classification standards - national and international - incl. CE marking, Annex ZA of the respective product standard)

Testing and classification in accordance with special international requirements (IMO, ASTM)

DIN EN ISO 17025

Technical data sheets for the respective test devices

Lecture notes in iLearn

Handouts for the course

BPP-14 DIGITAL BUILDING PROCESS (BIM 4D TO 6D)

Module code	BPP-14
Module coordination	Prof. Dr. Matthias Hümmer
Course number and name	BPP-14 Digital Building Process (BIM 4D to 6D)
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Qualification goals:

In the module, students acquire basic knowledge and practical skills in the application of 3D Building Information Modeling (BIM) as well as the extended dimensions 4D to 6D (i.e. time, cost and sustainability aspects). The aim is to effectively structure, manage and apply BIM data to efficiently plan and implement construction projects.

Professional Competence

Knowledge

After successfully completing the module, students will have knowledge in the following areas:

- Fundamentals of Building Information Modeling (BIM) and an understanding of the different dimensions and phases in BIM.
- 4D and 5D BIM planning
- Ability for 4D planning, i.e. schedules for controlling and monitoring the construction phases, including target/actual comparisons.
- Knowledge of 5D cost planning, which enables precise cost control and provides verifiable measurements for invoicing.

- Fundamentals of sustainability and its use in the context of 6D BIM by dealing with the ecological, economic and social aspects of sustainability, including the circular economy and the consideration of buildings as future sources of raw materials.
- BIM in the construction process
- Basics of BIM implementation, including client information requirements and BIM execution plans (BAP).
- Roles and responsibilities in BIM projects and change management, with a particular focus on the human factor.
- Introduction to the most important BIM use cases and standards, such as openBIM approaches, buildingSMART standards (IFC, MVD, IDM, BCF).
- Fundamentals of BIM model types, coordination techniques and the use of collaboration platforms such as DALUX and BIM360, as well as basic knowledge of BIM data structures.
- Introduction to lean management methods such as the Last Planner System, cycle planning, short-cycle communication, 3D costing, cost groups according to DIN 276 and model-based tenders.

Skills:

After successfully completing the module, students will be able to

- navigate confidently in a BIM project environment and define or identify specific 4D, 5D and 6D BIM project objectives to solve tasks in a targeted manner.
- integrate time planning (4D), cost management (5D) and sustainability or life cycle aspects (6D) into project processing.
- actively participate in collaborative BIM teams that work in compliance with BIM methods and thus make a significant contribution to the success of construction projects.
- Understand the importance of 4D, 5D and 6D BIM for optimizing project control and the life cycle of a building.
- Recognize measures to meet the requirements of 4D (construction scheduling), 5D (cost control) and 6D (life cycle management) BIM. You will be able to formulate and successfully implement these requirements in a BIM execution plan (BAP) in collaboration with other trades and companies.
- Implement BIM-based planning in a practical manner, carry out collision-free planning and create improved quantity takeoffs and precise target/actual comparisons for cost and schedule planning (5D and 4D).

Personal Competences:

Students work both independently and in small teams on projects within the module in order to develop their ability to work efficiently alone and together on problem solutions and to put their knowledge into practice. This strengthens their teamwork and problem-solving skills.

They are able to work in a structured and effective manner, both alone and in teams, and, thanks to the interdisciplinary nature of the course, are able to adopt different professional perspectives and constructively contribute to the project work.

Methodological Competence

Students learn to acquire theoretical knowledge for the understanding of 4D to 6D BIM construction projects and to transfer this to practical applications. They acquire the ability to formulate planning tasks in BIM projects in a discipline-specific manner. They understand the special features of interdisciplinary project planning and are able to recognize and define the necessary interfaces between the disciplines involved. They recognize requirements and the need for coordination for joint, model-based planning between the various project participants and can propose appropriate solutions to ensure efficient collaboration in the BIM process.

This enables them to apply the skills they have learned in a targeted manner, resulting in better retention of theory and sustainable transfer of skills to real construction projects. They gain an overview of different skills and theories and can choose the most efficient approach for their application.

Applicability in this and other Programs

- Lectures:
  - BPP-32 Seminar on Product Development
  - BPP-33 Project Seminar
- Degree Programs:
  - Bachelors and Masters in Civil Engineering
  - Bachelors and Masters in Architecture
  - Masters in Healthy and Sustainable Buildings

Entrance Requirements

Successful completion of the following modules is recommended:

- BPP-08 CAD 2D / 3D (BIM)

Learning Content

- Origin and history of the BIM concept. Definition of BIM, BIM phases with an in-depth introduction to BIM 4D to 6D
- BIM planning phases and process management
- Information models (LOD, LOG and LOI) and BIM model structure
- Fundamentals of the Common Data Environment and BIM data structures Database fundamentals for BIM as well as networking and exchanging BIM data, e.g. via IFC
- Fundamentals of sustainability and efficiency as well as circular economy realized via 6D-BIM
- Coupling and possible applications of innovative technologies in BIM (such as artificial intelligence, catalogue systems, software, augmented reality (AR), virtual reality (VR)

Teaching Methods

BIM authoring software, PowerPoint presentation, Laboratory works, whiteboard, document camera (visualizer) and more

Lecture materials in iLearn

Remarks

Recommended Literature

- Baldwin, Mark (2019). Der BIM-Manager, Praktische Anleitung für das BIM-Projektmangement, BEUTH, 2018, 2. Aufl.
- Benton, B. C., & Omura, G. (2021). Mastering AutoCAD 2023 and AutoCAD LT 2023*. Wiley.
- Borrmann, André (2022). Building Information Modeling, Technologische Grundlagen und industrielle Praxis, Springer-Verlag, 2. Auflage
- Braun, A., Tuttas, S., Stilla, U., & Borrmann, A. (2018). Building Information Modeling-Technology Foundations and Industry Practice. In Building Information ModelingTechnology Foundations and Industry Practice. Springer International Publishing..
- Kröger, S. (2018). BIM und Lean Construction: Synergien zweier Arbeitsmethodiken. Beuth Verlag.

- Tzortzopoulos, P., Kagioglou, M., & Koskela, L. (Eds.). (2020). Lean construction: Core concepts and new frontiers. Routledge..
- Sacks, R., Eastman, C., Lee, G., & Teicholz, P. (2018). BIM handbook: A guide to building information modeling for owners, designers, engineers, contractors, and facility managers. John Wiley & Sons. .
- DIN EN ISO 19650. (n.d.). Organisation und Digitalisierung von Informationen zu Bauwerken und Ingenieurwerken, einschließlich Bauwerksinformationsmodellierung (BIM) Informationsmanagement mit BIM*. Berlin: DIN.
- ISO 19650-1:2018. Organization and Digitization of Information about Buildings and Civil Engineering Works, including BIM. Geneva: ISO.
- DIN EN 17412. (n.d.). Bauwerksinformationsmodellierung Stufe der Information. Berlin: DIN.
- ISO/TS 12911:2012. Framework for Building Information Modeling (BIM) Guidance. Geneva: ISO.
- ISO 29481-1:2016. Building Information Modeling Information Delivery Manual (IDM). Geneva: ISO.
- DIN EN ISO 14040. (n.d.). Umweltmanagement Ökobilanz Grundsätze und Rahmenbedingungen*. Berlin: DIN.
- Wang, L., & Xu, Y. (2019). Artificial intelligence in design and construction (https://www.iaarc.org/publications/2019_proceedings_of_the_36th_isarc/artificial_intelligence_techniques_to_support_design_and_construction.html)
- Deng, Min & Menassa, Carol. (2021). From BIM to digital twins: A systematic review of the evolution of intelligent building representations in the AEC-FM industry. Journal of Information Technology in Construction. 26. 58-83. 10.36680/j.itcon.2021.005.
- Vasey, L., & Menges, A. (2020). Potentials of cyber-physical systems in architecture and construction. In Construction 4.0 (pp. 90-112). Routledge.
- Additional literature recommendations are provided in the lecture

BPP-15 SCIENTIFIC WORK

Module code	BPP-15
Module coordination	Prof. Dr. Tobias Bader
Course number and name	BPP-15 Scientific Work
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	3
ECTS	3
Workload	Time of attendance: 45hours self-study: 45hours Total: 90hours
Type of Examination	Portfolio
Weighting of the grade	3/240
Language of Instruction	English

Module Objective

Professional Competence

Knowledge
Students are able to:

- Assess interdisciplinary scientific research topics and applications
- Discuss underlying theories of research models
- Explain strategies of research problem analysis
- Describe structure of scientific and technical publications

Skills
Students are capable to:

- Address theoretical and/or experimental work for solving practice-oriented problems
- Plan and structure project work and evaluate work in progress
- Address research questions with quantitative research methods
- Analyse data and critically evaluate and interpret the results
- Document scientific work and results, present and discuss them

- Apply citation and referencing standards
- Structure and conceptualize reports and scientific papers

Personal competence

Social competence
The students will be able to:

- Apply concepts and models of intercultural communication for higher effectiveness in international environments
- Communicate and collaborate successfully and respectfully with others in a team
- Have constructive professional discussions
- Do collaborative work on a small research project and deliver results
- Present and defend the results of their work

Autonomy
The students will be able to:

- Apply theoretical concepts to practical applications
- Acquire knowledge in a specific context independently and to map this knowledge onto other research fields

Applicability in this and other Programs

Project Work, Bachelor Thesis

Entrance Requirements

Learning Content

The module provides the basics for developing skills and competences in applying scientific and research methods in both individual and collaborative working contexts focusing on:

- Introduction to methods in scientific work
- Code of ethics of engineers, plagiarism
- Working in collaboration with others in a multicultural international environment

- Planning research work efficiently: planning and scheduling
- Methodical and systematic approach to the handling of complex tasks
- Introduction to quantitative research methods
- Processing and presenting scientific data and results
- Dissemination of results, written and oral communication
- Practicing in teams addressing simple research questions under the form of small research projects
- Writing technical reports and scientific papers
- Oral presentation of the work and discussion of the results

Teaching Methods

Students are closely cooperating to carry out a small research project as a team work which they document as a first written paper. Applying the taught content into a practical work the students are training their competences acquired during their studies, and in the first part of the course, in a self-responsible and self-guided manner, fulfilling to specific tasks of the small projects.
Team work also includes promoting intercultural competence development by reflecting on personal identities and differences, principles of collective strength and advantages of being supported by a team. The module addresses language used depending on the context, what favours and inhibits communication, how to deal with critical situations as well as on attributions, responsibilities within a collaborative team working, among others

Remarks

Recommended Literature

- Kate L. Turabian, A Manual for Writers of Research Papers, Theses, and Dissertations, 8th Ed., Chicago Press 2013
- Charles Lipson, How to Write a BA Thesis: A Practical Guide from Your First Ideas to Your Finished Paper, Chicago Press 2005
- Dalgaard, P. Introductory statistics with R, Springer 2008

BPP-16 ENGLISH NEGOTIATIONS

Module code	BPP-16
Module coordination	Tanja Mertadana
Course number and name	BPP-16 English Negotiations
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	2
ECTS	2
Workload	Time of attendance: 30hours self-study: 30hours Total: 60hours
Type of Examination	See examination schedule AWP and languages, written ex. 60 min.
Duration of Examination	60min.
Weighting of the grade	2/240
Language of Instruction	English

Module Objective

The module English 2 (Negotiations) at level C1 aims to equip students with specialised language skills necessary for independent performance in a globalised field of building products and processes. The course focuses on negotiating terms and conditions with a variety of people from customers to suppliers as well as with government agencies and employees in the student's own company. The aim here is to deepen the students' relationship with the English language in a professional context so that they can use the language effectively and efficiently as a practical means of communication.

The module covers the four basic language skills - listening, reading, speaking and writing. Students expand their subject-specific vocabulary and deepen their knowledge of the language structures.

One aspect of the module is to optimise fluency and improve the ability to communicate in English in order to better understand texts and discussions. Through task-based speaking, listening, reading and writing activities, students improve their communicative skills and develop their ability to express themselves. This enables them to participate in technical discussions, to work in a team, to create relevant documents independently, and to successfully negotiate in English.

On completion of the module, the students will have achieved the following learning objectives:

Professional skills

- The students will be proficient in English at a confident language level (C1, CEFR) and will also be able to understand technical discussions in the field of building products and processes
- They will have the skills to understand specialised literature and to write texts independently at C1 level
- Students will have acquired the skills to express themselves at C1 level in formal and professional contexts
- They will be able to understand discussions and more complex content in their field of specialisation
- They will have developed the ability to functionally apply grammatical structures in their future professional fields
- Students will have the linguistic skill and flexibility to react competently to unexpected changes during a conversation

Methodological skills

- Students will have expanded their language acquisition skills by reflecting on their individual learning styles
- They will be able to filter information from different English sources and use it in a purposeful way during a negotiation
- Students will be able to represent their own position vis-à-vis another party in a negotiation
- Similarly, students will have learnt to respond to the negotiating partner at the right point in the discussion to ensure that agreement is reached without compromising their own position
- This course gives students the language skills they need to say the right thing at the right time

Social skills

- Students will have developed social skills such as teamwork, reliability, and negotiation skills
- Students will have learnt assertiveness in negotiations and how to deal respectfully with negotiating partners

Personal skills

- Students will have developed sound language skills and negotiating skills that are of fundamental importance for their personal development and the future work environment

Applicability in this and other Programs

No applicability in other degree programmes.

Entrance Requirements

Successful completion of the following modules is recommended.

The prerequisite for successful participation in the module is a command of the English language at B2/C1 level, based on the Common European Framework of Reference for Languages (CEFR).

Learning Content

1. What is a negotiation?
2. Goal setting and team preparation
3. Negotiating in different cultures
4. Writing tenders
5. Different types of persuasion and negotiation
6. Dealing with pressure
7. Listening carefully and reading between the lines
8. What does "fair" mean?
9. Short-term vs. long-term results
10. Different types of results
11. Follow-up and measurement of success
12. Paraphrasing and summarising skills
13. Idiomatic expressions

Teaching Methods

Teaching and learning methods focus on improving the four main language skills (listening, speaking, reading and writing) and optimising professional and soft skills. Examples of teaching methods used include various forms of group and individual work, mini-presentations, intensive reading and listening exercises, role-play and grammar games, loci method, dictation exercises, translations, peer feedback, work with learning stations, and various writing activities to consolidate the knowledge gained.

Students will be given weekly assignments for self-study.

Remarks

All language courses require a compulsory attendance rate of 75% in order to be allowed to take the examination.

Recommended Literature

Baade, K., Holloway, C. et al *Business Result: 2nd ed.: Advanced*., Oxford: OUP, 2018.

Brook-Hart, G. *Business Benchmark*. 2nd ed.: Advanced Cambridge:CUP, 2013.

Dubicka, I., O?Keeffe, M., *Market Leader Advanced.* Harlow: Pearson Longman, 2016.

Emmerson, P. *Business English Handbook Advanced*. London: Macmillian, 2007.

Hall, D., Foley, M. *MyGrammarLab Advanced (C1 /C2)*, Harlow: Pearson

LaFond, C., Vine, S., Welch, B. *Short Course Series - Englisch im Beruf - Business Skills ? B1/B2: English for Negotiating*, Berlin: Cornelsen, 2009.

Meyer, E. *The Culture Map: Decoding How People Think, Lead, and Get Things Done Across Cultures.* Public Affairs: New York, 2016.

Ury, W., Fischer, R. *Getting to Yes: Negotiating Agreement Without Giving In. Penguin: New York*, Third Edition, 2011.

Voss, C., Raz, T., *Never Split the Difference: Negotiating As If Your Life Depended On It*, Harper Business: London, 2017.

BPP-17 GERMAN B1 / PART 1 + 2

Module code	BPP-17
Module coordination	Tanja Mertadana
Course number and name	BPP-17 German B1 / part 1 + 2
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	See examination schedule AWP and languages, written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	German

Module Objective

The module German B1/ part 1 + 2 focuses on improving students' communication skills and expanding their vocabulary range. It also aims to broaden their comprehension of more complex texts communicated in writing and orally, such as articles and reports. The module furthermore trains their ability to comprehend and engage in longer conversations and discussions on a variety of topics.

This module covers the first part of the level B1. Level B1 is completed with the module German B1/ part 3 + 4 in the following semester.

The main emphasis of the module is to improve students' verbal skills so as to enable them to express opinions, ideas and experiences. By writing coherent texts, such as reports, letters or argumentation will be applied as means of further enhancing their writing skills. The module will also involve deepening students' grammar knowledge and expanding their range of vocabulary. This will enable them to apply the acquired linguistic skills to practical situations, such as in presentations, role plays or group discussions. Their intercultural skills will be broadened, enabling them to communicate in international environments. The course incorporates a diverse range of activities; group work, pair work, role plays, discussions, listening and reading comprehension. The aim of the module is to prepare students for real-life situations.

Specifically, students completing the module will achieve the following learning outcomes:

Professional skills

At Level B1, students should be able to:

- Read texts of a more complex nature and comprehend specific information contained in them.
- Actively engage in discussions and conversations, exchange views and opinions and present arguments.
- Give an account of a variety of topics, both orally and in writing, such as advantages and disadvantages, technological developments or future trends.
- Apply and comprehend subject-specific terminology and vocabulary.
- Hold basic presentations and answer questions on these.

Methodological skills

Methodological skills here refer to students' ability to apply a variety of learning and working methods so that they may further build on their linguistic and subject-specific knowledge.

- Application of various learning strategies in order to broaden and deepen their vocabulary and knowledge of grammatical structures.
- Use of authentic materials, such as specialist articles, presentations or videos for self-research and learning purposes.
- Independently plan, organise and carry out written tasks and projects.
- Treat complex listening exercises, e.g. expert interviews or discussions.
- Work in collaboration and interactively with other students in group work and projects.

Social skills

Social skills here refer to students' ability to conduct themselves appropriately, communicate effectively and work in groups when engaging in social interactions.

- Effective oral communication in a variety of contexts, e.g. in presentations, discussions or group work.
- Ability to actively listen and respond appropriately to opinions and viewpoints expressed by other students.
- Collaboration in group projects and teamwork in order to collectively solve tasks.

- Intercultural sensitivity and the ability to work with students of various cultural backgrounds.

Personal skills

Personal skills here refer to students' individual abilities, attitudes and traits that enable them to achieve their goals, further their personal development and operate successfully.

- Independence and personal initiative when learning German.
- Organisational skills in order to plan and accomplish tasks and projects.
- Tenacity and perseverance on the road to achieving the learning goals and overcoming challenges.
- Critical thinking and the ability to form and uphold their own opinions.
- Confidence in their own abilities and their application of learnt knowledge.

Applicability in this and other Programs

Not applicable in other degree programmes.

Entrance Requirements

To participate in this module, students need to pass the examination German A2 first.

Learning Content

Grammar and vocabulary form the core elements of this course. The following key aspects are covered during the course: Regional and cultural studies, intercultural competence and pronunciation. Holidays/travel, technology/devices, complaints, job hunting and the environment are just some of the topics covered during this course. Additional topics will furthermore be incorporated in keeping with current literature and real-life developments. The following is an extract of the grammar topics that will be covered:

- Infinitive clauses
- Subordinate clauses
- Passive voice
- Connectors
- Prepositions
- Pronominal adverbs
- n-declension

- Subjunctive II

Teaching Methods

The teaching methods applied will focus on improving the four main language skills (listening, speaking, reading and writing). Examples of the applied learning methods include various forms of group, individual and collaborative work, mini-presentations, exercises involving intensive reading and listening, role plays and grammar games, loci method, dictation exercises, translations, peer feedback, working with learning stations, and various writing activities designed to consolidate the content learnt. It is also envisaged that projects will be carried out using the scenario method.

Students will be given weekly assignments for self-study.

Remarks

In all language courses, students will be required to meet a minimum compulsory attendance rate of 75%.

