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Faculty of Computer Science and Business Information Systems

Technical University of Applied Sciences Würzburg-Schweinfurt

Module Handbook

Bachelor Business Information Systems (B. Sc.)

Summer semester 2025
Winter semester 2025

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Contents

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

1. semester

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 9999999
General Compulsory Elective

Module profile

Exam number
9999999

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German/English

Organisation

Responsible lecturer
Prof. Dr. Jochen Seufert

Lecturer(s)
Beate Wassermann

Applicability	BIN, BWI
Semester according to SPO	1. semester
Type of module	AWPM

Required prerequisites for the participation in the module according to the SPO
As a rule, none; exceptions are determined and announced by the Faculty of Natural Sciences and Humanities.

Recommended prerequisites for the participation in the module
none

Content
Selection of two general science electives (AWPF) (2 x 2 SWS) or one AWPF (1 x 4 SWS) from the range of subjects offered by the Faculty of Applied Natural Sciences and Humanities (FANG).

Range of subjects offered by the FANG in the areas of
- languages
- Cultural studies
- Natural sciences and technology
- Politics, law and economics
- Education, psychology and social sciences
- Soft skills
- Creativity and art.

Courses whose content is already part of or directly related to parts of other modules of the degree programme are excluded from the FANG catalogue. The corresponding courses are marked with a blocking note in the FANG subject catalogue.
The contents of the individual AWPFs are published on the FANG faculty's own homepage.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German/English

Condition for the award of credit points
None

Learning outcomes
The subject-specific learning objectives depend on the AWPF selected.
The students

- also acquire knowledge and competences that are not subject-specific but may be important for the desired career goal, such as special knowledge of foreign languages, natural sciences or social sciences
- analyse a wide variety of issues
- categorise subject-specific knowledge in an interdisciplinary context
- transfer what they have learnt to their current training
- have expanded their key competences and, where applicable, foreign language skills, which supports their personal development, also in intercultural terms
- are aware of their personal, social and ethical responsibilities.

Literature
depending on the selected AWPFs

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5011030
Discrete Mathematics and Linear Algebra

Module profile

Exam number
5011030

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Sabrina Klos

Lecturer(s)
Prof. Dr. Sabrina Klos

Applicability	BWI
Semester according to SPO	1. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
School maths

Content
Linear algebra:
Linear systems of equations, matrices, vectors, scalar product, calculating with matrices, inverse matrices, determinants.

Logic:
Logical operations, truth tables, propositional algebra, normal forms.

Number theory:
Modulo calculus, extended Euclidean algorithm, Euler-Fermat theorem, RSA encryption method.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Students know basic concepts and techniques from the mathematical fields of propositional logic, number theory and linear algebra.
- Students understand the importance of mathematical methods and their role in applications from the fields of business informatics and e-commerce, for example in the calculation of IBAN check digits, the introduction of the RSA public key encryption method and the simplification of complex logical expressions in conditional queries in programmes.
- Students apply mathematical techniques to solve practical problems in the fields of business informatics and e-commerce.
- Students analyse mathematical problems from the fields of propositional logic, number theory and linear algebra in order to develop and implement suitable solution strategies.
- Students evaluate different solution strategies with regard to their effectiveness and efficiency in solving specific mathematical problems.
- Students create their own solution strategies to successfully solve mathematical problems.

Literature

Bartholomé, Andreas; Rung, Josef; Kern, Hans: Zahlentheorie für Einsteiger; Vieweg + Teubner, Wiesbaden
Beutelspacher, Albrecht; Zschiegner, Marc-Alexander: Discrete Mathematics for Beginners; Vieweg + Teubner, Wiesbaden
Brill, Manfred: Mathematics for Computer Scientists; Hanser Verlag; Munich/Vienna
Gramlich, Günter: Lineare Algebra - Eine Einführung; Fachbuchverlag Leipzig im Carl Hanser Verlag
Hartmann, Peter: Mathematics for Computer Scientists; Vieweg + Teubner, Wiesbaden
Papula, Lothar: Mathematics for Engineers and Scientists 1 and 2; Vieweg + Teubner; Wiesbaden
Pommersheim, James E.; Marks, Tim K.; Flapan, Erica L.: Number Theory: A Lively Introduction with Proofs, Applications, and Stories; John Wiley & Sons
Schubert, Matthias: Mathematics for Computer Scientists; Vieweg + Teubner, Wiesbaden

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5000440,6910010 Introduction to Computer Science

Module profile

Exam number
5000440,6910010

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 30 hrs

Self-study: 120 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Peter Braun

Lecturer(s)
Prof. Dr. Peter Braun

Applicability	BDGD, BWI
Semester according to SPO	1. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
The module teaches the basics of computer science for students outside the core computer science programme.