Recommended Literature

Textbook:

Netzwerk neu B1.1, Kurs- und Übungsbuch mit Audios und Videos, Klett Verlag Lektionen 1-6 (ISBN 978-3-12-607170-3)

Recommended reading:

Grammatik aktiv: A1-B1, Cornelsen Verlag (ISBN 978-3-06-122964-1)

Übungsgrammatik für die Grundstufe: Lösungsheft, Hueber Verlag (ISBN 978-3-922989-70-7)

Fit in Grammatik B1, Hueber Verlag (ISBN 978-3-19-607493-2)

Deutsch als Fremdsprache, Übungsgrammatik für die Grundstufe Niveau A2-B2, Liebaug-Dartmann (ISBN 978-3-922989-70-7)

Wortschatz & Grammatik B1: Buch (deutsch üben), Hueber (ISBN 978-3194874930)

Deutsch intensiv Wortschatz B1: Das Training, Klett (ISBN 978-3126750769)

BPP-18 STRUCTUAL ENGINEERING

Module code	BPP-18
Module coordination	Prof. Dr. Markus Hainthaler
Course number and name	BPP-18 Structual Engineering
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Students will acquire

- basic knowledge about the following:
  - the importance, structure and objectives in statics, the concept of security
  - structure of a static calculation
  - load determination
  - compilation and analysis of forces and momentum
  - equilibrium of forces and momentum in the level
- knowledge of the backgrounds behind load assumptions and knowledge with the relevant national German annex for net weight, payloads, wind loads, and snow loads

Skills:

With the acquired knowledge, students should be able to

- recognise the most important elements and support structures in statics
- handle support structures

- confidently apply the cutting principle and equilibrium conditions
- determine supporting loads and cutting force lines on statically determined systems
- know the principles for determining loads

Competences:

After successful completion, students will be able to:

- prepare statics-related tasks
- recognise and apply mechanical contexts
- ask technical questions
- answer technical questions appropriately
- realistically appraise their own knowledge regarding the specialist area

Applicability in this and other Programs

Civil Engineering, Architecture

Entrance Requirements

Learning Content

Principles of statics

- Fundamentals of effects (area loads, line loads, individual loads, idealisation, load flow)
- Development of load models as a result of the effects
- Explanations and notes regarding the effects on support structures according to: DIN EN 1991-1-1-1: Densities, self-weight, imposed loads for buildings, DIN EN 1991-1-3: Snow loads, DIN EN 1991-1-4: Wind loads
- Design situations and action combinations according to DIN EN 1990: Principles of structure planning, safety concept and design rules
- Exercise based on practical examples
- Insight into determining effects via computer programs

Teaching Methods

Lecture, exercises and examples

Remarks

Recommended Literature

References:
Leicher, Kasper, Kasper: Tragwerkslehre in Beispielen und Zeichnungen, Reguvis, 5th edition, 2022
Widjaja, Baustatik ? einfach und anschaulich, Bauwerk BBB Beuth, 5th edition 2020
Gross,Hauger, Schröder, Wall: Technische Mechanik, Band 1: Statik, 12th edition 2013, Springer Verlag, Berlin

Course handouts

BPP-19 COMPLETION OF THE INTERIOR, TECHNICAL BUILDING EQUIPMENT AND SMART HOME

Module code	BPP-19
Module coordination	Prof. Dr. Ahmed Khoja
Course number and name	BPP-19 Completion of the Interior, Technical Building Equipment and Smart Home
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Qualification goals:

The objective of this module is to acquire knowledge about wall systems, flooring systems, coverings, doors, windows, technical building equipment (TGA) planning, and smart home integration. These topics are taught through practical examples and real-world applications, with a focus on developing efficient planning criteria.

Professional Competence

Knowledge

Upon completion of the module, students will gain knowledge in:

- Fundamentals of load-bearing and non-load-bearing walls, including drywall wall systems.
- Knowledge of flooring, ceiling cladding, and wall coverings.
- Basics of door and window systems.
- Introduction to technical building equipment (TGA) planning and installation.

- Fundamentals of using renewable energy sources in buildings.
- Introduction to the integration and planning of smart building controls ("Smart Home").
- Development of selection criteria for targeted and efficient planning.

Skills

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

- Develop cost-effective, sustainable systems based on the construction project
- Develop interior fit-out and system installation plans and thier requiremints.
- analyse designs and the choice of products
- Prepare and analyse detailed plans
- Select and dimension technical building systems.
- Understand the fundamentals of building installations
- monitor construction and the installation situation during the construction phase

Personal Competence

Social Competence

Through group project work, students learn effective teamwork as well as project management and coordination.Hybrid collaboration is intentionally practiced by combining online and offline formats to enhance student interaction and integrate modern working methods.

Methodological Competence

The teaching of building Interior Fit-out, Smart and Technical Building Equipment imparts practical methodological competencies through examples, experiments, and project work, providing students with realistic insights into professional practice. Group work involves comparing and discussing different concepts, fostering critical thinking and teamwork skills.

Applicability in this and other Programs

- Lectures:
  - BPP-30 Building Envelope
  - BPP-29 Sustainable Building
  - BPP-36 Building in Existing Structures and Deconstruction

- Degree Programs:
  - Bachelors and Masters in Civil Engineering
  - Bachelors and Masters in Architecture
  - Masters in Healthy and Sustainable Buildings

Entrance Requirements

Successful completion of the following modules is recommended.

- BPP-07 Building Physics: Building and Room Acoustics
- BPP-03 Building Materials Science
- BPP-08 CAD 2D / 3D (BIM)
- BPP-11 Building Physics: Fire Protection
- BPP-12 Building Construction

Learning Content

- Wall systems and partitions.
- Flooring, ceiling cladding, and wall coverings.
- Door and window systems.
- TGA planning.
- Integration of renewable energy systems in buildings.
- Interior fit-out and installation planning.
- Smart home integration and its Opportunities

Teaching Methods

Lecture, PowerPoint presentations, whiteboard, exercises, and project work.

Remarks

Recommended Literature

- Lecture scripts and materials.
- Sinopoli, J. (2010). Smart Building Systems for Architects, Owners, and Builders.
- Marques, G., Saini, J., & Dutta, M. (Eds.). (2023). IoT Enabled Computer-Aided Systems for Smart Buildings. Springer.
- Bollin, E. (Ed.). (2023). Using Renewable Energies in Buildings: Heating and Cooling Supply, Automation, Executed Examples. Springer Nature.
- Bohne, D. (2023). Building Services and Energy Efficient Buildings. Springer.
- Wiewiorra, C., & Tscherch, A. (2020). Materials and Finishings. DOM publishers.
- Nutsch, W. (2015). Handbook of Construction: Interior Fit-out. Dt. Verlag-Anst.
- Additional literature will be announced in the lecture

BPP-20 CONSTRUCTION CALCULATION

Module code	BPP-20
Module coordination	Prof. Dr. Matthias Hümmer
Course number and name	BPP-20 Construction Calculation
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Qualification goals:

After completing the module, students acquire basic knowledge in economics, business administration and the construction industry, which gives them a deep understanding of the economic interrelationships and operational processes in the construction industry. In addition, they are taught in-depth basics in the field of construction costing, which enables them to understand, create and analyze the costing procedures required in the construction industry.

Professional Competence

Knowledge

By successfully completing the module, students acquire:

- Basic knowledge of economics, business administration and the construction industry.
- a comprehensive understanding of economic interrelationships and operational processes in the construction industry.
- Comprehensive knowledge of basic costing procedures and stages of construction costing, including the application and integration of these procedures in practice.

- Understanding of the basics of tenders as well as the design and evaluation of tender texts.
- In-depth knowledge of the composition and structure of specifications to produce accurate and complete performance requirements.
- Knowledge of different types of costing, including overhead costing, final sum costing, contribution margin costing and fixed price costing.
- Insight into the basic stages of construction costing, such as quotation costing, original costing, job costing and labor costing, and their importance to the overall construction process.
- Ability to make precise and well-founded cost calculations in the construction industry, taking into account all phases from tender preparation to tendering and awarding of contracts through to construction.

Skills:

After successfully completing the module, students will be able to

- Understand costing procedures and select and apply the appropriate procedure depending on the time of costing (offer phase, before or during the execution of the construction contract).
- take a structured approach to costing and carry out all the necessary steps methodically.
- efficiently prepare quotation calculations that serve as a solid basis for negotiations and the awarding of contracts.
- create and maintain work calculations that correspond to the progress of the project and thus contribute to effective construction site and project controlling.
- Carry out cost comparisons between different construction methods to make informed decisions.
- Calculate individual costs for partial services in detail and systematically record and calculate the overhead costs of the construction site.
- use computerized methods to determine unit prices based on tender documents.
- make well-founded decisions for tender and labor costing that ensure the profitability of the project.
- Recognize changes during construction that have an impact on construction costs and derive and financially evaluate calculative consequences from the construction contract (considering the VOB or BGB).
- Create and evaluate tender texts for recyclable building products in order to promote the sustainability of buildings.

Personal Competences:

Students work both independently and in small teams on projects within the module to develop their ability to work efficiently alone and together on problem solutions and to put their knowledge into practice. This strengthens their teamwork and problem-solving skills.

They are able to work in a structured and effective manner, both alone and in teams, and, thanks to the interdisciplinary nature of the course, are able to adopt different professional perspectives and constructively contribute to the project works.

Methodological Competence

Students acquire theoretical knowledge in construction costing and construction management and learn to transfer this to practical construction projects. They develop the ability to formulate project-specific costing and construction management tasks, recognize interfaces between the disciplines and propose solutions for efficient cooperation. The requirements for economic planning and control as well as the linking of theory and practice, such as resource planning or process control, are taught.

The application of the skills learned enables a targeted and sustainable transfer to real construction projects. Students gain an overview of the methods and tools of construction costing and construction management and are able to choose the most efficient approach for different project situations.

Applicability in this and other Programs

- Lectures:
  - BPP-14 Digital Construction Process (BIM 4D to 6D)
  - BPP-32 Seminar on Product Development
  - BPP-33 Project Seminar
- Degree Programms:
  - Bachelors and Masters in Civil Engineering
  - Bachelors and Masters in Architecture
  - Masters in Healthy and Sustainable Buildings

Entrance Requirements

No prerequesites besides school level math.

Learning Content

- Fundamentals of economics and business administration
- Introduction to construction costing with an overview and objectives of construction costing and the importance of construction costing in the construction industry
- Introduction to types of tendering with consideration of open tendering, restricted tendering and negotiated procedures
- List of services and service programs
- Quantity and cost determination (model-based)
- Pricing of partial services
- Dealing with preliminary remarks
- Basics of costing types, in particular award costing, final total costing, contribution margin costing and fixed price costing as well as their connection with contract types
- Basics of the various stages of construction costing (offer, original, order and work costing)
- Submission/negotiation
- Standard values for the awarding of partial services
- Construction site and project controlling
- Cost structure to changing construction site situation
- Target times for construction cost monitoring: definition of target times for construction work, methods for monitoring and controlling construction costs and adjustments in the event of time deviations

Teaching Methods

Lectures / exercises / tutorials / homework

PowerPoint presentation, whiteboard, document camera (visualizer) and more

Lecture materials in iLearn

Remarks

Recommended Literature

- Materials provided in the lecture
- Drees, Krauß, Berhold (2019). Kalkulation von Baupreisen. Beuth Verlag, 13. Aufl.
- Ashworth, A., & Perera, S. (2015). Cost studies of buildings. Routledge. 6. Aufl
- Leimböck, E., Klaus, U. R., Hölkermann, O., Leimböck, E., Klaus, U. R., & Hölkermann, O. (2015). Teil B Projektcontrolling. Baukalkulation und Projektcontrolling: unter Berücksichtigung der KLR Bau und der VOB, 125-175.
- Brookes, Naomi. (2013). Construction Project Management. Construction Management and Economics. 31. 1019-1020. 10.1080/01446193.2013.787488
- Gould, F. E., & Joyce, N. E. (2003) Construction Project Management
- Hendrickson, C. T. (2023) Project Management for Construction (https://www.systematic.sk/web/media/Chris%20Hendrickson_Project_Management_for_Construction.pdf)
- Hering, E. (2014). Kostenrechnung und Kostenmanagement für Ingenieure. Springer-Verlag.
- Keil et al. (2011): Kostenrechnung für Bauingenieure. 12. Aufl.
- Peterson, S. J. (2013). Construction Accounting and Financial Management, 3rd edition, Published by Pearson
- Malkwitz, A., Kattenbusch, M., Mock, S., & Grüber, M. (2022) Kostenermittlung und-kalkulation im Bauprojekt. - Preisermittlung für Bauarbeiten. Springer link (https://link.springer.com/content/pdf/10.1007/978-3-658-38927-7.pdf)
- Ostrowski, S. E. (2013) Construction Cost Analysis and Estimating
- Fuchs, Berger & Seifert (2020) richtig: 2023 Beck'scher HOAI- und Architektenrechts-Kommentar: HOAI
- Lücke, Martin (2019): Unstimmigkeiten und Lösungsansätze eines Gemeinkostenausgleichs infolge von Leistungsmodifikationen und Behinderungen des Bauablaufs. In: Christian Hofstadler: Aktuelle Entwicklungen in Baubetrieb, Bauwirtschaft und Bauvertragsrecht (S. 287-304), Springer Fachmedien Wiesbaden
- Additional literature recommendations are provided in the lecture

BPP-21 PRODUCT MANAGEMENT: STRATEGY AND MARKETING

Module code	BPP-21
Module coordination	Prof. Dr. Roland Augustin
Course number and name	BPP-21 Product Management: Strategy and Marketing
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	report and presentation
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Knowledge:

In this module, students acquire fundamental knowledge of product management and marketing. The aim is to present both the classical and modern elements of product management, product strategy, and marketing. Students will gain a solid understanding of the role of the product manager and the strategic analysis of products. Additionally, innovative and process-oriented approaches to product management will be introduced.

Skills:

Upon successful completion of the module, students will have knowledge in the following areas:

- Fundamentals of product management and the role of the product manager
- Product strategy and analytical tools
- Process steps from product idea to market launch (Product Roadmap)
- Product distribution channels such as retail and wholesale, processors, construction industry, and online trade

- Product marketing in social media and influencer marketing
- Product marketing and brand management
- Process-oriented product management and innovation
- Market observation, requirement assessment, market launch, and product controlling
- International marketing and management strategies as well as intercultural communication

Competences:

Upon successful completion of the sub-module, students will have competences in the following:

- Define product objectives such as technical characteristics, pricing strategy, and design
- Coordinate and manage the product development process
- Apply market positioning as well as product and brand management
- Manage innovation within companies and oversee the new product development process
- Plan target group-specific marketing strategies in the marketing mix and campaigns
- Develop their own marketing strategies for products
- Integrate knowledge of sustainable construction into the product development process
- Professionally create and deliver business presentations

Social Competence:

Students work independently and in small groups on tasks and small projects. They are able to work in a structured and effective manner, either alone or in a team. The interactive nature of the course allows them to incorporate different professional perspectives and backgrounds and contribute constructively to the discussion of topics. They also learn how to develop their own product and plan and support its potential market launch. Methodological Competence 90 Students learn to apply their technical knowledge to the field of product management, while also applying their own personal experience in dealing with products.

After successfully completing this sub-module, students will have acquired the skills to apply product, industry, and marketing knowledge, as well as to demonstrate management competence within a company. They will also acquire cross-national

ways of thinking and acting with regard to raw materials, products, locations, and industries. They will learn alternative courses of action and recognize the framework of international product management. In addition, students learn how to deal with modern forms of product management and recognize the potential of various sales and marketing strategies (direct sales, retail sales, platform, social media and influencer marketing) at an international level.

Applicability in this and other Programs

BPP-24 Product Development/ -testing

BPP-33 Seminar on Product Development

BPP-35 Product Management 1
BPP-36 Green Building

All similar courses in civil engineering

Entrance Requirements

Learning Content

- Fundamentals of product management
- The role and profile of the product manager
- Market research, market analysis
- Product strategy & analytical tools
- Process-oriented product management and innovation (Product Roadmap)
- Marketing mix including online marketing and the use of social media
- Business presentations
- Product marketing & brand management
- International marketing and product management

Teaching Methods

Lectures / exercises / tutorials / home work

PowerPoint presentation, whiteboard, document camera (visualiser) and additional lecture materials in iLearn

Remarks

Recommended Literature

- Aumayr, K. J. (2023). Successful Product Management: Tool Box for Professional Product Management and Product Marketing. Springer Nature.
- Trott, P. (2017). Innovation management and new product development. Pearson education.
- Udroiu, R., & Bere, P. (Eds.). (2018). Product lifecycle management: Terminology and applications. BoDBooks on Demand.
- Cateora, P. R., Money, R. B., Gilly, M. C., & Graham, J. L. (2020). International marketing. McGraw-Hill.
- Handouts
- Additional literature will be announced in the lecture.

BPP-22 LAW: BUILDING LAW / CONSTRUCTION CONTRACT / VOB

Module code	BPP-22
Module coordination	Tobias Appel
Course number and name	BPP-22 Law: Building Law / Construction Contract / VOB
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Knowledge:

The course provides the participants with knowledge about:

- Rights and obligations of the contracting parties relating to the award of construction contracts according to VOB
  - Part A (VOB/A): General conditions of contract relating to the award of construction work
  - Part B (VOB/B): General conditions of contract for the execution of construction contracts
  - Part C (VOB/C): General technical specifications (ATV DIN) in construction contracts (ATV DIN)
- German Civil Code (BGB) in relation to contracts for work and services
- Legal framework for construction contracts abroad according to FIDIC (Fédération Internationale des Ingénieurs Conseils) and its model contracts (Red Book, Yellow Book, Silver Book, White Book)

- Model letters for the business processes in construction management

Skills:

Upon successful completion of the sub-module, students will be able to:

- Correctly assess the tasks and responsibilities in construction management
- Reflect different perspectives and interests of the contractual partners involved in national and international construction projects
- Distinguish between contractually owed, changed and additional services (VOB/B)
- Distinguish between additional services and special services (VOB/C)
- Apply the correct consequences under building law depending on the existing situations
- Identify, notify, document and enforce supplementary claims with legal basis in simple cases
- Verify additional requirements from partner companies in terms of entitlement and plausibility

Competences:

Upon successful completion of the sub-module, students will have competences in the following:

- Importance and application of VOB Parts A,B and C as a basis for the correct description of the building work and the building execution in national construction projects
- Significance, application and differences between VOB/B and German Civil Code in relation to contracts for work and services
- Significance and application of the FIDIC contract types in international construction projects, depending on which services the contractor takes on and which tasks remain with the principal
- Significance and use of model letters for correspondence ranging from acceptance requests, notices of objections, extensions of deadlines, obstruction notices to final payment declarations and repayment of the security deposit

Applicability in this and other Programs

BPP-20 Construction Calculation
BPP-26 Commercial Management
BPP-36 Building in existing structures

All similar courses in civil engineering

Entrance Requirements

Learning Content

- Building contracts and building contract law
- Acceptance of work performance
- Construction period - execution and contract deadlines
- Disruption of the construction process and premature termination of the contract
- Model letters
- Building defects
- Invoicing and payment as well as subsequent claims
- Securities
- Modifications and commissioning modifications

Teaching Methods

Lectures / exercises / tutorials / home work

PowerPoint presentation, whiteboard, document camera (visualiser) and additional lecture materials in iLearn

Lectures / exercises / tutorials / home work

PowerPoint presentation, whiteboard, document camera (visualiser) and additional lecture materials in iLearn

Remarks

Recommended Literature

- Lecture script
- VOB/A, VOB/B and VOB/C
- BGB (German Civil Code)
- FIDIC

BPP-23 GERMAN B1 / PART 3 + 4

Module code	BPP-23
Module coordination	Tanja Mertadana
Course number and name	BPP-23 German B1 / part 3 + 4
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	See examination schedule AWP and languages, written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	German

Module Objective

The module German B1/ part 3 + 4 focuses on improving students' communication skills and expanding their vocabulary range. It also aims to broaden their comprehension of more complex texts communicated in writing and orally, such as articles and reports. The module furthermore trains their ability to comprehend and engage in longer conversations and discussions on a variety of topics.

This module covers the second part of the level B1. Level B1 is completed with the module German B1/ part 3 + 4.

The main emphasis of the module is to improve students' verbal skills so as to enable them to express opinions, ideas and experiences. By writing coherent texts, such as reports, letters or argumentation will be applied as means of further enhancing their writing skills. The module will also involve deepening students' grammar knowledge and expanding their range of vocabulary. This will enable them to apply the acquired linguistic skills to practical situations, such as in presentations, role plays or group discussions. Their intercultural skills will be broadened, enabling them to communicate in international environments. The course incorporates a diverse range of activities; group work, pair work, role plays, discussions, listening and reading comprehension. The aim of the module is to prepare students for real-life situations.

Specifically, students completing the module will achieve the following learning outcomes:

Professional skills

At Level B1, students should be able to:

- Read texts of a more complex nature and comprehend specific information contained in them.
- Actively engage in discussions and conversations, exchange views and opinions and present arguments.
- Give an account of a variety of topics, both orally and in writing, such as advantages and disadvantages, technological developments or future trends.
- Apply and comprehend subject-specific terminology and vocabulary.
- Hold basic presentations and answer questions on these.

Methodological skills

Methodological skills here refer to students' ability to apply a variety of learning and working methods so that they may further build on their linguistic and subject-specific knowledge.

- Application of various learning strategies in order to broaden and deepen their vocabulary and knowledge of grammatical structures.
- Use of authentic materials, such as specialist articles, presentations or videos for self-research and learning purposes.
- Independently plan, organise and carry out written tasks and projects.
- Treat complex listening exercises, e.g. expert interviews or discussions.
- Work in collaboration and interactively with other students in group work and projects.

Social skills

Social skills here refer to students' ability to conduct themselves appropriately, communicate effectively and work in groups when engaging in social interactions.

- Effective oral communication in a variety of contexts, e.g. in presentations, discussions or group work.
- Ability to actively listen and respond appropriately to opinions and viewpoints expressed by other students.
- Collaboration in group projects and teamwork in order to collectively solve tasks.

- Intercultural sensitivity and the ability to work with students of various cultural backgrounds.

Personal skills

Personal skills here refer to students' individual abilities, attitudes and traits that enable them to achieve their goals, further their personal development and operate successfully.

- Independence and personal initiative when learning German.
- Organisational skills in order to plan and accomplish tasks and projects.
- Tenacity and perseverance on the road to achieving the learning goals and overcoming challenges.
- Critical thinking and the ability to form and uphold their own opinions.
- Confidence in their own abilities and their application of learnt knowledge.

Applicability in this and other Programs

Not applicable in other degree programmes.

Entrance Requirements

To participate in this module, students need to pass the examination German B1/ part 1 + 2 first.

Learning Content

Grammar and vocabulary form the core elements of this course. The following key aspects are covered during the course: Regional and cultural studies, intercultural competence and pronunciation. Relationships, health, culture, politics, urban life and finances are just some of the topics covered during this course. Additional topics will furthermore be incorporated in keeping with current literature and real-life developments. The following is an extract of the grammar topics that will be covered:

- Infinitive clauses
- Subordinate clauses
- Passive voice
- Connectors
- Prepositions
- Pronominal adverbs
- n-declension

- Subjunctive II

Teaching Methods

The teaching methods applied will focus on improving the four main language skills (listening, speaking, reading and writing). Examples of the applied learning methods include various forms of group, individual and collaborative work, mini-presentations, exercises involving intensive reading and listening, role plays and grammar games, loci method, dictation exercises, translations, peer feedback, working with learning stations, and various writing activities designed to consolidate the content learnt. It is also envisaged that projects will be carried out using the scenario method.

Students will be given weekly assignments for self-study.

Remarks

In all language courses, students will be required to meet a minimum compulsory attendance rate of 75%.

Recommended Literature

Textbook:

Netzwerk neu B1.2, Kurs- und Übungsbuch mit Audios und Videos, Klett Verlag Lektionen 7-12 (ISBN 978-3-12-607171-0)

Recommended reading:

Grammatik aktiv: A1-B1, Cornelsen Verlag (ISBN 978-3-06-122964-1)

Übungsgrammatik für die Grundstufe: Lösungsheft, Hueber Verlag (ISBN 978-3-922989-70-7)

Fit in Grammatik B1, Hueber Verlag (ISBN 978-3-19-607493-2)

Deutsch als Fremdsprache, Übungsgrammatik für die Grundstufe Niveau A2-B2, Liebaug-Dartmann (ISBN 978-3-922989-70-7)

Wortschatz & Grammatik B1: Buch (deutsch üben), Hueber (ISBN 978-3194874930)

Deutsch intensiv Wortschatz B1: Das Training, Klett (ISBN 978-3126750769)

BPP-24 FUNDAMENTALS OF PROJECT MANAGEMENT AND PLANNING

Module code	BPP-24
Module coordination	Prof. Dr. Ahmed Khoja
Course number and name	BPP-24 Fundamentals of Project Management and Planning
Semester	5
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Qualification goals:

In this module, students acquire basic knowledge and practical skills in the fundamentals of project management and planning in the construction industry. The focus is on the introduction to project structuring, scheduling and cost planning as well as the application of key planning methods and tools. Students will be able to systematically organize and efficiently implement construction projects by considering key aspects such as time, resource and quality management.

Professional Competence

Knowledge

After successfully completing the module, students will have a sound knowledge of

- They understand basic concepts and principles of project management, including the structure and dynamics of construction projects, and can apply traditional (PMI) and agile (SCRUM) methods in different contexts.

- They know the key tools and documents for project preparation and are familiar with the methodological approaches to planning and executing construction projects.
- They understand the relevant aspects of VOB, including contractual, ancillary and special services, as well as the phases of HOAI and their significance for construction projects.
- You will be able to distinguish between different types of partner companies (suppliers, subcontractors, installation partners, service providers) and evaluate, select and commission their role in the construction project.
- They know the different types of costing, including quotation costing, original costing, job costing and work costing, and their application in different phases of a construction project.

Skills:

After successfully completing the module, students will be able to

- Undertake project management and construction estimating tasks, including creating and analyzing mass extracts from implementation plans or 3D models to accurately determine required materials.
- Evaluate products and identify potential for additions by assessing alternatives in terms of ecological and economic benefits, thereby recognizing ecologically better and economically more favorable alternatives
- Formulate price inquiries, prepare price comparisons and critically evaluate offers to accurately request and order materials and installation services.
- Check the necessary evidence to ensure the quality and approval of products and services.
- Create a precise work calculation and plan and prepare construction projects of medium complexity in the areas of quality, quantity, costs, deadlines, capacities, logistics and documentation.
- Understand the structure of the construction project to assess the suitability of partner companies in terms of price, quality and sustainability and make informed decisions to minimize risks and maximize opportunities.

Personal Competences:

Students work both independently and in small teams on projects within the module to strengthen their teamwork and problem-solving skills.

They can work in a structured and effective manner alone or in a team and, due to the interdisciplinary nature of the course, are able to adopt different professional perspectives and constructively contribute to the project work.

Methodological Competence

Students acquire theoretical knowledge of the fundamentals of project management and construction planning and learn to transfer this to practical applications. They develop the ability to formulate planning tasks for specific disciplines, recognize interdisciplinary interfaces and define requirements for efficient cooperation in construction projects. They understand key project management tools, such as time planning, cost management and quality control, and can apply these in a targeted manner.

By combining theory and practice, students are able to apply their knowledge sustainably in real construction projects. They gain an overview of different approaches and skills and can identify the most efficient methods for specific challenges in project management and construction planning.

Applicability in this and other Programs

- Lectures:
  - BPP-14 Digital Construction Process (BIM 4D to 6D)
  - BPP-32 Seminar on Product Development
  - BPP-33 Project Seminar
- Degree Programs:
  - Bachelors and Masters in Civil Engineering
  - Bachelors and Masters in Architecture
  - Masters in Healthy and Sustainable Buildings

Entrance Requirements

Successful completion of the following modules is recommended:

- BPP-01 Engineering Mathematics
- BPP-03 Buidling Materials Characteristics
- BPP-20 Construction Calculation

Learning Content

- General principles of projects, project planning and management
- Introduction to project management and planning in the construction industry
- Project preparation: Procedure and instruments in project preparation

- Contractual, ancillary and special services
- Planning phases according to HOAI and AHO
- Partner companies in the construction industry (suppliers, subcontractors, installation partners and service providers) as well as evaluation criteria and evidence for the assessment and selection of partner companies
- Overview of contract types and calculation types
- Basics of quantity surveying and material procurement
- Product differentiation and potential for supplements
- Requesting and ordering materials and services
- Project planning and management
- Risk and opportunity management in project planning

Teaching Methods

Lectures / exercises / tutorials / homework

PowerPoint presentation, whiteboard, document camera (visualizer) and more

Lecture materials in iLearn

Remarks

Recommended Literature

- Materials provided in the lecture
- Jha, Kumar Neeraj (2015) Construction Project Management: Theory and Practice, - Noida Pearson 2015
- Rösel, W. (2000) "Baumanagement (Grundlagen, Technik Praxis) Springer
- Harris, F., & McCaffer, R. (2013) Modern Construction Management
- Kochendörfer B., Liebchen J.-H., und Viering Markus G. (2021). Bau-Projekt-Management
- Girmscheid G. (2014) Bauunternehmensmanagement-prozessorientiert Band 1 (Strategische Managementprozesse)
- Girmscheid G. (2014) Bauunternehmensmanagement-prozessorientiert Band 2 (Operative Leistungserstellungs- und Supportprozesse)

- Girmscheid G. (2007) Kalkulation und Preisbildung in Bauunternehmen (Grundlagen, Methodik und Organisation)
- Girmscheid G. (2015) Angebots- und Ausführungsmanagement-prozessorientiert(Grundlagen, Methodik und Organisation)
- Girmscheid G. (2014) Projektabwicklung in der Bauwirtschaft-prozessorientiert(Wege zur Win-Win-Situation für Auftraggeber und Auftragnehmer)
- Wiendahl, H. P. (2019). Betriebsorganisation für Ingenieure. Carl Hanser Verlag GmbH Co KG.
- Del Pico, W. J. (2023). Project control: Integrating cost and schedule in construction. John Wiley & Sons.
- Sears, S. K., Sears, G. A., & Clough, R. H. (2010). Construction project management: A practical guide to field construction management. John Wiley & Sons.
- Ashworth, A., & Perera, S. (2015). Cost studies of buildings. Routledge.
- Harris, R. K. (2007). Project Management: Strategic Design and Implementation. Cost Engineering, 49(8), 20.
- Edwards, P., & Bowen, P. (2005). Risk management in project organisations. Routledge (https://www.taylorfrancis.com/books/mono/10.4324/9781315042886/risk-management-project-organisations-peter-edwards-paul-bowen)
- Harris, F., McCaffer, R., Baldwin, A., & Edum-Fotwe, F. (2020). Modern construction management. John Wiley & Sons.
- Pinto, J. K. (2020). Project management: achieving competitive advantage. Pearson.
- Schwalbe, K. (2015). Information Technology Project Management, chapter 10. Cengage Learning
- Harris, F., McCaffer, R., Baldwin, A., & Edum-Fotwe, F. (2020). Modern construction management. John Wiley & Sons. (https://books.google.de/books?hl=de&lr=&id=uW8LEAAAQBAJ&oi=fnd&pg=PP11&dq=%22Modern+Construction+Management%22+by+Harris+%26+McCaffer+(2021)+&ots=0_vl8mjrOR&sig=_YMUPnNJ65VxA0iGd47Mf692w4I#v=onepage&q=%22Modern%20Construction%20Management%22%20by%20Harris%20%26%20McCaffer%20(2021)&f=false)
- Kerzner, H. (2009). Project Management: A Systems Approach to Planning, Scheduling and Controlling. (http://faculty.tamuc.edu/jdavis/tmgt/514/208/TMGT514-208-Syllabus.pdf)

- Morris, P. W., & Pinto, J. K. (2007). The Wiley guide to project, program, and portfolio management (Vol. 3). John Wiley & Sons.
- Project Management Institute. (2021). A guide to the Project Management Body of Knowledge (PMBOK guide) (7th ed.). Project Management Institute.
- Nicholas, J. M., & Steyn, H. (2020). Project management for engineering, business and technology. Routledge.
- Turner, R. (2016). Gower handbook of project management. Routledge.
- Additional literature recommendations are provided in the lecture

BPP-25 PROJECT EXECUTIONAND CONTROLLING

Module code	BPP-25
Module coordination	Prof. Dr. Matthias Hümmer
Course number and name	BPP-25 Project Execution and Controlling
Semester	5
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Qualification goals:

The Project Execution and Controlling module enables students to organize and manage complex construction projects efficiently and sustainably. The application of lean management principles and the integration of modern, digital methods for optimizing construction processes are taken into account. This module prepares students comprehensively for the legal and organizational challenges of construction practice and teaches them how to integrate innovative approaches such as circular construction into their projects.

Professional Competence

Knowledge

The course provides students with in-depth knowledge in the following areas:

- Overview of construction processes and construction operations
- Understanding the basic structures and processes of construction organization and construction processes that are necessary for successful project execution.
- Occupational health and safety and environmental protection regulations on the construction site.
- Inspection of products and trades during construction.

- Knowledge of the statutory and legal framework conditions and requirements for cooperation with external partners (such as assembly partners and subcontractors).
- Introduction to the basics and principles of lean construction management and the importance of precise detailed scheduling to optimize construction processes and control the construction process.
- Digitalization and the tools and technologies required to increase efficiency and transparency in construction operations and projects.
- Insight into the challenges of implementing digitalization and change management projects.
- Introduction to innovative approaches and business models aimed at sustainability and the circular economy in the construction industry.

Skills:

After successfully completing the module, students will be able to

- Take a holistic view of construction projects, integrate process steps and drive sustainable and innovative solutions.
- develop construction site-specific, technical solutions and integrate external partners such as subcontractors into construction projects in a legally compliant manner.
- master the planning and implementation of a structured, synchronized work organization to efficiently optimize construction processes and apply lean principles to avoid waste.
- prepare general and project-specific evidence and documentation, implement contractually agreed services and manage projects in compliance with occupational safety and environmental standards.
- identify quality-relevant inspection requirements independently, carry out inspections and document the results professionally.
- use digital technologies in a targeted manner to make construction projects more efficient and transparent and to exploit the potential of digitalization in the construction industry.
- develop and implement sustainable concepts for the resource-conserving use of building materials (e.g. recycling concepts) and develop innovative, circular construction approaches and business models and integrate them into projects.

Personal Competences:

Students work both independently and in small teams on projects within the module to strengthen their teamwork and problem-solving skills.

They are able to work in a structured and effective manner alone or in a team and, due to the interdisciplinary nature of the course, are able to adopt different professional perspectives and constructively contribute to the project work.

Methodological Competence

Students acquire theoretical knowledge of the fundamentals of project execution and controlling in the construction industry and learn to transfer this to practical applications. They develop the ability to define project tasks in a discipline-specific manner, recognize key interfaces between specialist areas and develop solutions for effective cooperation. They understand the requirements for structured planning and targeted controlling and are able to apply methods and tools for managing construction projects.

By combining theory and practice, students are able to apply the skills they have learned in real construction projects. They gain an overview of different approaches and can select the most efficient one for the successful implementation of projects.

Applicability in this and other Programs

- Lectures:
  - BPP-32 Seminar on Product Development
  - BPP-33 Project Seminar
- Degree Programs:
  - Bachelors and Masters in Civil Engineering
  - Bachelors and Masters in Architecture
  - Masters in Healthy and Sustainable Buildings

Entrance Requirements

Learning Content

- Introduction to construction organization and construction processes
- Basics of project management and project control
- Classification and use of suppliers, installation partners and subcontractors
- Basics of instruction and training of construction site personnel

- Verification and documentation
- Inspections during construction
- Basics of occupational health and safety and environmental protection regulations
- Fundamentals and basic knowledge in the application of lean construction management
- Circular construction and new business models
- Digitalization in construction operations

Teaching Methods

Lectures / exercises / tutorials / homework

PowerPoint presentation, whiteboard, document camera (visualizer) and more

Lecture materials in iLearn

Remarks

Recommended Literature

- Materials provided in the lecture
- Harris, R. K. (2007). Project Management: Strategic Design and Implementation. Cost Engineering, 49(8), 20.
- Edwards, P., & Bowen, P. (2005). Risk management in project organisations. Routledge (https://www.taylorfrancis.com/books/mono/10.4324/9781315042886/risk-management-project-organisations-peter-edwards-paul-bowen)
- Harris, F., McCaffer, R., Baldwin, A., & Edum-Fotwe, F. (2020). Modern construction management. John Wiley & Sons.
- Pinto, J. K. (2020). Project management: achieving competitive advantage. Pearson.
- BRZ Deutschland GmbH (Ed.). (2013). Bauprojekte erfolgreich steuern und managen: Bauprojekt-Management in bauausführenden Unternehmen. Springer-Verlag.
- Axmann, R. (2023). Projektmanagement im Bauwesen. Carl Hanser Verlag GmbH Co KG

- https://books.google.de/books?hl=de&lr=&id=uW8LEAAAQBAJ&oi=fnd&pg=PP11&dq=%22Modern+Construction+Management%22+by+Harris+%26+McCaffer+(2021)+&ots=0_vl8mjrOR&sig=_YMUPnNJ65VxA0iGd47Mf692w4I#v=onepage&q=%22Modern%20Construction%20Management%22%20by%20Harris%20%26%20McCaffer%20(2021)&f=false)
- Kerzner, H. (2009). Project Management: A Systems Approach to Planning, Scheduling and Controlling. (http://faculty.tamuc.edu/jdavis/tmgt/514/208/TMGT514-208-Syllabus.pdf)
- Morris, P. W., & Pinto, J. K. (2007). The Wiley guide to project, program, and portfolio management (Vol. 3). John Wiley & Sons.
- Project Management Institute. (2021). A guide to the Project Management Body of Knowledge (PMBOK guide) (7th ed.). Project Management Institute.
- Nicholas, J. M., & Steyn, H. (2020). Project management for engineering, business and technology. Routledge.
- Turner, R. (2016). Gower handbook of project management. Routledge.
- Winch, G. M. (2012). Managing construction projects. John Wiley & Sons.
- Bock, T., & Linner, T. (2015). Robotic industrialization. Cambridge University Press.
- Deng, Min & Menassa, Carol. (2021). From BIM to digital twins: A systematic review of the evolution of intelligent building representations in the AEC-FM industry. Journal of Information Technology in Construction. 26. 58-83. 10.36680/j.itcon.2021.005.
- Vasey, L., & Menges, A. (2020). Potentials of cyber-physical systems in architecture and construction. In Construction 4.0 (pp. 90-112). Routledge.
- Additional literature recommendations are provided in the lecture

BPP-26 COMMERCIAL MANAGEMENT

Module code	BPP-26
Module coordination	Prof. Dr. Roland Augustin
Course number and name	BPP-26 Commercial Management
Semester	5
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Aims of the module

In this module, students acquire basic knowledge and practical application of commercial projects in the construction industry. In addition to basic knowledge of construction management, the aim is to acquire the specialist knowledge required for measurement and invoicing

Professional Competence:

Knowledge

The course provides students with knowledge of:

- VOB Part B and Part C, FIDIC, application and scope of application
- Types of construction contracts
- Invoice types and contents of invoices, electronic invoices
- Invoicing in the construction industry and invoice components
- Determination of performance on site, provision of services
- Insight into the basics of cost and activity accounting

- Securities (e.g. guarantees) in the construction industry depending on the contract phase
- Project controlling
- Supplementary management

Skills:

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

- Carry out performance determinations in a timely and system-technical manner in the contractually agreed form
- Initiate invoicing with evidence of the type and scope of the service, necessary quantity calculations, drawings and other supporting documents
- Recognize and implement billing provisions in the technical contract terms and other contract documents such as specifications
- Technically check invoices from partner companies
- Carry out supplementary management in an orderly manner
- To design tracking of the open items (OP) list
- Monitor the risk of default (client and supply chain)
- Read balance sheets, profit and loss accounts (P&L) and recognize risks

Competencies:

Social competence

Students work both independently and in small teams on projects and issues within the module in order to develop the skills to solve problems alone or in teams.