- Information, information content, information coding, representation of numbers and characters, coding of text, dates, colour information
- Binary arithmetic, Boolean algebra and logic gates
- Models and modelling as a fundamental principle in computer science, abstraction, reduction, decomposition, aggregation
- Description of data structures with the extended Backus-Naur form
- Modelling of dynamic systems and their description with finite automata and state diagrams
- Formal languages, regular grammars and the word problem
- Other automata models: Moore and Mealy automata
- The concept of algorithm, computability, halting problem, functionality and programming of Turing machines
- Basic algorithms for searching and sorting
- History of hardware development
- Structure and basic operation of a computer and microprocessor, Von Neumann architecture, Moore's law
- Structure and operation of the Internet and World Wide Web
- Introduction to the HTML and Markdown languages
- Structure of distributed systems, client-server, peer-to-peer, blockchain, Git
- History of artificial intelligence, machine learning methods, regression, how neural networks work
- Data protection and ethics in computer science

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Students remember basic concepts of information processing and can measure the information content of messages.
- Students understand data coding and basic methods of modelling within computer science.
- Students apply methods for describing data structures.
- Students analyse simple dynamic systems and describe them using state diagrams.
- Students create regular grammars and solve the word problem with the help of finite automata.
- Students analyse simple problems and create solutions with the help of Turing machines.
- Students recall important points in the history of computer science.

Literature

- Gumm, Heinz-Peter; Sommer, Manfred: Einführung in die Informatik, 10th edition, Oldenbourg, 2012.
- Ernst, Hartmut; Schmidt, Jochen; Beneken, Gerd: Grundkurs Informatik: Grundlagen und Konzepte für die erfolgreiche IT-Praxis, 8th edition, Springer Verlag, 2023.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5011010
Basics of Programming

Module profile

Exam number
5011010

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction, Exercise

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr.-Ing. Tobias Fertig

Lecturer(s)
Prof. Dr.-Ing. Tobias Fertig, Christine Zilker

Applicability	BWI
Semester according to SPO	1. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
None

Recommended prerequisites for the participation in the module
none

Content
The Programming I module is about learning procedural programming and the first parts of object-oriented programming in the Java programming language. The ability to programme and thus to independently solve small problems in different areas is one of the basic skills expected of a (business) computer scientist.

The course consists of 13 lessons, which are made up of learning videos, the corresponding exercises, the Power Point slides for the videos and quizzes matching the material.

The learning videos are structured in such a way that students gradually familiarise themselves with the various language constructs and basic programming concepts. The accompanying seminar lessons are used to ask questions and consolidate the material.

The exercises are by far the most important part of the course. Students learn programming by solving problems independently. The tutorials help by giving students food for thought from the lecturer if a student gets stuck with a problem and by discussing and improving the quality of solutions. The exercises usually belong to the previous learning videos and pick up on their content.

There is a quiz for each lesson, which uses simple questions to give students the opportunity to check whether they know or understand the material covered.

Contents:
- Introduction/first programme (Hello world)
- Elementary language constructs (expressions, primitive variables, assignments)
- Essential (control) statements (conditional statements, branching, head- and foot-controlled loops)
- Methods, recursion, arrays, complex data types
- Object-orientation (introduction), classes, objects, (instance) methods, visibility
- Multidimensional arrays, behaviour of reference types, string methods, garbage collector

- Data structures (singly and doubly linked lists, binary trees, traversing trees)
- Packages, implicit inheritance, relations using the example of equals
- DRY principle, tell, don't ask principle
- Optional: bitwise operators

- IDE used: Eclipse

This module is the basis for Programming 2 and the programming project. Furthermore, the content and skills acquired in this module make the Programming 3 module much easier and are useful for

- Mathematical SW in computer science
- Algorithms and data structures 2
- Operating systems
- Fundamentals of distributed systems
- Data Management & Data Science

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
bZv - currently suspended

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- apply procedural programming as well as introductory principles of object-oriented programming
- independently implement a solution strategy for writing small procedural and object-oriented Java programmes according to a given design idea
- understand simple mathematical and technical problems and implement a solution
- generalise sub-problems by suitable means

Literature
Heinisch, Cornelia; Müller-Hofmann, Frank; Goll, Joachim: Java als erste Programmiersprache; Vom Einsteiger zum Profi; Springer Vieweg, 2023
Christian Ullenboom: Java ist auch eine Insel, 17th, updated and revised edition, Rheinwerk Computing, 2023
Reinhard Schiedermeier: Programming with Java, Pearson Studium - IT, 2010

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5000430
Introduction to Business Information Systems

Module profile

Exam number
5000430

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karsten Huffstadt

Lecturer(s)
Marvin Tessitore

Applicability	BWI
Semester according to SPO	1. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
The module Fundamentals of Information Systems introduces students to central concepts, systems and ways of thinking at the interface between business administration and information technology. Students learn how information systems are used to support, control and innovate operational processes and what role they play in digital business models. They gain a basic understanding of the architecture, functionality and strategic importance of business IT systems - from ERP systems and databases to current developments such as cloud computing and platform economics. The aim is to create a solid foundation for understanding and helping to shape digital value creation.

Specific contents are:
- Concept and objectives of business informatics
- Components of business information systems
- Structure and application of ERP systems
- Introduction to business process modelling (e.g. BPMN)
- Basic concepts of data processing and database technology
- Information management and IT infrastructure in the company
- Digitalisation and automation of business processes
- IT-supported decision support systems (BI, MIS)
- Current topics: Cloud computing, platform economy, AI-supported systems (insight)
- Legal and ethical aspects of digital information systems (data protection, GDPR, bias)

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students...

- name central terms, models and systems of business informatics (e.g. information systems, ERP, databases, processes). (to remember)
- explain the structure, functions and interaction of business information systems and their relevance for companies. (to understand)
- apply selected methods (e.g. modelling of business processes or data) to simple scenarios. (to apply)
- distinguish between different types of systems and analyse their use in the context of operational processes and digital business models. (to analyse)
- evaluate the opportunities and challenges of digital change and system integration from an operational perspective. (to evaluate)
- design simple models for mapping business processes or information flows. (to create)

Literature
Schmoll, M. (2022). Grundkurs Wirtschaftsinformatik: Eine kompakte und praxisorientierte Einführung. Springer Vieweg.
Hess, T., & Ludwig, S. (2020). Introduction to business informatics. Vahlen Publishing House.
Thome, R. (ed.) (2023). Business informatics: Fundamentals. De Gruyter Oldenbourg.
Heinrich, L. J., & Riedl, R. (2019). Information Management. De Gruyter Oldenbourg.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5000510,6910050
Basics of Economics

Module profile

Exam number
5000510,6910050

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Eva Wedlich

Lecturer(s)
Prof. Dr. Eva Wedlich

Applicability	BDGD, BWI
Semester according to SPO	1. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
Fundamentals and concepts of business administration and economics
- Meaning of host liability
- types of goods
- Economic principle
- economic sectors
- production factors

Key figures
- productivity
- economic efficiency
- Return on equity
- Return on assets
- Return on sales

Choice of location
Legal forms
- Partnerships and corporations

Fundamentals of business accounting
Pricing on markets
- Household demand
- Supply by companies

National accounts
Economic goals

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Students know and understand the central principles and most important contexts of economics and business administration.
- Students understand the basic principles of economic models and can explain these in the context of simple economic scenarios.

explain them in the context of simple economic scenarios.

- Students apply key figures, are able to calculate and analyse them and evaluate them according to economic scenarios.
- Students apply basic techniques for analysing economic data in order to create simple economic forecasts.
- Students evaluate economic relationships and are able to understand them.
- Students understand, analyse and correctly evaluate economic texts (including those from economic journals).

Literature

Bofinger, P.: Fundamentals of Economics: An Introduction to the Science of Markets, 2019
Mankiw, G.; Taylor, M.: Fundamentals of Economics; 8th edition; Schäffer-Poeschel, Stuttgart, 2021
Balderjahn, I.; Specht, G.: Introduction to Business Administration: 8th edition, Schäffer-Poeschel, Stuttgart, 2020
Vahs, D.; Schäfer-Kunz, J.: Introduction to Business Administration; 9th edition; Schäffer-Poeschel, Stuttgart, 2025
Wöhe, G.: Introduction to General Business Administration; 28th edition; Vahlen; Munich, 2023

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5000130,5100130,6810020 Programming I

Module profile

Exam number
5000130,5100130,6810020

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction, Exercise

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Steffen Heinzl

Lecturer(s)
Prof. Dr. Steffen Heinzl, Christine Zilker

Applicability	BIN, BISD, BWI
Semester according to SPO	1. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
bZv

Recommended prerequisites for the participation in the module
none

Content
The Programming I module is about learning procedural programming and the first parts of object-oriented programming in the Java programming language. The ability to programme and thus to independently solve small problems in different areas is one of the basic skills expected of a (business) computer scientist.

The course consists of 13 lessons, which consist of learning videos, the corresponding exercises, the Power Point slides for the videos and quizzes that match the material.

The learning videos are structured in such a way that students gradually familiarise themselves with the various language constructs and basic programming concepts. The accompanying seminar lessons are used to ask questions and consolidate the material.