Professional competence

After successfully completing the sub-module, students will have the skills to carry out digital quantity takeoff as well as debit and credit-side construction invoicing. Types of invoices, verifiable invoices and their components are understood, the basics of VOB B and C and the ATVs based on them are understood and applied. Proof of the type and scope of services for invoicing can be provided. You will learn the significance of the various construction securities (construction securities) and their effects and application depending on the contract phase. In addition, project controlling also covers the topics of forecast and supplement management, as well as the interpretation of balance sheets and profit and loss accounts.

Applicability in this and other Programs

- **Lectures**
  - BPP-20 Construction calkulation
  - BPP-21 Product Management
  - BPP-24 Fundamentals of Project Management and Planning
  - BPP-25 Project Execution und Controlling
  - BPP-32 Seminar Product Development
  - BPP-33 Project Seminar
- **Study courses**
  - All similar degree programs in civil engineering

Entrance Requirements

No prerequesites besides school level math.

Learning Content

- Basics of construction management and construction economics
- Types of construction contracts (national and international)
- Accounts receivable and accounts payable, determination of quantities
- Invoicing, payment, components of invoices
- Securities (e.g. guarantees)
- Supplementary management
- Direction (hourly wage work)
- Forecast planning
- Understanding and interpreting balance sheets and GUV
- Certificates (e.g. exemption certificate, UST 1 TG)
- Progress billing, management billing, final and counter-billing
- Warranties and provisions

Teaching Methods

Lectures / exercises / tutorials / home work

PowerPoint presentation, whiteboard, document camera (visualiser) and additional lecture materials in iLearn.

Remarks

Recommended Literature

- Lecture materials in iLearn
- VOB B and C, for example ATV DIN 18340 Dry construction work
- FIDIC Handbooks (Red, Yellow, Silver and Green)
- Ralf Schöwer, The construction site manual, measurement and quantity take-off, Forum Verlag Herket
- Further literature and links in iLearn

BPP-27 COMPULSORY ELECTIVE 1 (FWP-1)

Module code	BPP-27
Module coordination	Prof. Dr. Markus Hainthaler
Course number and name	Strategic Planning and Project Management Financing and Accounting Real Estate Investement Life Cycle Analysis and Ecobalancing Innovative Constructions and Building Products IFRS and Organizational Law Process Safety Entrepreneurship Process Optimization Interdisciplinary Product Development Technology and Intellectual Property Rights Management Architectural History and Theory SIVV Certificate Vernomimicry Applied AI in the Building Process BPP-27 Compulsory Elective 1 (FWP-1)
Semester	5, 8
Duration of the module	2 semester
Module frequency	annually
Course type	compulsory course
Level	Undergraduate
Semester periods per week (SWS)	5
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Weighting of the grade	5/240
Language of Instruction	Course dependent, English

Module Objective

The Compulsory Elective I and II modules provide the students with the opportunity to address specialized topics, other than the mandatory courses of the main field of study, topics that are broadening by that their field of knowledge and skills in these areas.

Several courses will be offered for each Compulsory Elective module upon availability and attendance interest of students from the following pool:

- Architectural History and Theory
- Entrepreneurship
- Strategic Planning and Project Management
- Finance and Accounting
- Technoligy and Intellectual Property Rights Management
- Process Optimization
- Process Safety
- Life Cycle Analysis and Ecobalancing
- SIVV Certificate
- IFRS and Organizational Law
- Interdisciplinary Product Development
- Innovative Constructions and Building Products
- Applied AI in the Construction Process
- Real Estate Investement
- Vernomimicry

Applicability in this and other Programs

BPP-35 Internship including PLV seminars

BPP-40 Bachelor thesis

The module is primarily intended for the Bachelor of Building Products and Processes but it can also be chosen by students of other fields of study.

Entrance Requirements

Please see the respective course descriptions for specific information on prerequisites.

Learning Content

Please see the respective course descriptions for specific information on content.

Teaching Methods

Please see the respective course descriptions for specific information on didactic methods employed.

Remarks

Please see the respective course descriptions for course-specific remarks.

Recommended Literature

Please see the respective course descriptions for literature references.

STRATEGIC PLANNING AND PROJECT MANAGEMENT

Objectives

The Strategic Planning and Project Management module introduces students to the basics of project management. Along the project phases, students learn the key tools of project planning and implementation. Through consistent transfer and application in the planning of specific real projects, module participants build up project management expertise. A focus is on the conceptual development of projects. Building on this, students get to know central approaches and tools of strategic management.

Project Management competence

The students:

- learn basic concepts and use specialised terminology confidently
- gain an overview of the interrelationships of the project business and process thinking
- acquire project management competence by planning and developing real project concepts
- deepen project management tools along the typical project phases
- understand the organisation of projects in operational structures
- deepen their knowledge in the areas of communication, leadership and consistent customer orientation
- can calculate and evaluate project structures and network plans
- familiarise themselves with the use of PM software tools such as MS Project
- gain an insight into the importance of agile project management approaches in times of transformation

Strategic Management competence

The students:

- understand the relevance of strategic planning in a business context

- are able to differentiate between operational and strategic planning
- recognise the connections between corporate strategy, long-term success and company value.
- learn approaches for internal and external analyses to determine the strategic position of a company
- are able to identify competitive positions and draw strategic conclusions
- recognise challenges in strategic change and the importance of leadership, communication and corporate culture
- discuss the strategic importance of artificial intelligence for companies
- integrate the possibilities of artificial intelligence into strategic considerations

Social Competence

Students collaborate in small project teams to develop their ability to work effectively and efficiently in group settings, applying their knowledge collectively to solve complex problems. This group work is designed to strengthen both teamwork and problem-solving competencies. To further promote intercultural skills, the teams will be composed of students from diverse cultural backgrounds, enabling them to refine their capacity for intercultural communication, collaboration, and sensitivity.

Methodological Competence

Students develop the ability to transfer theoretical knowledge into practical project contexts, thereby enhancing their capacity to apply acquired skills in real-world scenarios. This applied learning approach supports deeper retention of theoretical content and fosters transfer competencies. Through this process, students cultivate a structured, analytical, and systems-oriented mindset, equipping them to design and implement effective project management strategiesfrom initial project definition and planning to professional project execution, control and closure.

Learning Content

The course will be taught with a focus specifically planning, leadership and implementation:

- Project definition and project organisation
- Project structure and work package planning
- Scheduling and process planning
- Cost planning and project control
- Risk management in projects

- Project completion techniques and acceptance procedures
- Analysis of case studies from companies
- Strategic Management fundamentals
- Corporate Success and firm value
- Strategic position
- Strategic choices
- Strategic change
- Strategic Management in times of transformation and AI

Entrance Requirements

Type of Examination

Methods

Interactive lectures, coaching on project development, case studies, group work, discussions and presentations of work in progress.

Remarks

Recommended Literature

Recommended reading (if possible in the most current edition):

- Association for Project Management. (2020). *APM body of knowledge* (8th ed.). Association for Project Management.
- Berkun, S. (2008) Making Things Happen: Mastering Project Management (Theory in Practice). Sebastopol, CA: O'Reilly Media
- Schelle, H., Ottmann, R. Pfeiffer, A. (2008) ProjektManager. 3. Auflage. Nürnberg: GPM, Dt. Ges. für Projektmanagement. ISBN 3-924841-26-8
- Burgardt, M. (2018) Projektmanagement: Leitfaden für die Planung, Überwachung und Steuerung von Projekten. 10. Auflage. Erlangen: Publicis Publishing. ISBN 978-3-89578-472-9, 3-89578-472-9
- Kunow, A. (2019) Project Management & Business Coaching: Agile project management - target-oriented and efficient with active body language & comprehensive communication. Buchum, Germany: KISP Bücher

- Martinelli, R.J., Milosevic, D.Z., (2016) Project Management ToolBox - Tools and Techniques for the Practicing Project Manager. Hoboken: Wiley
- Project Management Institute (2013) A guide to the project management body of knowledge. PMBOK(R) Guide. Newtown Square, PA: Project Management Institute

FINANCING AND ACCOUNTING

Objectives

Professional and methodological Competence
Students develop a thorough understanding of basic accounting principles, can classify the functions of investment and financing into the operational sequences and apply their instruments.

Knowledge

- Students know and understand the essential features of financial and management accounting as well as the legal foundations and components of bookkeeping and accounting.
- Students have a deep understanding of financial reports as a basic skill for business studies.
- Students are familiar with central methodological foundations and instruments of investment and financing, can explain them and apply them to typical operational problems.

Skills

- Students are able to evaluate the impact of business transactions on financial accounting. In particular, students have a deep understanding of the effectiveness/neutrality of business transactions on financial statements, and execute accounting transactions independently.
- Students are able to prepare and analyze financial statements and management reports.
- In their professional practice, students can identify problem situations that require investment and financing solutions. They are able to independently find adequate solutions for these situations, to evaluate them and to question them critically.

Personal Competence

Social competence

- Students develop communication skills that are supported by tasks and case studies. They are familiar with the essential terminology of financial accounting and communicate about basic problems with other participants using the appropriate technical terms.

- Students are encouraged to discuss critical/controversial topics in an objective atmosphere.
- Students can present their analyses in a goal-oriented and application-oriented manner matching the target audience.
- Students are able to work problem/solution-oriented in small mixed groups, learning and broadening teamwork abilities.

Autonomy

- Students will be able to solve complex problems independently with application-related, fundamental knowledge of bookkeeping and accounting.
- Students know and understand the limitations, assumptions and problems of methods and instruments of investment and financing in a specific context. Students can independently choose and employ suitable valuation approaches for the respective task.
- Students are able to relate their acquired knowledge to other lectures and topics.

Learning Content

- Accounting: information for decision making
- Basic financial statements
- The accounting cycle
- Understanding financial statements and cash flow
- Time value of money
- Valuing stocks and bonds
- Capital Budgeting

Entrance Requirements

Methods

Seminaristic teaching combining topic-oriented lectures, exercises, group work, group presentations, and classroom discussions.
Students are encouraged to actively participate in course by choosing appropriate didactical methods. They are strongly invited to discuss real-life problems and applications interactively throughout the lecture.
The seminar is accompanied by tutorials where calculation examples from the course are repeated for better understanding and examples similar to those used during course sessions are calculated.

Remarks

Teaching is supported by iLearn platform: Relevant course materials are made available online.

Recommended Literature

Basic literature

- Williams J.R., Haka S.F., Bettner M.S., Carcello J.V.; "Financial & Managerial Accounting: The Basis for Business Decisions"; 17th internat. edition; New York: McGraw-Hill Education; 2015.
- Ross S.A., Westerfield R.W., Jordan B.D.; "Essentials of Corporate Finance"; 9th internat. edition; New York: McGraw-Hill Education; 2017.

Supplementary literature

- McLaney E., Atrill P.; "Accounting and Finance: An Introduction"; 9th edition; Harlow: Pearson Education; 2018.
- Gitman L.J., Zutter C.J.; "Principles of Managerial Finance"; 14th global edition; Harlow: Pearson Education; 2015.

REAL ESTATE INVESTEMENT

Objectives

Qualification goals:

In this module, students acquire fundamental knowledge and practical skills in real estate investments. The goal is to develop a comprehensive understanding of the real estate market, investment strategies, and financing models. To make the acquired knowledge more tangible, practical examples, due diligence assessments, property valuation, and real estate investment cases are discussed and applied. Furthermore, students will become familiar with the influence of sustainability aspects and future trends in the real estate market.

Professional Competence

Knowledge

Upon completion of the module, students will gain knowledge in:

- Fundamentals of the real estate market and its functioning.
- Various investment strategies and valuation methods.
- Insight into sustainability aspects and their importance in real estate investments.

- Methods for conducting real estate due diligence assessments.
- Principles of real estate financing and business models.
- Risk assessment and market cycles.
- Future trends in the real estate sector.

Skills

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

- Analyze real estate markets and assess market trends.
- Make investment decisions based on economic feasibility analyses.
- Integrate sustainability criteria into investment strategies.
- Develop financing models for real estate projects.
- Conduct due diligence assessments and identify risk factors.
- Perform real estate valuations using recognized methods.

Personal Competence

Social Competence

Through group work and presentations, students develop collaboration skills and the ability to discuss complex investment topics. They also learn to conduct critical analyses and communicate their findings. Additionally, groups are composed of multicultural teams to enhance and refine students' intercultural interaction skills.

Methodological Competence

Students learn to apply theoretical concepts to practical case studies and justify investment decisions using both quantitative and qualitative methods.

Learning Content

- Fundamentals of the real estate sector (terminology, market mechanisms, market analysis, and investment concepts).
- Sustainability and climate change (impacts, sustainable building, life cycle cost analysis).
- Due diligence and site analysis (key evaluation criteria, risk assessment, decision-making fundamentals).
- Financing and time value of money (mortgages, cash flows, interest rate calculations).

- Valuation and investment methods (comparison, income, and cost approaches).
- Investment decision-making.
- Crisis and risk management (distressed assets, real estate classes, handling problematic properties).
- Future trends and digitalization (PropTech, new business models, market developments).
- Practical case studies and presentations (real-world examples, best practices, discussions).

Entrance Requirements

Successful completion of the following modules is recommended:

- BPP-01 Engineering Mathematics
- BPP-26 Commercial Management

Methods

Lectures with case studies, PowerPoint presentations, whiteboard discussions, presentations, and simulations of investment decisions, group work, and discussions.

Remarks

Recommended Literature

- Lecture scripts and materials.
- Jones, C. A., & Trevillion, E. (2022). Real Estate Investment: Theory and Practice. Palgrave Macmillan.
- Manganelli, B. (2015). Real Estate Investing. Springer.
- Khoja, A., Danylenko, O., Lopez, C. P., Davis, A., & Essig, N. (2021, October). Socioeconomic Reflections on Historic Buildings Renovations: A Portrait of Rural Alpine Municipalities. IOP Publishing.
- Khoja, A., & Danylenko, O. (2020). Real Estate 5.0: Synthesizing the Next Generation of Buildings. ON RESEARCH, 5, 50.
- Additional literature will be announced in the lecture.

LIFE CYCLE ANALYSIS AND ECOBALANCING

Objectives

Qualification goals:

The module follows a practice-oriented teaching approach within the BPP study program. It enables students to deepen the theoretical knowledge acquired in the modules on construction processes and to further develop their practical skills in the area of life cycle assessment (LCA) and eco-balances. By practically applying what they have learned, students are given the opportunity to apply and test theoretical knowledge early in practice.

Professional Competence

Knowledge

Upon successful completion of the module, students will have in-depth knowledge in the following areas:

- Understand the fundamental concepts of life cycle assessment (LCA) and eco-balancing.
- Recognize the potential and challenges of life cycle assessment (LCA) and eco-balancing in general, as well as in construction products and processes.
- Know where and how to find current relevant knowledge, including research findings.
- Independently understand the methods of all mentioned areas of the innovation process.
- Understand how to design the innovation process in all the above aspects.

Skills:

Upon completion of the module, students will be able to:

- Understand the concepts of life cycle assessment (LCA) and eco-balancing in general and with a focus on construction products.
- Understand the key tools for assessing the environmental impacts of construction products and processes from cradle to grave, using standardized methods to evaluate resource consumption, emissions, and overall sustainability.
- Critically analyze and interpret the results of these assessments to make informed decisions for sustainable development in various industries.
- Independently understand the innovation process and transfer it to new problem areas.
- Design a construction product in the innovation process in all the above aspects and adapt it to the company's requirements.

Personal Competences:

Students demonstrate that they can work both individually and in small groups to solve problems, aiming to improve their teamwork and problem-solving skills. They are capable of independently developing solutions to practical tasks and actively participating in construction activities. The project work promotes the individual design of further studies and allows students to incorporate their experiences into specializations and electives in the following semesters. The groups are composed in a multicultural mix to promote and refine students' intercultural interaction skills. The project work can eventually be carried out in collaboration with students from the Bachelor's program in Industrial Engineering or the Master's program in Healthy and Sustainable Buildings.

Methodological Competence

Students improve their knowledge in the area of life cycle assessment (LCA) and eco-balancing in general, with a focus on construction products, and are able to set up, organize, and carry out small LCA and eco-balancing projects. They learn to select relevant knowledge segments, conduct results and case analyses, and interpret them. They apply task-appropriate working methods and problem-solving techniques/strategies and design effective problem-solving processes. Additionally, they can visualize, present, and interpret findings and results.

Furthermore, they develop skills for independent and interdisciplinary acquisition of knowledge and abilities. They are capable of obtaining, preparing, presenting, and interpreting information, as well as practically applying theoretical foundations.

Learning Content

- Students work on an interdisciplinary product in teams (team size varies depending on the project, between 2 and 8 students) on real construction projects or construction products.
- Based on a given task, students:
- Determine the requirements
- Develop a solution
- Plan a project and create a project implementation plan based on a project charter
- Execute the project implementation plan in a structured manner
- Create presentations to report on the progress
- The results must be presented, defended, and documented.
- Importance and relevance of sustainability in today's world for companies and individuals

- Fundamentals of life cycle assessment (LCA) and eco-balancing
- Sustainability standards such as DGNB or LEED and criteria for evaluating sustainability
- Fundamentals of project management and methods
- Application of LCA tools and techniques
- Evaluation of the sustainability of construction products and processes using examples of construction products
- Integration of eco-balance strategies into decision-making processes

Entrance Requirements

Successful completion of the following modules is recommended:

- BPP-14 Digital Building Process (BIM 4D to 6D)
- BPP-19 Completion of the Interior, Technical Building Equipment and Smart Home
- BPP-20 Construction Calculation
- BPP-21 Product Management: Strategy and Marketing
- BPP-22 Law: Building Law / Construction Contract / VOB
- BPP-24 Fundamentals of Project Management und Planning
- BPP-31 Product Development and Testing
- BPP-34 Law: Building Product Regulations

Type of Examination

Methods

Lectures / exercises / laboratory works / tutorials / homework

PowerPoint presentation, whiteboard, document camera (visualizer) and more

Lecture materials in iLearn

Remarks

Recommended Literature

Literature is depending on the projects and products to be explored in the project seminar, it will be announced in the lecture.