The exercises are by far the most important part of the course. Students learn programming by solving problems independently. The tutorials help by giving students food for thought from the lecturer if a student gets stuck with a problem and by discussing and improving the quality of solutions. The exercises usually belong to the previous learning videos and pick up on their content.

There is a quiz for each lesson, which uses simple questions to give students the opportunity to check whether they know or understand the material covered.

Contents:
- Introduction/first programme (Hello world)
- Elementary language constructs (expressions, primitive variables, assignments)
- Essential (control) statements (conditional statements, branching, head- and foot-controlled loops)
- Methods, recursion, arrays, complex data types
- Object-orientation (introduction), classes, objects, (instance) methods, visibility
- Multidimensional arrays, behaviour of reference types, string methods, garbage collector

- Data structures (singly and doubly linked lists, binary trees, traversing trees)
- Packages, implicit inheritance, relations using the example of equals
- DRY principle, tell, don't ask principle
- Optional: bitwise operators

- IDE used: Eclipse

This module is the basis for Programming 2 and the programming project. Furthermore, the content and skills acquired in this module make the Programming 3 module much easier and are useful for

- Mathematical SW in computer science
- Algorithms and data structures 2
- Operating systems
- Fundamentals of distributed systems
- Data Management & Data Science

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- apply procedural programming as well as introductory principles of object-oriented programming
- independently implement a solution strategy for writing small procedural and object-oriented Java programmes according to a given design idea
- understand simple mathematical and technical problems and implement a solution
- generalise sub-problems by suitable means

Literature
Heinisch, Cornelia; Müller-Hofmann, Frank; Goll, Joachim: Java als erste Programmiersprache; Vom Einsteiger zum Profi; Springer Vieweg, 2023
Christian Ullenboom: Java ist auch eine Insel, 17th, updated and revised edition, Rheinwerk Computing, 2023
Reinhard Schiedermeier: Programming with Java, Pearson Studium - IT, 2010

2. semester

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5001310
Databases

Module profile

Exam number
5001310

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction, Exercise

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Frank-Michael Schleif

Lecturer(s)
Michael Rott

Applicability	BWI
Semester according to SPO	2. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
bZv

Recommended prerequisites for the participation in the module
none

Content
Introduction
- Persistent data storage
- Requirements for database systems

Relational data model (*)
- Relations and relational algebra
- Integrity conditions
- Normalisation

Database design (*)
- Conceptual data modelling
- Logical data modelling
- normal forms

SQL (*)
- Basics of DDL, DML
- Simple and complex SQL queries
- Query processing

Transaction processing
Databases in multi-tier architectures
- Performance and scalability
- Non-relational databases (NoSQL)
- Focus topic

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students have understood basic database concepts such as the relational data model and the relational algebra.
They are able to design and practically implement database solutions with the help of the modelling and SQL skills taught.
Students have a basic understanding of the specific requirements for data storage in multi-tier software architectures, especially web applications. They have an overview of database technologies for performance and scalability.
Sound technical knowledge

- Computer science basics: understanding the concept of data persistence; implementation of persistence with and without the help of an RDBMS
- Subject-specific specialisations: Teaching techniques for data modelling and data management

Problem-solving skills

- Ability to analyse and structure technical problems: Conceptual data models are transformed into logical and physical models and normalised in order to be able to manage data in a structured and high-performance manner
- Ability to develop and implement solution strategies: Database-based solution concepts are developed on the basis of analysing technical information requirements
- Expertise in networking different specialist areas: The functionality of the interface between programming and databases is taught using JDBC. The link between database development and software engineering is established using ERM models, among other things.

Methodological competence

- Ability to think logically, analytically and conceptually: Conceptual models must be developed from technical requirements for information needs through structured analysis. Logical procedures and analytical skills are a prerequisite and subject of learning.

Practical experience and professional qualification

- Knowledge of practical tasks: The design, implementation and utilisation of small and large databases are part of every practical IT application.

Scientific way of working

- Ability to analyse and structure complex tasks: Analysis of discourse worlds and modelling as entity-relationship models; analysis of complex information requirements and implementation in formal query languages.