- Bare, J. C., Norris, G. A., Pennington, D. W., & McKone, T. (2003). TRACI: The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts. Journal of Industrial Ecology, 6(3-4), 49-78.
- Baumann, H., & Tillman, A.-M. (2004). The Hitchhiker's Guide to LCA: An Orientation in Life Cycle Assessment Methodology and Application. Studentliteratur.
- Björklund, A. (2002). Survey of Approaches to Improve Reliability in LCA. The International Journal of Life Cycle Assessment, 7(2), 64-72.
- Curran, M. A. (Ed.). (2015). Life Cycle Assessment Handbook: A Guide for Environmentally Sustainable Products. Wiley.
- DGNB German Sustainable Building Council. (2018). DGNB System: Criteria Set New Construction, Buildings. DGNB.
- Guinée, J. B. (Ed.). (2002). Handbook on Life Cycle Assessment: Operational Guide to the ISO Standards. Kluwer Academic Publishers.
- Hauschild, M. Z., Rosenbaum, R. K., & Olsen, S. I. (Eds.). (2018). Life Cycle Assessment: Theory and Practice. Springer.
- Hellweg, S., & Mila i Canals, L. (2014). Emerging Approaches, Challenges and Opportunities in Life Cycle Assessment. Science, 344(6188), 1109-1113.
- ISO 14040. (2006). Environmental ManagementLife Cycle AssessmentPrinciples and Framework. International Organization for Standardization.
- ISO 14044. (2006). Environmental ManagementLife Cycle AssessmentRequirements and Guidelines. International Organization for Standardization.
- Klöpffer, W., & Grahl, B. (2014). Life Cycle Assessment (LCA): A Guide to Best Practice. Wiley-VCH.
- Pennington, D. W., Potting, J., Finnveden, G., Lindeijer, E., Jolliet, O., & Rydberg, T. (2004). Life Cycle Assessment Part 2: Current Impact Assessment Practice. Environment International, 30(5), 721-739.
- U.S. Green Building Council. (2013). LEED v4 for Building Design and Construction: Reference Guide. U.S. Green Building Council.

INNOVATIVE CONSTRUCTIONS AND BUILDING PRODUCTS

Objectives

Aims of the module

The module is based on a practice-oriented teaching approach within the BPP study program and enables students to deepen the theoretical knowledge acquired in the modules on construction processes and to implement their practical skills in an innovative design and construction product. By putting what they have learned into practice, students are given the opportunity to apply and test theoretical knowledge in practice at an early stage.

Professional Competence:

Knowledge

After successfully completing the module, students will have knowledge of:

- Innovative constructions and building products
- work effectively in interdisciplinary and intercultural teams by bringing in different skills and developing their intercultural competences
- prioritize tasks appropriately to increase efficiency and effectiveness in product development
- critically reflect on their own knowledge for continuous improvement
- Development and exchange of innovative ideas
- Structuring, planning and successfully implementing new, interdisciplinary projects
- Work in or lead intercultural teams in a results-oriented and cooperative manner
- Analysing problems, identifying and evaluating alternative solutions in innovative products and adapting project planning based on these solutions

Skills

After successfully completing the module, students will be able to

- Develop and transfer innovative designs and construction products to real products
- test these products for suitability for use in different environments.
- to work on various projects in different environments
- Present work results to interdisciplinary specialist groups

- define goals for innovative products and lead project teams through the various development phases in a goal-oriented, efficient and successful manner

Personal Competence

Social competence:

Students work in small groups on an innovative product development project within or across degree programs to learn how to work together efficiently in a project team to solve problems and implement their knowledge together. This is intended to strengthen their teamwork and problem-solving skills.

In addition, these groups will be mixed multicultural in order to promote and refine the students' intercultural interaction skills.

Professional competence:

Students learn to transfer theoretical knowledge into a project and are thus able to apply the skills they have learned.

Learning Content

Theoretical Basis:

- Basics of concrete chemistry
- Basics of canoe construction
- Introduction to innovative product development
- Importance of cooperation in the construction industry
- Overview of relevant theories and models

Practical Project Work:

- Students design and create an innovative construction or building product in teams
- The innovative construction is technically planned, designed and practically implemented
- The innovative construction is tested for suitability in various stages
- The teams will enter a regional and national comparison with this innovative construction.

Entrance Requirements

Successful completion of the following modules is recommended:

- Fundamentals of Project Management and Planning: BPP-24

- Project Execution andcontrolling: BPP-25

Methods

Lectures / exercises / tutorials / homework / group work / practical execution and application

PowerPoint presentation, whiteboard, document camera (visualizer) and others

Lecture materials in iLearn

Remarks

Participation at the annual Concrete Canoe Regatta.

Recommended Literature

Dependent on the tasks and will therefore be announced in the lecture.

IFRS AND ORGANIZATIONAL LAW

Objectives

Aims of the module

In this module, students acquire basic knowledge and practical application of national and international accounting rules (HGB and IFRS). In addition to basic knowledge of business administration about the possible legal forms of a company, the aim is to acquire the specialist knowledge required to prepare financial statements in accordance with IFRS.

Professional Competence:

Knowledge

The course provides students with knowledge of:

- Company law (gbR, GmbH, KG, GmbH & Co. KG, AG, Holding, International Group)
- Fundamentals of accounting
- IFRS as a standard for internationally operating companies
- Accounting contents of financial statements according to the German Commercial Code (HGB)
- Accounting contents of financial statements in accordance with the International Financial Reporting Standard (IFRS)
- Fundamental differences between HGB and IFRS

- Depreciation and amortization according to HGB and IFRS
- Application examples

Skills

After successfully completing this sub-module, students will be able to

- Describe the differences between the individual legal forms of a company and outline the advantages and disadvantages
- Carry out accounting in accordance with HGB
- Perform accounting in accordance with IFRS
- Read balance sheets, profit and loss statements (P&L) in HGB and recognize risks
- Understand and interpret IFRS balance sheets
- Prepare and evaluate depreciation and amortization in HGB and IFRS

Competence:

Social competence:

Students work both independently and in small teams on projects and issues within the module to develop the skills to solve problems alone or in teams.

Professional competence:

After successfully completing the sub-module, students have the competence to understand legal company structures and to prepare auditable annual financial statements. They will understand the rules for the preparation of annual financial statements and their components and will understand and apply the principles of the German Commercial Code (HGB) and IFRS as well as the depreciation and amortization regulations based on them. You will learn the significance of the various sets of rules and their effects and application. They will also learn how to interpret balance sheets and income statements.

Methodological competence:

Students improve their knowledge in the field of business administration with a focus on company law and accounting standards and can set up, organize and carry out small projects in the field of accounting.

Students learn to select relevant knowledge segments, carry out results and case analyses and interpret them. They apply task-appropriate working methods and problem-solving techniques/strategies and design effective problem-solving processes. They are also able to visualize, represent and present findings and results.

Learning Content

- Fundamentals of business administration and company law
- Differences in the legal forms of companies
- Differences between the individual company forms nationally and internationally (GmbH vs. Ltd.)
- Fundamentals of accounting according to the German Commercial Code (HGB)
- Accounting principles according to the International Financial Reporting Standard (IFRS)
- Differences between the accounting forms
- Understanding and interpreting balance sheets and income statements according to HGB
- Understanding and interpreting balance sheets and income statements according to IFRS
- Depreciation and amortization according to HGB and IFRS

Entrance Requirements

BPP-26 Commercial Management

Methods

Lectures / exercises / tutorials / homework / group work / practical application of theoretical knowledge

PowerPoint presentation, whiteboard, document camera (visualizer) and others.

Remarks

Recommended Literature

Lecture materials in iLearn

- Rechnungslegungstrends für Controller, Hrsg. ICV Fachkreis Controlling und IFRS, Haufe Verlag, 2013-ebook
- Wojcik, Karl-Philipp, Die internationalen Rechnungslegungsstandards IAS/IFRS als europäisches Recht
- Alexander Brem, Reinhard Heyd, Wilhelm Schmeisser
  Internationale Betriebswirtschafthttps://doi.org/10.24053/9783739802008-1

- Amely, Thomas, BWL für Dummies
- Further literature and links in iLearn

PROCESS SAFETY

Objectives

Module Objective

The students understand the importance of process reliability, its key concepts and practical approaches needed to avoid potentially catastrophic incidents and to improve the efforts in managing process hazards. Upon completion of this module the students should have the following competences:

Professional Competence

Knowledge

- Students understand and explain why and how these process safety systems have been implemented in some certain way, what they are intended to achieve, how to apply them daily to achieve safe and reliable operations, and possibly, how to improve them as needed.
- Students should know three essential parts of a process safety system that focus on general concepts of safety culture.
- They know safety pyramid with different levels and the way to define process risk. They are able to carry out a risk assessment considering the frequency and consequence.
- The students should identify different pictograms with specific hazard information. Students understand and explain typical barrier protection layer models.
- Operational disciplines should be well understood from both the organizational and personal point of view.
- The students are familiar with personal protective equipment and hazardous materials, as well as the fire explosion

Skills

- Ability to apply key concepts and methodologies to support effective process safety systems.
- Ability to transfer the knowledge to fill in potential gaps between the approaches presented in this course and the practices in facility.
- Ability to analyze the facilitys process safety program.

Personal Competence

Method competence:

After participating in this module, students will be able to understand safety culture and obey the safe guidelines in any working place. Based on the basic fundamental aspects of safety methodology, they can also meet and overcome the challenges that the safety

is needed to be further updated as the technology develops, e.g. further maintaining/ improving the facilitys process safety program.

Personal and social competence :

- Students should be able to let themselves complete work safely everyday.
- They have the personal communication skills to find the potential hazard not only from themselves but also from the coworkers, thus prevent the incidents in the first place.
- They reflect their disciplines to use safely the hazardous materials and process.

Learning Content

- Introduction to Process Safety and its importance
- Safety Culture, Safety Permit Systems
- Process Safety Systems, Process Risk Assessement
- Protection Layer Model (Swiss Cheese Model, Bow Tie Diagrams)
- Operational Discipline (Organizational and Personal OD)
- Personal Protective Equipment
- Gases, Vapors, Particulates, Toxic Metals, Hazards of Liquids
- Hazardous Chemical Identification
- Fire and Explosion

Entrance Requirements

Methods

seminaristic teaching / exercises / case study / home work

Remarks

Applicability in this and other Programs

BA Wirtschaftsingenieurwesen at THD

The learning outcomes of this module can be applied in any lectures and other study programmes that deal with process reliability, work safety, and hazard protection.

Excursion to companies can be offered

Recommended Literature

James A. Klein, Bruce K.: Process Safety: Key Concepts and Practical Approaches. CRC

Press Taylor & Francis Group, 2017.

Charles E. Thomas Process Technology: Safety, Health, and Environment. Cengage

Learning, 3rd Edition, 2011

Kahl A., Bier M.: Arbeitssicherheit: Fachliche Grundlagen, Erich Schmidt Verlag, 2019

ENTREPRENEURSHIP

Objectives

Module objectives

The students should learn an efficient and goal-oriented entrepreneurship management. Efficient and goal-oriented entrepreneurship management makes it necessary to implement structured business processes and use up-to-date, demand-oriented start-up methodologies.
Entrepreneurial Management understands how to identify, analyze and seize opportunities, turn big/smart data into business opportunities and take full advantage of the digital transformation, manage stakeholders and communication, surf on diversity and do business in emerging markets, manage growth and understand the fundamentals of business rules.
The students learn a systematic process of envisioning a desired future, and translating this vision into broadly defined goals or objectives and a sequence of steps to achieve them.

Learning Content

The module considers business start-ups as a process from the identification and evaluation of opportunities, the procurement of relevant human and monetary resources, the establishment of an organization, to the management of a start-up. In addition to theories and concepts, relevant practical methods to build a start-up team and procedures are taught to support this process.

Entrance Requirements

Methods

Seminaristic teaching / exercises / team work / home work

Remarks

Recommended Literature

- Blank, S., *The startup owner's manual: The step-by-step guide for building a great company*. BookBaby, 2012
- Brown, T., *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*. Harper Collins, 2009
- Clark, T., Osterwalder, A., & Pigneur, Y.,. *Business model you: a one-page method for reinventing your career*. John Wiley & Sons, 2012
- Doz, Y. L., & Kosonen, M., *Fast strategy: How strategic agility will help you stay ahead of the game*. Pearson Education, 2008
- Drucker, P., *Innovation and entrepreneurship*. Routledge, 2014
- Maurya, A., *Running lean: iterate from plan A to a plan that works*. O?Reilly Media, Inc., 2012
- Osterwalder, A., & Pigneur, Y., *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons, 2010
- Porter, M. E., & Advantage, C., *Creating and Sustaining Superior Performance*. New York, NY: Free press, 1985
- Ries, E., *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create RadicallySuccessful Businesses*. Crown Publishing Group, 2011
- Wirtz, B. W. *Business Model Management: Design - Instrumente - Erfolgsfaktoren von Geschäftsmodellen*. Gabler Verlag, 2013

o Zollenkop, M., *Geschäftsmodellinnovation: Initiierung eines systematischen Innovationsmanagements für Geschäftsmodelle auf Basis lebenszyklusorientierter Frühaufklärung*. Springer-Verlag, 2009

PROCESS OPTIMIZATION

Objectives

Module Objective

Professional Competence

Knowledge

From the variety of engineering and management courses in the previous semesters, students are already capable to develop and design innovative building products for a wide range of applications. Another dimension for a successful and marketable building product lies both in ensuring its reliability and functionality during its whole lifetime, and the ability to manufacture this product efficiently, reproducibly and environment-friendly according to current quality standards on an industrial scale. This module therefore teaches the competences how to evaluate products according to their quality and reliability, and how to operate the respective production processes economically and optimize them holistically, with a special focus on sustainability and maximizing product quality while minimizing energy consumption. A wide range of optimization tools are presented that can be used in all phases of planning, operation and debottlenecking a plant.

Skills

After completing this module, students will be able to discuss all areas of quality optimizing a production plant both with technical and business experts. They understand the advantages and disadvantages of different optimization tools, their applicability limits and the required effort to realize them.

Personal and social Competence

The solution of the tasks given both in the lecture and the exam requires students´ self-responsible and self-directed working style. Herein, the concepts of all module topics have to be applied to new problems, analyzed regarding their relevance, and evaluated in order to yield a reliable result.

Learning Content

Quality Engineering

o Process-oriented quality management

o ISO 9000 ff.

- Set-up and introduction of a quality management system
- Methods and tools of quality planning
- Total Quality Management
- Six Sigma Process
- Define, Measure, Analyze, Improve, and Control (DMAIC-framework)
- Statistical methods within the DMAIC-framework

Production Optimization

- Reliability Management (FTA)
- Process Integration: Global Optimality, Heat Exchanger Networks (Pinch Method)
- Environmental Design: Aqueous Contamination, Atmospheric Emissions, Life Cycle Analysis (LCA)

Entrance Requirements

Methods

The lecture focuses on seminaristic teaching, but also applies detailed practical exercises based on the theoretical background. The key content is conveyed in combination of a written script and slide and video presentations. All material is uploaded to an online learning portal (iLearn). The students are strongly invited to discuss real-life problems and applications interactively throughout the lecture. Tutorials will be offered on demand.

Remarks

Applicability in this and other Programs

This module is an elective lecture designed for higher semester students, so there will be no direct applicability within the same study programme. However, the learning outcomes can be applied in any other study programmes that deal with the design, operation, maintenance and optimization of plants and production systems.

Recommended Literature

Quality Engineering

- T. Pyzdek "Quality Engineering Handbook", CRC Press
- G. Linß "Qualitätsmanagement für Ingenieure", Hanser, München-Wien

- Pfeifer "Praxisbuch Qualitätsmanagement", Hanser, München-Wien

Production Optimization

- B. Bertsche "Reliability in Automotive and Mechanical Engineering", 1st edition
- R. Smith "Chemical Process Design and Integration", 2nd edition

INTERDISCIPLINARY PRODUCT DEVELOPMENT

Objectives

Objectives

The module is based on a practical teaching approach within the BPP study program and enables students to deepen the theoretical knowledge acquired in the modules on construction processes and to further develop their practical skills in interdisciplinary product development and project management. By putting what they have learned into practice, students are given the opportunity to apply and test theoretical knowledge in practice at an early stage.

Professional Competence

Knowledge

After successfully completing the module, students will have knowledge of

- International project management and interdisciplinary construction product development
- Work effectively in interdisciplinary and intercultural teams by bringing in different skills and developing their intercultural competencies
- Prioritize tasks appropriately to increase efficiency and effectiveness in project delivery and project management
- How and when to escalate problematic issues to the relevant parties
- Critically reflect on their own knowledge for continuous improvement
- Developing and sharing innovative and sustainable ideas in the context of construction products
- Structuring, planning and successful implementation of new, interdisciplinary projects
- Work in a results-oriented and cooperative manner in intercultural teams or lead them
- Analyzing problems, identifying and evaluating alternative solutions in interdisciplinary projects and adapting project planning based on these solutions

Skills

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

- Transfer theoretical knowledge of project management and product development to real projects and interdisciplinary products
- Determine which project management method is most effective in different situations
- Identify the most effective leadership technique for various project teams
- Recognize signs when a project is not working or is failing
- Work on various projects in different environments
- Present and defend work results to interdisciplinary expert groups by selecting important issues appropriately for the target audience, constructing argument chains, and using suitable presentation techniques
- Define goals for interdisciplinary project teams and lead project teams through the project phases in a goal-oriented, efficient, and successful manner

Personal Competence

Social competence

Students work in small groups on either study-course internal or cross-study program interdisciplinary product development projects to learn how to efficiently collaborate on problem-solving within a project team and to apply their knowledge collectively. This aims to strengthen their teamwork and problem-solving skills. Additionally, these groups are composed of multicultural mixes to promote and refine the students' intercultural interaction skills.

Autonomy

Students learn to transfer theoretical knowledge into a project, enabling them to apply their acquired skills. This leads to better retention of the learned theory and facilitates the transfer of abilities. Additionally, students gain an overview of various competencies and theories and are able to choose the most efficient approach for their application. Students develop an analytical, system-oriented mindset and should be able to structure the most effective approach for project management and interdisciplinary product development under different aspects, starting from planning through selection to implementation.

Learning Content

Theoretical Foundations

- Basics of Project Management
- Basics of Product Development
- Introduction to Interdisciplinary Product Development
- Importance of Collaboration in Construction
- Overview of Relevant Theories and Models

Practical Project Work

- Students work in teams (team size varies depending on the project, between 2 and 8 students) on real construction projects or products.
- Based on a given task, the students:
- Determine the requirements
- Develop a solution
- Plan a project and create a project implementation plan based on a project charter
- Execute the project implementation plan in a structured manner
- Create presentations to report the progress
- The results must be presented, defended, and documented.
- The task can consist of any content from study program modules and may also involve transferring knowledge from other fields unrelated to construction to create new construction product ideas or innovations.

Entrance Requirements

Successful completion of the following modules is recommended:

- BPP-14 Digital Building Process (BIM 4D to 6D)
- BPP-20 Construction Calculation
- BPP-24 Fundamentals of Project Management and Planning
- BPP-25 Project Execution and Controlling

Methods

Lectures / exercises / laboratory works / tutorials / homework

PowerPoint presentation, whiteboard, document camera (visualizer) and more

Lecture materials in iLearn

Remarks

Recommended Literature

- Literature is depending on the projects and products to be explored in the project seminar, it will be announced in the lecture.

TECHNOLOGY AND INTELLECTUAL PROPERTY RIGHTS MANAGEMENT

Objectives

Professional Competence

Knowledge

- Understanding what intellectual property rights are
- Understanding the significance of intellectual property and technological Innovation in society
- Knowledge of basic principles and methods for intellectual property management
- Knowledge of basic principles n technology transfer

Skills

- Students are able to apply theories and methods to :
- Identify intellectual assets
- Identify main types of intellectual property
- Prepare and evaluate an IP exploitation strategy
- Managing Intellectual property rights
- Technology transfer from University to Industry

Personal Competence

Social competence

- Students are able to work goal-oriented in small mixed groups, learning and broadening teamwork abilities.

Autonomy

- Develop analytical thinking, attention to details and ability to consider different strategies to solve individually problems related to this lecture.

Learning Content

- Introduction to Intellectual Property Rights
- Intellectual property rights management national and international environment
- World wide IPR management system, World Intellectual Property Organization (WIPO)
- International Treaties and Conventions on Intellectual Property
- The Impact of Technological Innovation on Society
- Protecting technical innovation: patents and trade secrets
- Intellectual property management in technology transfer

Entrance Requirements

Methods

Seminaristic teaching / exercises / team work / home work

Remarks

Recommended Literature

- Melissa A. Schilling, Strategic management of technological innovation, 6th Ed., McGraw-Hill Education 2020
- Keith Goffin Palgrave, Innovation management : effective strategy and implementation, 3rd Ed., Macmillan Education 2017
- Intellectual Property Handbook: Policy, Law and Use, WIPO 2004 : https://www.wipo.int/about-ip/en/iprm/

- WIPO Technology Trends 2019 : https://www.wipo.int/publications/en/details.jsp?id=4386

ARCHITECTURAL HISTORY AND THEORY

Objectives

Students learn about the historic development of architecture worldwide. Furthermore, they understand architectural theories and its development over time.