Literature
Piepmeyer, Lothar: Grundkurs Datenbank-systeme; 1st ed.; Hanser; Munich, 2011
Heuer, Andreas; Saake, Gunter: Databases - Concepts and Languages; 5th ed.; MITP-Verlag; Bonn, 2013

Module: 5000910,6910120
English for IT

Module profile

Exam number
5000910,6910120

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Graeme Dunphy

Lecturer(s)
Beate Wassermann,
Andrea Kreiner-Wegener

Applicability	BDGD, BWI
Semester according to SPO	2. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
approx. 6 years of school English, level B2

Content
technical vocabulary; reading, understanding and working on technical texts (e.g. project descriptions, excerpts from computing magazines, authentic technical reading material); listening comprehension (authentic recordings on computer-related topics) oral communication skills (e.g. telephoning, presentations, discussions, negotiations, meetings); written communication (esp. emails)

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
Students have English language skills so that they can work or study in an English speaking country without major language difficulties.
Course level B2 (CEFR)

Literature
lecture script, different articles, listening materials

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5002030
Marketing and Sales

Module profile

Exam number
5002030

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Eva Wedlich

Lecturer(s)
Prof. Dr. Eva Wedlich

Applicability	BWI
Semester according to SPO	2. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Fundamentals of economics

Content
- Definition of terms
- Methods of market and sales research
- Products and product ranges
- Marketing mix
- Forms of customer order processing (file-to-stock, file-to-stock, etc., drop shipments)
- Forms of availability checks
- Online marketing

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students are familiar with practical tasks, know the procedures and processes in an industrial environment and can solve problems under industrial boundary conditions by addressing, analysing and solving marketing and sales-related issues on the basis of practical case studies.
Students have knowledge of the master data of marketing and sales.
Students acquire the ability to analyse sales-related issues.
Students know the instruments of marketing and can apply them.

Literature
Geyer, Helmut: Crash course in marketing 5th edition, 2023
Winkelmann, Peter; Spandl, Torsten: Marketing und Vertrieb: Fundamente für die marktorientierte Unternehmensführung 9th edition, 2023

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5000350
Mathematics II

Module profile

Exam number
5000350

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Andreas Keller

Lecturer(s)
Prof. Dr. Andreas Keller

Applicability	BWI
Semester according to SPO	2. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
School maths, Mathematics I

Content
Real numbers
Properties of functions
Sequences
Limits and continuity
Differential calculus
Integral calculus
Examples from financial mathematics

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Maths and science Fundamentals:
Building on the mathematical skills acquired in Mathematics I, students become familiar with further concepts and techniques from the mathematical field of analysis. The acquired knowledge of differential and integral calculus is an important skill for subjects such as statistics, in particular the section on probability theory including normal distribution, and serves as a basis for operations research.

Ability to develop and implement solution strategies:
Solving exercises in differential and integral calculus is an important part of the Maths II course. By analysing and solving these problems, the ability to develop and implement solution strategies is further trained, building on the skills acquired in Mathematics I.

The ability to think logically, analytically and conceptually:
By understanding mathematical texts and working on mathematical tasks, the ability to think abstractly and logically is further trained, building on the skills acquired in Mathematics I.

Literature
Brill, Manfred: Mathematics for Computer Scientists; Hanser Verlag; Munich/Vienna
Ihrig, Holger; Pflaumer, Peter: Finanzmathematik - Intensivkurs; Oldenbourg Verlag; Munich;
Hartmann, Peter: Mathematics for Computer Scientists; Vieweg + Teubner, Wiesbaden
Papula, Lothar: Mathematics for Engineers and Scientists 1 and 2; Vieweg + Teubner; Wiesbaden
Schubert, Matthias: Mathematics for Computer Scientists, Vieweg + Teubner, Wiesbaden
Tietze, Jürgen: Introduction to Financial Mathematics, Vieweg + Teubner, Wiesbaden

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5000220,5100220
Programming II

Module profile

Exam number
5000220,5100220

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction, Exercise

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr.-Ing. Tobias Fertig

Lecturer(s)
Prof. Dr.-Ing. Tobias Fertig,
Olaf Christen,
Christine Zilker

Applicability	BIN, BWI
Semester according to SPO	2. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
None

Recommended prerequisites for the participation in the module
Programming I

Content
The Programming II module is about learning object-oriented programming (in the Java programming language). In order to structure larger information systems, it is important to learn how these can be set up, designed and tested.

This course consists of 13 lessons, which are made up of learning videos, the corresponding exercises, the Power Point slides for the videos and quizzes matching the material.

The learning videos are structured in such a way that students are first confronted with tests and then gradually learn object-orientation and its application. The accompanying seminar lessons are used to ask questions and consolidate the material.

The exercises are by far the most important part of the course. Students learn object-orientated programming by solving problems independently. The tutorials help by giving students food for thought from the lecturer if a student gets stuck with a problem and by discussing and improving the quality of solutions. The exercises usually belong to the previous learning videos and pick up on their content.

There is a quiz for each lesson, which uses simple questions to give students the opportunity to check whether they know or understand the material covered.

Contents:
Unit tests (JUnit 5)
Dependency management (Maven)
Inheritance (specialisation, generalisation)
Enumerations
Abstract classes, interfaces, composition
Exceptions
streams
generics
Collections, associative arrays (maps)
Nested classes (static nested, inner, local, anonymous classes)
Lambda expressions
Threads

Design patterns: Builder, Decorator, Visitor
Fluent interfaces
Functional programming with the help of the Stream API

IDE: Eclipse or IntelliJ

The content and skills acquired in this module make the programming project much easier.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
bZv - currently suspended

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- apply the concepts of object-oriented programming
- independently implement a solution strategy for writing object-oriented Java programmes
- implement partial solutions to larger programmes/problems
- structure problems into several sub-problems
- Implement tests for software systems
- Understand and use polymorphism in methods and types
- use class libraries to extend programmes
- understand first design patterns

Literature
Schiedermeier, Reinhard: Programming with Java. Pearson, 2nd edition, 2010.
Schiedermeier, Reinhard: Programming with Java II. Pearson, 2013.
Bloch, Joshua: Effective Java. 3rd Edition, Addison-Wesley, 2017.
Ullenboom, Christian: Java ist auch eine Insel. 16th edition, Rheinwerk Computing, 2021.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5000610
Accountancy and Taxes

Module profile

Exam number
5000610

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction, Exercise

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Eva Wedlich

Lecturer(s)
Christian Holleber

Applicability	BWI
Semester according to SPO	2. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Basic understanding of economic and socio-political contexts

Content
Teaching the basics of business accounting and tax law: financial accounting, accounting in accordance with commercial law.
Addressees and objectives of annual financial statements, relationship between commercial and tax balance sheets.
Preparation of balance sheet, profit and loss account, notes and management report.
Internal corporate accounting, controlling & cost accounting.
Investment planning and financing.
Financial and liquidity planning.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Basic accounting terms are introduced and the tasks and addressees of internal and external accounting are clarified.
They will be able to document simple business transactions and know the relevant principles.
Various accounting cycles are recognised and can be assigned.
The structure of the annual financial statements is known and can be calculated and interpreted, as can an example calculation of the operating result.
The influence of taxation on business decisions is discussed.
Ideas and methods for investment and financing decisions are understood.
You will be able to prepare sound financial and liquidity planning.

Literature
Current law books (BGB, HGB, EStG..)
Introduction to General Business Administration - Wöhe - currently 28th edition - Vahlen
Introduction to Accounting - Coenenberg et. al - 8th edition - Schäffer Poeschel
Basiswissen Rechnungswesen - Schultz - 8th edition - dtv

3. semester

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Module: 5011160
Data Science

Module profile

Exam number
5011160

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction, Exercise

Language of instruction
German/English

Organisation

Responsible lecturer
Prof. Dr. Frank-Michael Schleif

Lecturer(s)
Prof. Dr. Frank-Michael Schleif

Applicability	BWI
Semester according to SPO	3. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
None

Recommended prerequisites for the participation in the module
Databases, courses in the context of programming and software engineering
(Lecture(s) in data base systems, programming and software engineering)

Content
Classical and modern concepts for data management and analysis of (semi-)structured data are covered.

Topics include:

XML / JSON Technologies
- Basics of XML and JSON
- DTD and XML Schema
- XPath, XSLT
- Queries on JSON documents
- Usage Scenarios
- Data Management Concepts

Basics of Data Warehousing
- Multidimensional Data Modelling
- Data Sources: Integration of Relational Database Systems, Web Services, JDBC/ODBC
- Some additional information on Privacy and Information Security in DBMS
- Planning and Implementation of ETL Processes
- Online Analytical Processing (OLAP)
- Introduction to NoSQL Databases and Big Data

Graph Databases
- Introduction to Graphs and Graph Management Systems
- Graph Database Query Language Cypher
- Modelling Concepts in Graph Databases
- Selected Data Analysis Concepts and Algorithms
- Data Analysis with Graph Databases

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German/English

Condition for the award of credit points
None

Learning outcomes
1. the students know the fundamental concepts and challenges related to data management and data analysis systems for businesses.
2. the students understand the components and architectures of data warehouse systems and their relevance in organisational contexts.
3. the students apply various data management methods, including non-relational databases (e.g., graph databases), in practical scenarios.
4. the students analyse data management processes and data analysis procedures, identifying key technologies and best practices used in enterprises.
5. the students evaluate solution strategies for application-specific problems in the fields of data management and data science, considering scalability and performance factors.
6. the students create data-driven solutions by designing and implementing database-based systems that address practical business challenges.
7. the students develop a comprehensive understanding of procedural models, multidimensional modelling, and database system integration in the context of data science.