Based on case studies, the students understand the concept of architecture as cultural expression of its specific period.

Professional Competence

Knowledge

After successfully finishing the module, students will get to:

- Understand the development of architecture in its historic context
- Understand the complexity of architectural solutions
- Understand vernacular architecture and its concepts in the context of different climate zones
- Understand representative architecture and its specific political and social context
- Understand the drivers behind the development of urban structures and its specific results

Skills

Upon completion of the module the students will be able to:

- Describe basic concepts of architectural development in different regions and in its specific political, social and environmental context
- Describe different architecture styles, with focus on Europe
- Describe basic concepts of the historic development of urban structures, including its political, social and environmental context

Social competence

Students are demonstrating working individually or in small groups to solve problems that aim at enhancing their team-working skills as well as their problem-solving capabilities. Further, students also know how to analyze the perspective of historic stakeholders, understand their behavior and understand the architectural outcome.

Methodological competence:

The students improve the knowledge in the field of history of architecture based on case studies. The students should be enabled to apply the acquired knowledge and to critically evaluate and inter-present subject-specific information on the basis of criteria of architecture. Students develop an analytical system-oriented way of thinking and are able to structure the approach for analyzing historic buildings and historic urban structures.

Learning Content

- Human development, buildings, urban structures from the very start
- Historic development of architecture in Europe and selected examples from different continents
- Historic development of urban structures in Europe and selected examples from different continents
- Architecture theory and its application

Entrance Requirements

Methods

Seminaristic teaching / Presentations / Case studies / Moderated discussions / Field trips

Remarks

Recommended Literature

Conway, H., Roenisch, R. (2004) Understanding Architecture - An Introduction to Architecture and Architectural History. Routledge : New York / USA

SIVV CERTIFICATE

Objectives

Aims of the module

The module is based on a practical teaching approach within the BPP study program and enables students to deepen the theoretical knowledge acquired in the modules on construction products and construction processes and to further develop their practical skills in the field of maintenance of concrete components.

By implementing what they have learned, students should be given the opportunity to apply and test theoretical knowledge in practice at an early stage. You should also be able to achieve the SIVV certificate as an additional qualification goal

Professional Competence:

Knowledge

Upon successful completion of the module, students will be able to:

- Understand the basic concepts of concrete repair.
- To recognize the potential and challenges of each process and method.
- Know where and how to find current relevant knowledge of processes, products and equipment, including research findings.
- To understand the methods of all the above areas of concrete repair and to apply them in the correct areas.
- To understand the theory and practice of concrete repair.

Skills

On completion of the module students will be able to:

- Understand the concepts of concrete repair in general and with emphasis on practical application in refurbishment situations.
- Differentiate between the most important concrete repair methods in theory, understand the practical implementation of maintenance measures from the cradle to the grave and also carry them out independently on a laboratory scale.
- Analyze the individual procedures and make application decisions in order to carry out the appropriate measures in a targeted manner.
- Understand the handling of processes and substances, understand and apply hazardous substance labeling and also apply personal protective measures in a targeted manner.
- Plan and carry out all aspects of a maintenance measure on concrete components.

Social competence:

Students demonstrate that they can work both individually and in small groups to solve problems. They are able to independently develop solutions to practical tasks and actively participate in the application of procedures and methods. The practical work promotes the individual design of further studies and enables students to incorporate their experience into in-depth studies and specializations in the following semesters, in particular through freely selectable elective subjects. The groups are put together in such a way that they are multiculturally mixed in order to promote and

refine the students' intercultural interaction skills. Finally, the project work can be carried out in collaboration with students from the DIT Bachelor's degree program in Civil Engineering.

Methodological competence:

Students improve their knowledge in the field of concrete repair with a focus on construction products and procedures for repair and are able to set up, organize and carry out small projects in the field of concrete maintenance.

Students learn to select relevant knowledge segments, carry out results and case analyses and interpret them. They apply task-appropriate working methods and problem-solving techniques/strategies and design effective problem-solving processes. They are also able to visualize, represent and present findings and results.

Furthermore, they develop skills for the independent and interdisciplinary acquisition of knowledge and skills. They are able to obtain, process, present and interpret information and apply theoretical principles in practice.

Learning Content

- **Concrete**

Technical regulations, raw materials, concrete properties

- **Steel**

Reinforced concrete, stress-strain behavior, corrosion, marking of reinforcing steel, welding of reinforcing steel

- **Plastics**

Reactive resins, plastic dispersions, plastic solutions

- **Protective measures**

Hazardous substances, hazardousness of individual substances, protective measures, first aid, obtaining information, hazardous substance register, storage, environmental protection

- **Substrate**

Concrete, steel

- **Preparation of mixtures**

Construction site equipment, external conditions, basic test certificate (proof of usability), plastic solutions and dispersions, PCC mortar, reaction resin mixtures, preparation of reaction resin mixtures, preparation of mixtures for injections, calculation of the volume mixing ratio for reaction resin, calculation of the material requirement per m2, temperature and processing times.

- **Surface protection**

Measures for surface protection, surface protection systems, execution and monitoring, description of surface protection systems

- **Filling cracks and cavities**

Causes of cracks and cavities, defects due to cracks and cavities, detection of crack characteristics, detection of cavities, application objectives and areas of application for filling cracks and cavities, properties of fillers for cracks and cavities, filling methods, execution of filling work

- **Plastic-modified cement mortar/concrete and reaction resin mortar/concrete**

Plastic-modified cement mortar/concrete (PCC), reaction resin-bonded mortar/concrete (PC), epoxy resin-modified cement mortar/concrete (ECC)

- **Repair**

Building diagnosis, preparation of the concrete base, measures/repair principles, building materials, execution, monitoring

- **Joint repair**

Terms and designations; joint types, exterior wall joints

- **Monitoring**

Monitoring by the company carrying out the work, monitoring by a recognized monitoring body

- **Grouting**

Applications, cement-bonded grouting compounds, reaction resin-bonded grouting compounds, selection of grouting compounds, substrate and climatic ambient conditions,

- **Bonded component reinforcement**

Basics of reinforcement, application requirements, products, preparatory work, bonding work

- **Bonding of segments**

Construction method, joint types, production of segments, joint fillers, substrate, assembly of segments with press joints, self-monitoring

- **Sprayable plastic-modified cement mortar/concrete**

Areas of application, usability, properties of fresh and solid mortar, spraying process, machine technology, surface treatment, requirements for personnel, monitoring of execution

- **Building law**

Building law requirements, technical building regulations, proof of compliance, proof of conformity, regulations for the protection and repair of concrete components

Entrance Requirements

Successful completion of the following modules is recommended:

- BPP-03 Building Material Characteristics
- BPP-13 Testing of Building Materials
- BPP-19 Completion of the Interior, Technical Building Equipment and Smart Home
- BPP-21 Product Management Strategy und marketing
- BPP-22 Law: Building Law / Construction Contract / VOB
- BPP-24 Fundamentals of Project Management and Planning

Methods

Lectures / exercises / tutorials / homework / group work / practical application of theoretical knowledge

PowerPoint presentation, whiteboard, document camera (visualizer) and others.

Remarks

This module includes practical work

Recommended Literature

SIVV handbook - Protecting, repairing, connecting and reinforcing concrete components

Technical regulations of the concrete and cement industry, as well as the DAStB

Technical product data sheets

Lecture materials in iLearn

VERNOMIMICRY

Objectives

Qualification goals:

Vernomimicry explores the connection between nature and traditional building concepts as a response to climate change. Building on principles of biomimetic architecture and regional construction traditions, students learn to develop sustainable, climate-adaptive, and culturally embedded construction methods. The focus is not on the visual imitation of nature but rather on the functional integration of biological adaptation strategies into modern architectural concepts.

By analyzing historical building techniques, natural principles, and forward-looking architectural trends, students examine proven solutions that have adapted to local environmental conditions through evolutionary processes.

Through case studies, design methods, and their own projects, students develop innovative concepts for climate-resilient buildings and product that are not only sustainable but also deeply rooted in architectural culture and the environment. The goal is to understand nature and traditional arechitecture not just as an inspiration but as an integral part of the planning and construction process.

Professional Competence

Knowledge

Upon completion of the module, students will gain knowledge in:

- Materials and structures inspired by nature.
- Principles of desing in nature
- Principles of biomimetic architecture and traditional building methods.
- Biological and traditional construction strategies and their applicability to modern architecture.
- The relationship between climate adaptation, sustainability, and architecture.
- The integration of interdisciplinary insights from biology, architecture, and material science.
- Analytical skills for evaluating historical and modern architecture in the context of natural and traditional building principles.
- Understanding the interactions between nature and architecture.
- Creative thinking through critical reflection on existing construction methods and the development of innovative, vernomic solutions.

Skills

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

- Integrate biomimetic and traditional construction principles into architectural and product development concepts.
- Design climate-adapted and resilient building systems.
- Analyze historical and modern architecture in the context of natural and traditional building practices.
- Evaluate and optimize architectural designs using traditional and biomimetic approaches.
- Make informed, scientifically based decisions in selecting sustainable and resilient designs and material.

Personal Competence

Social Competence

Through group projects and interdisciplinary collaboration, students develop cooperative and communication skills. They work together to understand collaborative design processes that integrate both ecological and cultural considerations. Additionally, the groups are multicultural to enhance students intercultural interaction skills. This setting enables students to learn from one another and exchange knowledge about local building traditions and architectural characteristics from their home regions. As a result, they gain a deeper understanding of diverse traditional building techniques and their sustainable principles.

Methodological Competence

Students learn systematic methods for analyzing biomimetic principles and applying them to construction. They develop the ability to abstractly interpret natural processes and integrate them into sustainable architectural and urban design concepts. Furthermore, students apply theoretical knowledge in projects, demonstrating their ability to transfer their acquired skills to real-world applications.

Learning Content

- Climate change and ecological challenges (global impacts on the construction industry and urban development, necessity of resilient building methods).
- Introduction to Vernomimicry and the evolution of architecture (connection between nature and architecture, historical development, future adaptation strategies).

- Design processes in nature and traditional architecture (comparison of natural processes and regional building methods, resilience, and material and form optimization).
- Learning from nature and tradition (analysis of biomimetic and traditional solutions, bio-utilization, biomorphism, biophilia).
- Traditional architecture and climate adaptation (regional building techniques, passive strategies, ecological materials).
- Comparison: Nature Tradition Modernity (similarities and differences, challenges of adaptation, cultural influences).
- Future trends in architecture (role of Vernomimicry, sustainable material development).
- Vernomimicry Practical case studies and presentations (project work, development of innovative, vernomic solutions, applications, discussions

Entrance Requirements

Methods

Lectures with interactive case studies, group work, interdisciplinary workshops, practical applications in design projects, and excursions.

Remarks

Recommended Literature

- Khoja, A., & Waheeb, S. (2020). Vernomimicry: Bridging the Gap between Nature and Sustainable Architecture. Journal of Sustainable Development, 13(1).
- Pfammatter, U., & Hudson, J. (2014). Building for a Changing Culture and Climate: World Atlas of Sustainable Architecture. Dom.
- Weber, W., & Yannas, S. (Eds.). (2014). Lessons from Vernacular Architecture (Vol. 2). New York: Routledge.
- Knippers, J., Schmid, U., & Speck, T. (Eds.). (2019). Biomimetics for Architecture: Learning from Nature. Birkhäuser.
- Pohl, G., & Nachtigall, W. (2015). Biomimetics for Architecture & Design: Nature-Analogies-Technology. Springer.

- Farzaneh, H. H., & Lindemann, U. (2019). A Practical Guide to Bio-Inspired Design. Heidelberg: Springer Vieweg.
- Khoja, A. (2025). From Vernacular to Vernomimicry: Vernacular Design Principles for Resilient Communities. Springer.
- Sayigh, A. (Ed.). (2019). Sustainable Vernacular Architecture: How the Past Can Enrich the Future. Springer.
- Additional current publications and case studies will be announced in the course

Additional literature will be announced in the lecture

APPLIED AI IN THE BUILDING PROCESS

Objectives

Qualification goals:

The module aims to familiarize students with the fundamental and advanced aspects of Artificial Intelligence (AI) in construction and construction products and to deepen their understanding. Students should be enabled to develop, critically evaluate, and purposefully apply AI technologies so that innovative solutions to current challenges in construction processes and products can be developed. Furthermore, they should be able to work interdisciplinarily and apply their methodological and social skills in practice.

Professional Competence

Knowledge

After successfully completing the module, students will have the following knowledge:

- Fundamentals and applications of Artificial Intelligence (AI) and Machine Learning (ML), particularly in construction processes
- Programming, data management, and analysis, as well as the transfer to construction projects and products
- Understanding the use of AI in Building Information Modeling (BIM) and its integration into construction projects and innovative construction products
- Understanding the legal frameworks and ethical aspects of using AI in construction
- Understanding AI and ML techniques, their advantages and disadvantages in construction process optimization, and their use in innovations in construction products

- Development of AI-based solutions for construction monitoring, quality assurance, and improving sustainability

Skills:

After completing the module, students will be able to:

- Understand fundamental concepts of Artificial Intelligence (AI) and its applications in construction processes, as well as use industry-specific terms correctly.
- Evaluate and assess various AI-based approaches (such as Machine Learning [ML]) in terms of productivity, investment costs, and operational and maintenance costs.
- Develop design concepts to integrate AI into construction processes, intelligent construction products, and smart buildings.
- Analyze and evaluate the potential of using AI to optimize construction projects, intelligent construction products, and smart buildings.
- Purposefully apply AI to increase efficiency and innovation in construction processes.

Personal Competences:

Students work in small groups on either study-course internal or cross-study program interdisciplinary product development projects to learn how to efficiently collaborate on problem-solving within a project team and to apply their knowledge collectively. This aims to strengthen their teamwork and problem-solving skills. Additionally, these groups are composed of multicultural mixes to promote and refine the students' intercultural interaction skills.

Methodological Competence

Students learn to transfer theoretical knowledge into a project and are thus able to apply their acquired skills. This leads to better retention of the learned theory and facilitates the transfer of abilities. Additionally, students gain an overview of various competencies and theories and are able to choose the most efficient approach for their application. Students develop an analytical, system-oriented mindset and should be able to structure the most effective approach for project management and interdisciplinary product development under different aspects, starting from planning through selection to implementation.

Learning Content

Theory - Introduction and Fundamentals

- Introduction and fundamentals of Artificial Intelligence (AI), automation, and robotics with a focus on the construction industry

- Introduction and fundamentals of Machine Learning (ML)
- Introduction to data management and data analysis
- Introduction and fundamentals of programming and databases
- Fundamentals of integrating and utilizing AI in Building Information Modeling (BIM)

Practice Application of Fundamentals of Artificial Intelligence

- Students work in teams (team size varies depending on the project, between 2 and 8 students) on real AI applications for construction projects or products
- Based on a given or self-developed task, students:
- Get acquainted with practical AI tasks with requirements from the construction industry
- Develop a solution for a task or use cases from practice in the construction industry
- Initiate, plan, and carry out an AI R&D project based on a realizable AI project idea
- Create presentations to report the progress, with the requirement to present, defend, and document the results

Entrance Requirements

Successful completion of the following modules is recommended:

- BPP-04 Building Informatics and KI
- BPP-14 Digital Building Process (BIM 4D to 6D)
- BPP-20 Construction Calculation
- BPP-21 Product Management: Strategy and Marketing
- BPP-24 Fundamentals of Project Management and Planing
- BPP-25 Project Execution and Controlling

Methods

Lectures / exercises / laboratory works / tutorials / homework

PowerPoint presentation, whiteboard, document camera (visualizer) and more

Lecture materials in iLearn

Remarks

Recommended Literature

Literature is depending on the projects and products to be explored in the project seminar, it will be announced in the lecture.

General literature for this module:

- Project Management Institute. (2021). A guide to the Project Management Body of Knowledge (PMBOK guide) (7th ed.). Project Management Institute.
- Wang, L., & Xu, Y. (2019). Artificial intelligence in design and construction (https://www.iaarc.org/publications/2019_proceedings_of_the_36th_isarc/artificial_intelligence_techniques_to_support_design_and_construction.html)
- Bock, T., & Linner, T. (2015). Robotic Industrialization: Automation and Robotic Technologies for Customized Component, Module, and Building Prefabrication. Cambridge University Press.
- Deng, Z., & Cheng, J. C. (2019). Building Information Modeling-Based Data Mining for Construction Safety Management. Journal of Management in Engineering, 35(3), 04019002.
- Koehler, A., & Menges, A. (2020). The Integration of Robotic Fabrication Processes in Construction with Building Information Modeling (BIM). In J. LaCour (Ed.), Innovative Construction Practices (pp. 89-112). Routledge.
- Wang, L., & Xu, Y. (2019). Artificial Intelligence in Design and Construction. In X. Sun, H. Liu, Z. Gao, & Y. Xu (Eds.), Proceedings of the 36th Chinese Control Conference (CCC) (pp. 10351-10356). IEEE.

BPP-27 COMPULSORY ELECTIVE 1 (FWP-1)

BPP-28 GERMAN B2

Module code	BPP-28
Module coordination	Tanja Mertadana
Course number and name	BPP-28 German B2
Semester	5
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	8
ECTS	10
Workload	Time of attendance: 120hours self-study: 180hours Total: 300hours
Type of Examination	See examination schedule AWP and languages, written ex. 120 min.
Duration of Examination	120min.
Weighting of the grade	10/240
Language of Instruction	German

Module Objective

The German B2 module seeks to enable students to improve their communication skills and expand their range of vocabulary. This process will also involve understanding and interpreting complex written texts, such as technical reports, research papers and specialist literature.

It broadens their ability to follow and actively engage in longer and demanding oral presentations, lectures and discussions. Students' verbal skills will also be improved. Through this, students will be able to use specialist terminology and complex ideas in conversations and discussions. They will practice writing structured and argumentative texts, such as reports of a general scientific nature, project documentation or specialist articles, and consolidate this skill. The module additionally expands their vocabulary range and knowledge of grammar structures. The course is structured around a variety of activities, such as group discussions, case studies, role plays, presentations and project-based learning.

Specifically, students completing the module will achieve the following learning outcomes:

Subject-specific skills

At Level B2, students should be able to:

- Read, understand and analyse complex texts, such as articles of a general scientific nature or technical reports.
- Explain and discuss subject-specific concepts and linkages.
- Participate in work-related discussions and negotiations and convincingly convey their own standpoints.
- Hold presentations on complex topics and provide comprehensive answers to questions.

Methodological skills

Methodological skills here refer to students' ability to apply a variety of learning and working methods so that they may further build on their linguistic and subject-specific knowledge.

- Application of effective learning strategies in order to use subject-specific vocabulary and grammar structures.
- Fostering of self-regulated learning by having students read specialist literature, analyse scientific articles and systematically compile and acquire specialist vocabulary.
- Independent planning, structuring and presentation of complex written tasks, such as research reports or project work.
- Active participation in subject-specific discussions and debates by presenting arguments and giving constructive feedback.
- Critical reflection on their own learning progress and strategies.

Social skills

Social skills here refer to students' ability to conduct themselves appropriately, communicating effectively and working in groups when engaging in social interactions.

- Ability to apply effective oral communication skills in demanding situations, e.g. in expert discussions, presentations or negotiations.
- Empathy and the ability to understand other viewpoints and opinions and to respond appropriately to these.
- Effective collaboration in demanding group projects and teamwork where different abilities and views need to be brought together.
- Ability to resolve conflicts constructively and to liaise between deviating viewpoints.