Literature
Skiena, Steven S.: The Data Science Design Manual. Springer, 2017.
Robinson, Ian; Webber, Jim; Eifrem, Emil: Graph Databases. 2nd Edition, O'Reilly Media, 2015.
Friesen, Jeff: Java XML and JSON. Apress, 2019.
Knight, Brian; Becker, Allan; Kimball, Ralph: Professional Microsoft SQL Server 2014 Integration Services (Wrox Programmer to Programmer). Wrox, 2014.
Hastie, Trevor; Tibshirani, Robert; Friedman, Jerome: The Elements of Statistical Learning. 2nd Edition, Springer, 2009.
Kimball, Ralph; Ross, Margy; Thornthwaite, Warren; Mundy, Joy; Becker, Bob: The Data Warehouse Lifecycle Toolkit. 2nd Edition, Wiley, 2008.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5001410
Data Communication

Module profile

Exam number
5001410

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Christian Bachmeir

Lecturer(s)
Prof. Dr. Christian Bachmeir

Applicability	BWI
Semester according to SPO	3. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
Students are given an overview of current and common communication systems,
their performance and possibilities, their use in the business environment and also their limitations,
and are able to select and use them according to requirements.
Students should also familiarise themselves with modern cryptographic procedures
and recognise their necessity in day-to-day operations. They should also
learn these methods as a basis for other subjects.

Rough structure:
1) Introduction to communication networks
2) Theoretical basics of communication networks
3) Practical basics of communication networks
4) Introduction to IT security
5) Basics of cryptography

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
The students should:

- gain an overview of the main current communication systems and be able to evaluate and use them
- know and understand the concepts and functions of wireless communication technology
- Understand and be able to apply the basics of modern cryptography

Literature
Patrick Schnabel, Communications Technology Primer, Kindle eBooks
Kurose, Ross: Computer Networks, The Top-Down Approach, Publisher: Pearson Studium; Edition: 5th, updated edition (1 February 2012)
Tanenbaum, Wetherall: Computer Networks, Publisher: Pearson Studium; Edition: 5th, updated edition (1 August 2012)
Schmeh: Kryptografie: Verfahren - Protokolle - Infrastrukturen (iX-Edition) Publisher: dpunkt.verlag GmbH; Edition: 5th, updated edition (27 February 2013)

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5001900
IT Organisation and IT Performance Management

Module profile

Exam number
5001900

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Gabriele Saueressig

Lecturer(s)
Prof. Dr. Gabriele Saueressig

Applicability	BWI
Semester according to SPO	3. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Fundamentals of business informatics, fundamentals of economics, accounting and taxes

Content
The module teaches the basics of company organisation (in particular organisational structure, division of labour and coordination) and the business aspects of services.

In addition, topics relating to IT organisation are taught, e.g.
- Current challenges of IT organisation and possible solutions
- Macro- and micro-organisational issues
- Processes of internal and external IT service providers, e.g. service level management, support and user service (in accordance with ITIL)
- IT sourcing

The subject area of IT controlling includes
- Fundamentals of IT controlling
- IT key figures and key figure systems
- IT cost and performance accounting

are discussed.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Link the knowledge areas of "business administration", "accounting" and "organisation" with IT-related issues relating to the organisation and controlling of (internal and external) IT service providers
- Get to know typical processes (user service, service level management) using the example of specific industry and organisational characteristics
- Be able to solve complex organisational and cost-oriented issues in the IT organisation environment
- Be able to compare different organisational forms (e.g. internal IT, outsourced IT and IT outsourcing)
- Familiarise themselves with the structure and content of frameworks (e.g. ITIL)

Literature

- Magazines "HMD - Praxis der Wirtschaftsinformatik", "Wirtschaftsinformatik & Management", "CIO", "Computerwoche" and "IM+io -Das Magazin für Innovation, Organisation und Management"
- Beims, M.; Ziegenbein, M.: IT-Servicemanagement in der Praxis mit ITIL, 6. upd. Ed., Hanser, 2021
- Gadatsch, A.: IT-Controlling - From IT cost and activity allocation to smart controlling, 2nd edition, Springer Vieweg, 2021
- Kesten, R. et al: IT-Controlling, 2nd ed. Vahlen, Munich, 2013
- Tiemeyer, E.: Handbook of IT Management, 8th edition, Hanser, 2023
- Urbach, N.; Ahlemann, F.: IT-Management im Zeitalter der Digitalisierung: Auf dem Weg zur IT-Organisation der Zukunft, Springer Gabler, 2016

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003230,6810160
IT Project Management