Personal skills

Personal skills here refer to students' individual abilities, attitudes and traits that enable them to achieve their goals, further their personal development and work successfully.

- Self-reflection and continuous further development of one's own abilities.
- Flexibility and adaptability in order to be prepared to respond to new requirements and changes.
- Problem-solving skills and the ability to find innovative solutions.
- Resilience and the ability to work under pressure and deal with complex situations.

Applicability in this and other Programs

Not applicable in other degree programmes.

Entrance Requirements

To participate in this module, students need to pass the examination German B1/ part 3 + 4 first.

Learning Content

Grammar and vocabulary form the core elements of this course. The following key aspects are covered during the course: regional studies, intercultural skills and pronunciation. Relationships, work, history, communication, technology and health are just some of the areas covered during this course. Additional topics will furthermore be incorporated in keeping with current literature and real-life developments. The following is an extract of the grammar topics that will be covered:

- Connectors
- Alternatives to passive voice
- Noun+verb compounds
- Indirect speech

Teaching Methods

The teaching methods applied will focus on improving the four main language skills (listening, speaking, reading and writing). Examples of the applied learning methods include various forms of group, individual and collaborative work, mini-presentations, exercises involving intensive reading and listening, role plays and grammar games, loci method, dictation exercises, translations, peer feedback, working with learning stations, and various writing activities designed to consolidate the content learnt.

Students will be given weekly assignments for self-study.

Remarks

In all language courses, students will be required to meet a minimum compulsory attendance rate of 75%.

Recommended Literature

Textbooks:

Kontext B2.1, Kurs- und Übungsbuch mit Audios und Videos, Klett Verlag Lektionen 1-6 (ISBN 978-3-12-605340-2)

Kontext B2.2, Kurs- und Übungsbuch mit Audios und Videos, Klett Verlag Lektionen 7-12 (ISBN 978-3-12-605341-9)

Recommended reading:

Grammatik aktiv - Deutsch als Fremdsprache - 1. Ausgabe - B2/C1: Verstehen, Üben, Sprechen Übungsgrammatik, Klett (ISBN 978-3060214822)

Deutsch als Fremdsprache, Übungsgrammatik für die Grundstufe Niveau A2-B2. Liebaug-Dartmann (ISBN 978-3-922989-70-7)

Wortschatz & Grammatik B2: Buch, Hueber (ISBN 978-3194274938)

Deutsch intensiv Wortschatz B2, Klett (ISBN 978-3-12-675078-3)

BPP-29 SUSTAINABLE BUILDING

Module code	BPP-29
Module coordination	Prof. Dr. Ahmed Khoja
Course number and name	BPP-36 Sustainable Building
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	5
ECTS	5
Workload	Time of attendance: 75hours self-study: 75hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	Course dependent

Module Objective

Qualification goals:

The module "Sustainable Building" provides students with knowledge of sustainable planning and construction processes and their application in building practice. It fosters a holistic understanding of ecological, economic, and social aspects of sustainability and their integration into modern construction projects. The objective is to impart fundamental knowledge of sustainable building, including relevant standards, criteria, and assessment systems

Knowledge:

The project seminar provides the participants with knowledge about:

Upon completion of the course, students will acquire knowledge in:

- Fundamentals of sustainability.
- Ecological, economic, technical, and socio-cultural aspects of sustainability.
- Essential criteria for sustainable building.
- National and international verification methods for sustainable buildings (e.g., DGNB, BNB, LEED, BREEAM, SB Tool), Smart Building (e.g., SRI, SmartScore), and resilient construction.

- Fundamentals of Assessment Tools (e.g., life cycle assessment, life cycle costing, simulations) and verification documents that provide substantiated statements on the environmental, technical, and socio-cultural impacts of building products.

Skills:

Upon successful completion of the project seminar, students will be able to:

- Apply sustainability approaches to building products and structures using case studies.
- Identify, evaluate, and select building products based on sustainable, ecological, economic, and circular economy criteria.
- Provide necessary verification for building products used in certified sustainable buildings.
- Analyze building performance based on sustainable standards.

Personal Competence

Social Competence

Students work both independently and in interculturally mixed teams, learning how to effectively present progress and outcomes. They develop structured and efficient individual and team-based work skills. Furthermore, they acquire the ability to engage in technical discussions with peers on complex issues and find collaborative solutions. This team-oriented work is reinforced through small projects and practical applications.

Methodological Competence

Upon completing the module, students will understand the core principles of certification systems for organizations, buildings, and products. They will be able to distinguish and correctly apply these systems. Additionally, they will be capable of independently advancing sustainable and circular construction in practice.

Applicability in this and other Programs

- Lectures:
  - BPP-23 Product Management
  - BPP-27 Project Seminar
  - BPP-29 Seminar on Product Development
  - BPP-36 Building in Existing Structures and Deconstruction
- Degree Programs:

- All relevant construction-related study programs
- Masters in Healthy and Sustainable Buildings (HSB)

Entrance Requirements

Successful completion of the following modules is recommended.

- BPP-02 Building Chemistry
- BPP-06 Building Physics: Thermal and Moisture Protection
- BPP-07 Building Physics: Building and Room Acoustics
- BPP-12 Building Construction
- BPP-19 Interior Fit-out, Smart and technical building systems

Learning Content

- Requirements for modern construction: sustainability, smart buildings, and resilience.
- Building certification systems (national and international).
- Well-being, healthy indoor climate, and assessment criteria.
- Ecological protection objectives and evaluation criteria.
- Quality labels for building products (e.g., Natureplus, Cradle to Cradle, EU Ecolabel, etc.).
- Life cycle assessment and sustainable refurbishment, life cycle costing.
- Circular economy and circular construction.
- Planning processes and documentation requirements.
- Special topics on building performance and evaluation: resilience, smart buildings, and construction in existing structures.

Teaching Methods

Lectures, exercises, tutorials, assignments. PowerPoint presentations, whiteboard

Remarks

This module is taught in both German and English to ensure a comprehensive and varied learning experience.

Recommended Literature

- Lecture notes and documents from the lecture
- Dorn-Pfahler, S. (2017). Nachhaltiges Bauen des Bundes: Grundlagen-Methoden-Werkzeuge.
- Bundesministerium für Verkehr, Bau und Stadtentwicklung. (2019). Leitfaden Nachhaltiges Bauen Zukunftsfähiges Planen, Bauen und Betreiben von Gebäuden
- Bauer, M., Mösle, P., & Schwarz, M. (2013). Green building: Leitfaden für nachhaltiges Bauen. Springer-Verlag.
- Friedrichsen, S. (2024). Nachhaltiges Planen, Bauen und Wohnen: Kriterien für Neubau und Bauen im Bestand. SDG - Forschung, Konzepte, Lösungsansätze zur Nachhaltigkeit (3rd ed.). Springer-Verlag
- Habash, R. (2022). Sustainability and health in intelligent buildings. Woodhead Publishing.
- Droege, P. (2023). Intelligent environments 2Advanced systems for a healthy planet. In Intelligent Environments (pp. 1-32). North-Holland.
- Khoja, A. (2024). Towards Bridging the Climate Resilience Gap in Building Assessment Systems: An Integrated Framework for the German Built Environment (Doctoral dissertation, Technische Universität München).
- Deutsche Gesellschaft für Nachhaltiges Bauen, URL: https://www.dgnb.de
- DIN EN ISO-Norm 14040 (Umweltmanagement - Ökobilanz - Grundsätze und Rahmenbedingungen") DIN EN ISO-Norm 14044 (Umweltmanagement - Ökobilanz - Anforderungen und Anleitungen)
- DIN EN ISO Norm 14025 (Umweltkennzeichnungen und -deklarationen - Typ III Umweltdeklarationen)
- DIN EN-Norm 15804 (Nachhaltigkeit von Bauwerken - Umweltproduktdeklarationen - Grundregeln für die Produktkategorie Bauprodukte)
- https://www.bbsr.bund.de/SiteGlobals/Forms/Suche/VeroeffentlichungsSuche_Formular.html;jsessionid=BB021B6992A774D89F008F23A91B8F1C.live11293
- https://www.bauteileditor.de/
- www.oekobaudat.de Cradle to Cradle, URL: https://www.c2c.ngo
- Additional literature will be announced in the lecture

BPP-30 BUILDING ENVELOPE AND SUPPORTING STRUCTURES

Module code	BPP-30
Module coordination	Prof. Dr. Ahmed Khoja
Course number and name	BPP-30 Building Envelope
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Knowledge:

Knowledge of construction principles as well as physical and static requirements of windows, façades, ETICS and roof structures, even regarding professional planning of details alongside the design.

Knowledge of national and European test processes and classification systems for elements as well as post and beam façades.

Will know the technical regulations for professional planning and design of glazing in façades and roof constructions.

Skills:

Skills such as designing the construction for the façade, ETICS and roofs,

such as:

1. Connection details to the building
2. Accurate measurement of the water shedding level / resistance to driving rain
3. Prevention of condensation

4. Air and diffusion density
5. Thermal bridge analysis (pre-measurement)
6. Wind, dead water pre-measurement
7. Site and assembly plans
8. Accurate measurement of glass
9. Professional execution of thermal insulation composite systems

Competences:

The will students acquire the ability to safely plan the building envelope (façade + roof) in detail along with all requirements, to prepare a performance specification, and to coordinate or monitor assembly, such that the end result is an outcome that is ready for acceptance. In this case the focus is on designs for new buildings as well as energy-related renovation of residential and non-residential units. Improper execution will be recognised and corresponding measures will be taken.

Applicability in this and other Programs

BPP-03: Building Material Characteristics

Civil Engineering, Architecture

Entrance Requirements

Successful completion of the following modules is recommended.

- BPP-06: Fundamentals of Building Physics: Thermal Protection
- BPP-07: Fundamentals of Building Physics: Building and Room Acoustics
- BPP-11: Fundamentals of Building Physics : Fire Protection
- Semester 1 - 4

Learning Content

Will have acquired knowledge of typical facades - and roof systems in detail and will be able to confidently evaluate thermal insulation performance, diffusion density or openness, resistance to driving rain, prevention of condensation with

1. Rear-ventilated façade designs
2. ETICS (flammable/non-flammable)
3. Post and beam façades

4. Wood, aluminium and plastic windows
5. Double façades
6. Modular element façades, pre-fabricated ex-works (steel, aluminium, timber, glass designs)
7. Cold/warm roofs (hard and soft roofing), with and without a gradient (including green roofs)
8. Roof sealing systems with appropriate rainwater drainage systems

Teaching Methods

Lecture, exercises and examples

Remarks

Recommended Literature

Lecture notes and recommended literature from the lecture, specialist information from the WDVS and VhF associations, DiBt regulations/notes

BPP-31 PRODUCT DEVELOPMENT AND TESTING

Module code	BPP-31
Module coordination	Prof. Dr. Roland Augustin
Course number and name	BPP-33 Seminar on Product Development
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	German

Module Objective

Qualifcation goals

Knowledge:

Students will acquire

- basic knowledge about component and material properties:
- strength (tension/pressure/bending/shearing)
- reaction to fire
- thermal and hygric properties
- VOCs and pollutants
- Overview of laboratory test processes to determine properties

Skills:

With the acquired knowledge, students should be able to

- analyse necessary material properties for the intended purpose
- develop measures in order to adapt material properties
- handle and analyse recycling materials

Competences:

After successful completion, students will be able to:

- develop product ideas
- use SWOT analysis for strategic planning and implementation
- handle and analyse recycling materials, particularly safety aspects and quality assurance

Applicability in this and other Programs

Bachelor and Master Civil Engineering

Entrance Requirements

Successful completion of the following modules is recommended.

BPP-02: Chemistry of Building Materials

BPP-03: Building Material Charcteristics

BPP-06: Building Physics: Thermal and Moisture Protection

BPP-07: Building Physics: Building and Room Acoustics

BPP-11: Building Physics: Fire Protection

BPP-13: Testing of Building Materials

BPP-18: Structural Engineering

Learning Content

- Construction and product development processes
- Preparation of product requirement profiles
- Preparation of the product specification
- Determination and carrying out required product testing
- Determination of quality controls and monitoring product safety

Teaching Methods

Lecture, exercises and examples

Remarks

Recommended Literature

Standards:
Relevant testing standards, requirements from standard building regulations
Course handouts

BPP-32 SEMINAR ON PRODUCT DEVELOPMENT

Module code	BPP-32
Module coordination	Prof. Dr. Ahmed Khoja
Course number and name	BPP-32 Seminar on Product Development
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	report and presentation
Weighting of the grade	5/240
Language of Instruction	English

Module Objective

Qualification goals:

The Seminar on Product Development aligns with the practice-oriented teaching approach of the BPP study program, enabling students to consolidate their theoretical knowledge acquired in modules related to construction products and to further develop practical skills in the field of construction product development. Through this project seminar, students have the opportunity to experiment with applying their theoretical knowledge to practical scenarios during their studies

Knowledge:

Upon completion of the seminar, students will acquire knowledge in:

- The targeted application of theoretical knowledge in practice, particularly through iterative and user-centered approaches.
- Principles, processes, and tools of project management in product development projects (planning, control, monitoring).
- The Design Thinking process in product development (Empathize, Define, Ideate, Prototype, Test).
- Design for X (DFX) approaches in product development.

- Independent familiarization with new work fields or domains, using methods such as Persona, POV formulation, and user surveys.

Skills:

Upon successful completion of the project seminar, students will be able to:

- Apply systematic approaches in practical work.
- Independently lead a project or a part of a project.
- Present and communicate work results both orally and digitally.
- Document project processes and outcomes in a report format.

Personal Competence

Social Competence

Students collaborate in small teams on either program-internal or interdisciplinary product development projects. They learn how to efficiently work within a project team, apply their knowledge collaboratively, and develop user-centered solutions. This approach enhances their teamwork and problem-solving abilities.

Additionally, teams are composed of multicultural members to enhance students intercultural interaction skills. Empathy plays a central role, particularly in the Design Thinking process and in collaboration with various stakeholders.

Methodological Competence

Upon completing the seminar, students will have the competence to:

- Work task-oriented in small, diverse groups, combining creative, technical, and organizational skills.
- Prioritize tasks, allocate resources, and monitor project progress.
- Identify and escalate problematic issues early to avoid bottlenecks.
- Reflect on and continuously adapt knowledge, particularly within iterative Design Thinking processes.
- Exchange, develop, and validate their own applications and sustainable ideas with a user-centered approach.
- Structure, plan, and execute tasks within a new project (e.g., prototyping, user testing).
- Demonstrate compromise in teamwork and find constructive solutions.
- Re-plan when immediate problem resolution is not possible and flexibly respond to feedback.

Applicability in this and other Programs

- **Lectures:**
  - BPP-21 Product Management: Strategy and Marketing
  - BPP-23 Product Development / Testing
  - BPP-33 Project Seminar
- **Degree Programs:**
  - Bachelors and Masters in Civil Engineering
  - Bachelors and Masters in Architecture
  - Masters in Healthy and Sustainable Buildings

Entrance Requirements

Successful completion of the following modules is recommended.

- BPP-03 Building Material Characteristics
- BPP-06 Building Physics: Thermal and Moisture Protection
- BPP-07 Building Physics: Building and Room Acoustics
- BPP-08 CAD 2D/ 3D (BIM)
- BPP-11 Building Physics: Fire Protection
- BPP-13 Testing of Building Materials

Learning Content

- Students work in teams to develop new construction products or optimize existing ones, following an iterative design process (e.g., Design Thinking), from problem definition and user needs analysis (using tools like Personas and POV formulations) to prototyping and testing.
- Team sizes vary (depending on the project) from 2 to 8 students, allowing flexible adaptation to different project requirements.
- A given task is structured, planned, and executed systematically. The iterative approach enables continuous feedback and user interaction throughout the project.
- Results are presented in the final phase (e.g., as a pitch, online presentation, or poster session) and comprehensively documented in a project report, with special

emphasis on illustrating the entire development process and the rationale behind design decisions.

The assigned task may include or integrate content from the following modules:

- BPP-3 Building Material Characteristics
- BPP-8 CAD 2D / 3D (BIM)
- BPP-13 Testing of Building Materials
- BPP-21 Product Management: Strategy and Marketing
- BPP-31 Product Development and Testing
- BPP-34 Law: Building Product Regulations

Teaching Methods

Lecture, exercises and examples, practice project

Remarks

Recommended Literature

- Müller-Roterberg, C. (2020). Design Thinking for Dummies. John Wiley & Sons.
- Mattson, C. A., & Sorensen, C. D. (2019). Product Development: Principles and Tools for Creating Desirable and Transferable Designs. Springer Nature.
- Desai, A., & Mital, A. (2020). Sustainable product design and development. CRC Press.
- Additional literature will be recommended depending on the individual project in the lecture.

BPP-33 PROJECT SEMINAR

Module code	BPP-33
Module coordination	Prof. Dr. Matthias Hümmer
Course number and name	BPP-33 Project Seminar
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	report and presentation
Weighting of the grade	5/240
Language of Instruction	Course dependent

Module Objective

Qualification goals:

The project seminar follows a practice-oriented teaching approach within the BPP study program. It enables students to deepen the theoretical knowledge acquired in the modules on construction processes and to further develop their practical skills in project management. By practically applying what they have learned, students are given the opportunity to apply and test theoretical knowledge early in practice.

Professional Competence

Knowledge

Upon successful completion of the module, students will have in-depth knowledge in the following areas:

- The theory of project management and its practical application.
- The fundamental principles and processes of project management, and the tools required for successful project execution.
- Independent familiarization with new work areas and knowing how to escalate unsolvable problems effectively.
- The various project phases, with a particular focus on planning and implementation.

- The different roles in project management and their significance within the team.
- Assembling and effectively collaborating with project management teams in different environments.
- Selecting and applying the appropriate project management method depending on the project type.
- How leadership works in and through project management.
- The typical challenges and mistakes in planning and implementing projects.

Skills:

Upon successful completion of the project seminar, students will be able to:

- Combine and apply theoretical and methodological knowledge of project management in practical project situations in interdisciplinary product development.
- Plan, lead, and respond flexibly to challenges by selecting and applying appropriate project management methods.
- Identify and apply the appropriate leadership technique for various project teams, as well as recognize early warning signs and potential challenges.
- Work effectively in interdisciplinary and intercultural teams, further develop their intercultural competencies, and develop and implement innovative, sustainable ideas.
- Prioritize tasks contextually and project-specifically, identify problems, find solutions, and adjust project planning accordingly to achieve optimal results.

Personal Competences:

Students work in small groups on an intra- or interdisciplinary product development project to learn how to work efficiently together in a project team to solve problems and implement their knowledge collectively. This aims to strengthen their teamwork and problem-solving skills. Additionally, these groups are mixed multiculturally to promote and refine students' intercultural interaction skills.

Methodological Competence

Students learn to transfer theoretical knowledge into a project, enabling them to apply their acquired skills. This leads to better retention of the learned theory and facilitates the transfer of skills. Furthermore, students gain an overview of various competencies and theories and can choose the most efficient approach for their application. Students develop an analytical, system-oriented mindset and should be able to structure the most effective approach for project management and interdisciplinary product development from planning to selection to implementation.

Applicability in this and other Programs

- Lectures:
  - BPP-29 Sustainable Building
  - BPP-36 Building in existing Structures and Deconstruction
- Degree Programs:
  - Bachelors and Masters in Civil Engineering
  - Bachelors and Masters in Architecture
  - Masters in Healthy and Sustainable Buildings

Entrance Requirements

Successful completion of the following modules is recommended:

- BPP-14 Digital Building Process (BIM 4D to 6D)
- BPP-20 Construction Calculation
- BPP-24 Fundamentals of Project Management und Planning
- BPP-25 Projekt Execution and Controlling

Learning Content

- Students work on an interdisciplinary product in teams (team size varies depending on the project, between 2 and 8 students) on real construction projects or construction products.
- Based on a given task, students:
- Determine the requirements
- Develop a solution
- Plan a project and create a project implementation plan based on a project charter
- Execute the project implementation plan in a structured manner
- Create presentations to report on the progress
- The results must be presented, defended, and documented.

Teaching Methods

Lectures / exercises / laboratory works / tutorials / homework

PowerPoint presentation, whiteboard, document camera (visualizer) and more

Lecture materials in iLearn

Remarks

This module is taught in both German and English to ensure a comprehensive and varied learning experience.

Recommended Literature

Literature is depending on the projects and products to be explored in the project seminar, it will be announced in the lecture.

General literature:

- Project Management Institute. (2021). A guide to the Project Management Body of Knowledge (PMBOK guide) (7th ed.). Project Management Institute.
- Jakoby W. (2021) Projektmanagement für Ingenieure. Springer-Verlag.

BPP-34 LAW: BUILDING PRODUCT REGULATIONS

Module code	BPP-34
Module coordination	Prof. Dr. Roland Augustin
Course number and name	BPP-34 Law: Building Product Regulations
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	written ex. 90 min.
Duration of Examination	90min.
Weighting of the grade	5/240
Language of Instruction	Course dependent

Module Objective

Aims of the module

In the module, students acquire basic knowledge of European construction product law as well as information on current developments. The specific requirements of national construction law are also covered.

Professional competence:

Knowledge:

The course provides the participants with knowledge about:

- The amendment to the Construction Products Regulation and its impact on practice
- The organization and structure of the Construction Products Regulation (EU) No. 305/2011
- The further development of the Construction Products Regulation (EU) No. 305/2011 and the implementation of sustainability in the European harmonized standards
- The different ways of obtaining a CE mark for a construction product

- Recording the differences between harmonized and non-harmonized European standards and the importance of ETAs/EADs and the so-called EOTA route
- The meaning and content of declarations of performance
- Knowledge of the interaction between European law, national building law and state building law
- The structure of the Model Building Code (MBO), the associated LBOs and the Model Administrative Regulation on Technical Building Regulations (MVV TB)
- The most important national and international committees, authorities and bodies
- The correct planning and tendering of building products

Skills:

Upon successful completion of the sub-module, students will be able to:

- Identify and evaluate the required building product specifications from tendering, contracting and the use of building products
- Read and understand a European technical approval and derive the requirements for a construction product from it
- Derive the required construction product performance at national level with the help of MVV TB
- Prepare construction documentation for the approval authority or testing experts as part of construction supervision
- draw up declarations of performance to assume responsibility for the fulfilment of the essential characteristics of the construction product based on the normative European requirements

Personal Competences:

Social competences:

Students work both independently and in small teams on projects and issues within the module to develop the skills to solve problems alone or in a team.

Methodological competence

Students acquire theoretical knowledge about the conditions for the provision of harmonized construction products on the European internal market regarding the basic requirements for construction works. They are taught the different ways and contents of the requirements of European construction product law and its further development. They also learn about the interplay between European construction product law and national, specific application of the building regulations (MBO and

MVV TB), right through to proof of proper construction by means of correct construction documentation.

Applicability in this and other Programs

- **Lectures**
  - BPP-21 Product Management
  - BPP 25 Project Execution and Controlling
  - BPP 29 Sustainable Building
  - BPP 32 Seminar on Product Development
  - BPP-33 Project Seminar
  - BPP 36 Building in Existing Structures and Deconstruction
- **Study Programs**
  - All similar courses in civil engineering

Entrance Requirements

Successful completion of the following modules is recommended:

- BPP-22 Law: Building Law / Construction Contract / VOB

Learning Content

- Fundamentals of European construction product law
- Current amendment of European construction product law
- Fundamentals of the usability and applicability of construction products and types of construction
- Scope and interaction of national regulations and European approvals
- Construction documentation
- Specification of building requirements in national regulations
- Liability risks and responsibility of planners and contractors
- Practical examples of product-related building designs

Teaching Methods

Lectures / exercises / tutorials / homework

PowerPoint presentation, whiteboard, document camera (visualiser) and additional lecture materials in iLearn

Remarks

This module is taught in both German and English to ensure a comprehensive and varied learning experience.

Recommended Literature

- Lecture script
- Regulation (EU) No. 305/ 2011 (Building Products Regulation)
- Model Building Code (MBO)
- Model Administrative Regulation on Technical Building Regulations (MVV TB) from the Deutsches Institut für Bautechnik (DiBt)
- E. Eng. M. Sc. Patrick Gerhold, Bauproduktenrecht in der Praxis. Von der Bauproduktleistung bis zur Baudokumentation, RM Rudolf Müller

BPP-35 INTERNSHIP INCLUDING PLV SEMINARS

Module code	BPP-35
Module coordination	Prof. Dr. Ahmed Khoja
Course number and name	PLV Seminar 1 PLV Seminar 2 BPP-35 Internship
Semester	7
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	30
Workload	Time of attendance: 60hours self-study: 840hours Total: 900hours
Type of Examination	presentation,
Weighting of the grade	30/240
Language of Instruction	Course dependent, German

Module Objective

Professional Competence

Knowledge

- Understand the processes and procedures of a company.
- Understand the requirements in the professional live.
- Understand basic techniques around application preparation, presentation and communication.

Skills

- Ability to apply gained knowledge in a professional/commercial setting.
- Ability to access new work areas.
- Ability to evaluate real-life problems and to design and apply solution approaches.
- Ability to evaluate and explain the achievements and learnings.

Personal Competence

Social competence

- Ability to integrate into teams with more experienced professionals.

Autonomy

- Succeed professionally in a new environment.
- Learn how to autonomously achieve results.
- Learn how to gain a position in industry.

Applicability in this and other Programs

Applicable in all technical programs with practical semester.

Building Material Characteristics BPP-03

BPP-40 Bachelormodul

Entrance Requirements

For internship: 90 ECTS and PLV1 finalized.

For PLV2: Internship finalized.

Successful completion of the following modules is recommended:

Building Physics: Thermal and Moisture Protection (BPP-06)

Building Physics: Building and Room Acoustics (BPP-07)

Building Physics: Fire Protection (BPP-11)

Learning Content

PLV 1 seminars: Seven workshops, thereof four in the personal competence area and three in the professional competence area (to be selected from the overall course offering of the International Office and Career Services).

Workshops include:

- Application skills
- Interview training
- Communication training
- Presentation trainings
- MS-Office trainings
- Intercultural training

- Job skills
- Pyramidal communication

PLV 2 seminar: One week of training in advanced presentation techniques and communication. Each student has to give a 20 minute presentation on the content of his/her internship.

Internship: 18 week full time internship in a field which is related to Building Products and Processes. The internship can be planned with any German company or a research institute. Student's who want to do the internship in an international context need to get approval by the Practical Responsible Professor. The Practical Responsible Professor decides on whether a job is accepted for the internship.

Teaching Methods

Seminaristic workshops.

Practical work.

Recommended Literature

Depends on subject of internship.

BPP-36 BUILDING IN EXISTING STRUCTURES AND DECONSTRUCTION

Module code	BPP-36
Module coordination	Prof. Dr. Ahmed Khoja
Course number and name	BPP-36 Building in Existing Structures (Structural Damage, Removal / Demolition, Renovation)
Semester	8
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	Portfolio
Weighting of the grade	5/240
Language of Instruction	German

Module Objective

Module Objective

Knowledge:

The course provides the participants with knowledge about:

- The controlled demolition of buildings
- taking into account waste and hazardous materials legislation
- and the recognised rules of technology.
- Materials containing hazardous substances, exploration, removal, separation, disposal Possibilities of recycling construction waste into pure and high-quality recyclable materials.

Skills:

Upon successful completion of the sub-module, students will be able to:

- have a practical overview of the proper and safe removal of materials containing pollutants prior to demolition and the highest possible recycling of construction waste by type

- apply the technological steps in exploration, assessment and disposal. The focus is on controlled deconstruction
- use knowledge of methods to assess and evaluate the analysis of contaminated sites. This and the acquired understanding of the chemistry of contaminated sites make it possible to objectify hazard potentials

Competences:

Upon successful completion of the sub-module, students will be able to:

- classify general analytical and contamination-specific publications
- describe the obligation to recycle usable waste according to the basic sequence of action ?avoid-recycle-dispose?
- use basic terms and parameters of analytical chemistry and site contamination issues that are independent of the profession

Applicability in this and other Programs

- Lectures:
  - BPP-02: Chemistry of Building Materials
  - BPP-03: Building Material Characteristics
  - BPP-18: Structual Engineering
- All similar courses in civil engineering

Entrance Requirements

Successful completion of the following modules is recommended.

- BPP-02: Chemistry of Building Materials
- BPP-03 Building Material Characteristics
- BPP-13 Testing of Building Materials

Learning Content

- Contaminated sites in Bavaria / Germany
- Important pollutants/pollutant groups
- Protected resources and impact pathways
- Investigation of contaminated sites, risk assessment

- Disposal/recycling
- Occupational safety
- Pollutants in the building fabric
- Exploration of the building
- Evaluation of the exploration results
- Disposal
- Recycling management

Teaching Methods

Lectures / exercises / tutorials / home work

PowerPoint presentation, whiteboard, document camera (visualiser) and additional lecture materials in iLearn

Remarks

Recommended Literature

- Lecture script
- Kreislaufwirtschaftsgesetz (German Closed Substance Cycle & Waste Management Act (KrWG)/ Verordnung zur Vereinfachung des Deponierechts - Deponieverordnung DepV (Ordinance on the Simplification of Landfill Law - Landfill Ordinance
- Verordnung über das Europäische Abfallverzeichnis - Abfallverzeichnis-Verordnung AVV (Ordinance on the European list of wastes)
  Nachweisverordnung - NachwV (Ordinance on waste recovery and disposal records)
- Länderarbeitsgemeinschaft Abfall (LAGA) (Working group of the federal states on waste)
- Hazardous Substances Ordinance (GefStoffV)
- Chemicals Prohibition Ordinance (ChemVerbotsV)
- TRGS 524 ? Protective measures for activities in contaminated areas

BPP-37 MANAGEMENT SYSTEMS

Module code	BPP-37
Module coordination	Prof. Dr. Roland Augustin
Course number and name	BPP-37 Management Systems
Semester	8
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Type of Examination	report and presentation
Weighting of the grade	5/240
Language of Instruction	German

Module Objective

Aims of the module

In the module, students acquire basic knowledge of integrated management systems, their structure, application and information on current developments.

Professional competence:

Knowledge:

The course provides students with knowledge about:

- ISO 9001, ISO 14001, ISO 45001 and ISO 50001
- areas of application
- Structure of the respective standards
- Application in practice
- The most important national and international committees, authorities and bodies
- Setting up checklists and conducting an internal audit

Skills:

After successfully completing this sub-module, students will be able to

- Recognize and apply the basic requirements of the respective management systems
- Plan an audit for the respective standards, create and carry out the necessary documents.
- Create and apply an assessment matrix

Personal Competences:

Social competences:

Students work both independently and in small teams on projects and issues within the module to develop the skills to solve problems alone or in a team.

Methodological competence:

Students acquire theoretical knowledge of integrated management systems in relation to the basic requirements and fundamental structures. They are taught the different objectives and contents of the requirements of the respective standards. They also learn about the interaction between the individual standards and the resulting requirements as well as how to implement them in operational practice.

Applicability in this and other Programs

- **Lectures**
  - BPP-21 Product Management
  - BPP 25 Project Execution and Controlling
  - BPP 29 Sustainable Building
  - BPP 32 Seminar on Product Development
  - BPP-33 Project Seminar
  - BPP 36 Building in Existing Structures and Deconstruction
- **Study Programs**
  - All similar courses in civil engineering

Entrance Requirements

Learning Content

- Fundamentals of integrated management systems, structure of the certification system
- Structure of ISO 9001 quality management
- Structure of ISO 14001 Environmental management
- Structure of ISO 45001 Occupational safety
- Structure of ISO 50001 Energy management
- Preparation and implementation of an internal audit

Teaching Methods

Lectures / exercises / tutorials / home work

PowerPoint presentation, whiteboard, document camera (visualiser) and additional lecture materials in iLearn

Remarks

Recommended Literature

- lecture notes
- ISO 9001 Quality management
- ISO 14001 Environmental management
- ISO 45001 Occupational safety
- ISO 50001 Energy management
- Energy management systems in practice and related documents, Federal Environment Agency 2019
- Documents in iLearn

BPP-38 WORKSHOP ARCHITECTURE

Module code	BPP-38
Module coordination	Prof. Dr. Michael Laar
Course number and name	BPP-38 Workshop Architecture
Semester	8
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	3
ECTS	3
Workload	Time of attendance: 45hours self-study: 45hours Total: 90hours
Type of Examination	report and presentation
Weighting of the grade	3/240
Language of Instruction	English

Module Objective

Module Objective

Students learn about challenges and complexities of architecture on international, national and regional level. They learn the historical development of architecture, its current state and possible future scenarios. Furthermore, they understand the role of architects in the construction sector.

Based on case studies, the students understand the concepts of architecture and the role of architects from start to end.

Professional Competence

Knowledge

After successfully finishing the module, students will get to:

- Understand architecture in its international, national, and regional context
- Understand the role of architects and the design process
- Understand vernacular architecture and its concepts in the context of different climate zones and possible transfers to modern architecture
- Understand the context of building and neighbourhood

Skills

Upon completion of the module the students will be able to:

- Describe basic concepts of architecture and its relevance on international, national and regional level and use technical terms adequately
- Describe the role of architects and the design process
- Describe concepts of vernacular architecture in different climate zones
- Transfer adequate concepts of vernacular architecture to contemporary architecture

Social competence

Students are demonstrating working individually or in small groups to solve problems that aim at enhancing their team-working skills as well as their problem-solving capabilities. Further, students also know how to work with different groups of stakeholders, understand their perspectives, learn to consider these perspectives in their line of argumentation and act accordingly.

Methodological competence:

The students improve the knowledge in the field of architecture based on real case studies. The students should be enabled to apply the acquired knowledge and to critically evaluate and inter-present subject-specific information on the basis of criteria of architecture. Students develop an analytical system-oriented way of thinking and are able to structure the approach for building projects.

Applicability in this and other Programs

none

Entrance Requirements

Learning Content

- Basics of architecture: historical development, current situation and future projection
- Analysis of vernacular architecture in different climate zones
- Different stakeholder - different perspectives: how to deal with it
- Building and neighborhood

Teaching Methods

Seminaristic teaching / Exercises / Case studies / Moderated discussions / Lab-work & LivingLab /Field trips / Guest lectures

Remarks

Remarks

Excursions to landmark projects

Recommended Literature

- Zukowsky, J.,Kern S. (2022) Die Geschichte der Architektur: Von der Pyramide zum Wolkenkratzer. München:Prestel Verlag
- Weber, W., Yannas, S. (2014) Lessons from Vernacular Architecture: Achieving Climatic Buildings by Studying the Past. New York:Routledge
- Neufert, E. (2019) *Architects? Data.* 5th Edition. Hoboken, NJ, USA:Wiley Blackwell
- Neufert. E. (2021) Bauentwurfslehre. 43. Auflage. Wiesbaden:Springer Vieweg

BPP-39 COMPULSORY ELECTIVE 2 (FWP-2)

Module code	BPP-39
Module coordination	Prof. Dr. Markus Hainthaler
Course number and name	BPP-39 Compulsory elective 2 (FWP-2)
Semester	5, 8
Duration of the module	2 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60hours self-study: 90hours Total: 150hours
Weighting of the grade	5/240
Language of Instruction	Course dependent

Module Objective

The Compulsory Elective I and II modules provide the students with the opportunity to address specialized topics, other than the mandatory courses of the main field of study, topics that are broadening by that their field of knowledge and skills in these areas.

Several courses will be offered for each Compulsory Elective module upon availability and attendance interest of students from the following pool:

- Architectural History and Theory
- Entrepreneurship
- Strategic Planning and Project Management
- Finance and Accounting
- Technoligy and Intellectual Property Rights Management
- Process Optimization
- Process Safety
- Life Cycle Analysis and Ecobalancing
- SIVV Certificate
- IFRS and Organizational Law

- Interdisciplinary Product Development
- Innovative Constructions and Building Products
- Applied AI in the Construction Process
- Real Estate Investement
- Vernomimicry

Applicability in this and other Programs

BPP-35 Internship including PLV seminars

BPP-40 Bachelor thesis

The module is primarily intended for the Bachelor of Building Products and Processes but it can also be chosen by students of other fields of study.

Entrance Requirements

Please see the respective course descriptions for specific information on prerequisites.

Learning Content

Please see the respective course descriptions for specific information on content.

Teaching Methods

Please see the respective course descriptions for specific information on didactic methods employed.

Remarks

Please see the respective course descriptions for course-specific remarks.

Recommended Literature

Please see the respective course descriptions for literature references.

BPP-40 BACHELOR MODULE

Module code	BPP-40
Module coordination	Prof. Dr. Markus Hainthaler
Course number and name	BPP-40 Bachelor Thesis BPP-40 Thesis Defense
Semester	8
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Level	Undergraduate
Semester periods per week (SWS)	0
ECTS	12
Workload	Time of attendance: 0hours self-study: 360hours Total: 360hours
Type of Examination	Defense, Final Thesis
Weighting of the grade	12/240
Language of Instruction	Course dependent

Module Objective

Expertise

Students will have the necessary knowledge of theories and methods to solve complex engineering issues in the field of construction products and processes

Students will be able to explain the relevant approaches and terminology in depth in one or several aspects of their subject

Students will be able to categorise a research task from their specialist field in context, describe it, and critically evaluate it

Students will be able to apply fundamental principles and methods for planning and structuring work in the project

Skills

Students will be able to independently handle complex academic questions

Students will be able to select, apply, and further develop methods where necessary that are appropriate for resolving the specialist problem at hand

Students will be able to analyse problems using the methods learned on the course, then arrive at informed decisions and develop solutions.

Students will be able to take a critical stance from a professional perspective regarding the results of their own research.

Students will be able to work on their own or in a team, to plan and structure their work, to communicate appropriately with partners, to present the issue that is being covered and to discuss the results that arose from the research.

Social skills

Students will be able to illustrate a scientific problem to an expert audience a precise, comprehensible and structured manner, both orally and in writing, in a specialist discussion whilst competently handling questions and answering them in a manner that is appropriate

Autonomy

Students will be able to apply academic work principles independently and fully so that the necessary knowledge and materials are acquired to handle an engineering problem or a research task

Students will be able to structure a wide-ranging task independently whilst also being able to handle it within a specified period of time

Students will be able to independently present their work and results in an academic style whilst using appropriate communication techniques

Applicability in this and other Programs

none

Entrance Requirements

Students who have earned at least 150 ETCS points may register for the bachelor's thesis.

Learning Content

During the course, students already learn several different communication and management techniques as well as the fundamentals of academic work. The bachelor module grants the opportunity to demonstrate acquired knowledge and skills when handling a larger engineering problem. Specific matters and problems are independently handled using academic research methods and then documented in a written bachelor?s thesis.

The bachelor?s thesis can be written in English or German.

After the bachelor?s thesis is successfully completed, the student should make an oral presentation about their bachelor project and its outcomes.

Teaching Methods

Independent work / seminars / individual and group project

Remarks

Recommended Literature

- Eco U., Schick W., Wie man eine wissenschaftliche Abschlussarbeit schreibt, 13th edition, UTB 2010
- Ebel Hans Friedrich, Bliefert Claus, Bachelor-, Master- und Doktorarbeit, 4th edition, Wiley-VCH Verlag 2009
- Charles Lipson, How to Write a BA Thesis: A Practical Guide from Your First Ideas to Your Finished Paper, Chicago Press 2005