Module profile

Exam number
5003230,6810160

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction, Exercise

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr.-Ing. Anne Heß

Lecturer(s)
Prof. Dr. Eva Wedlich,
Prof. Dr.-Ing. Anne Heß

Applicability	BISD, BWI
Semester according to SPO	3. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
- Introduction to project and project management
- Project organisation
- Project planning process
- Project costing
- Project control and monitoring
- Project completion
- Personnel management and project marketing
- IT product management
- Core activities in IT projects (analysis, design, implementation, integration and stabilisation)
- Quality management and quality assurance
- Configuration management (rudimentary)
- Process models (phase models vs. iterative / incremental / agile process models)
- Agile project management / Scrum

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Students learn project management skills, in particular the necessary knowledge for project managers. Project management methods, processes and tools are covered.
- Students are familiarised with relevant core activities of software development and their objectives
- Students can assign and describe relevant sub-activities, input requirements and result types to the core activities
- Students can describe various process models (waterfall model, V-model, Scrum), including their respective advantages and disadvantages, and can describe and assign activities in the process models
- Students understand characteristic features and differences between phase-orientated process models and iterative/ incremental process models and can select suitable process models for a given project context and justify their selection
- Students know the basic principles, roles, artefacts, ceremonies and practices of agile projects (using Scrum as an example) and can find their way around an agile project as a team member
- Students understand the importance and relevance of software quality
- Students know the key concepts of quality management and quality assurance and can describe the relevant tasks and skills (soft skills) of quality managers
- Students know the main objectives, concepts and activities of configuration management, including the basic functionalities of tools to support configuration management

Literature

- Johannsen, A. and Kramer, A.: Basiswissen für Softwareprojektmanager, dpunkt.verlag, 2017.
- Olfert, K.: Projektmanagement, NWB Verlag, 11th edition 2019.
- Sterrer, C. and Winkler, G.: setting milestones. Project management (methods, processes, tools), Goldegg Verlag, 2010.
- Sterrer, C.: pm k.i.s.s.: Keep it short and simple, Goldegg Verlag, 2011.
- Tiemeyer, E: Handbuch IT-Projektmanagement, Hanser 2018
- Ziegler, Michael : Agile project management with Scrum for beginners, ISBN-13: 979-8751100346 , 2021
- Gundlach, Marco: Agile Project Management - Successfully Navigating with Scrum and Kanban: A Comprehensive Guide for Beginners and Experts, ISBN-13: 979-8392911936, 2023

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5000730,6910170
Innovation Management and Entrepreneurship

Module profile

Exam number
5000730,6910170

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Michael Müßig

Lecturer(s)
Prof. Dr. Michael Müßig

Applicability	BDGD, BWI
Semester according to SPO	3. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
The seminar "Innovation Management and Business Creation" offers a practice-orientated and comprehensive education that motivates students not only professionally but also personally and prepares them for real challenges in the business world. At the beginning of the course, the basics of innovation management are taught. This includes understanding the different types of innovation - such as incremental and disruptive innovation - as well as the importance of an innovative mindset in modern organisations. Schumpeter and Christensen are also introduced in relation to the respective historical context with their contributions. Models and theories by Alexander Osterwalder, such as the Business Model Canvas, are covered in detail to provide students with a robust tool for visually structuring and analysing business ideas. Design thinking is introduced as an essential method. Interactive workshops support students in developing creative solutions to problems, focussing on the needs of the users. The practical application of design thinking in real case studies enables a deep understanding of iterative processes and prototyping. In the area of business start-ups, the focus is on start-up strategies and business planning for digital business models. Topics such as market analyses, competition analyses and financing options are covered, as are the legal framework conditions for start-ups. Experience reports from guest lecturers - including successful founders - enrich the theoretical content and make it lively and tangible. Aspects of growth hacking and the "Scale Up" environment are also used to address the steps after the start-up to a successful company.
A further focus is placed on the requirements of sustainable technologies and business models. The aspect of digital sovereignty will also be problematised and discussed.
A practical project (Innovation Challenge in collaboration with the Centre for Digital Innovation, Würzburg) provides additional motivation for students. In teams, they develop their own business idea, create a business model canvas and finally present their idea to a panel of investors in a pitch simulation. This final project not only provides a practical exercise, but also strengthens students' confidence in their ideas and their feasibility. Through the combination of theoretical knowledge, practical workshops and personal development, students are fully prepared to put their own ideas into practice and make their contribution to digital transformation and

innovation. Through this practical project, students are also introduced to the region's start-up ecosystem (ZDI, Startup Prize, start-up round table, etc.).

Alternating CASE studies deepen the practical relevance (Tesla, Kodak and digital photography, Fashion and TEC - using the example of BOSS, Scoutbee, Vogel Communications, WeSort.AI, Faaren...).

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students remember basic concepts of innovation management and business creation, such as the business model canvas and design thinking.
Students understand the principles and benefits of an innovative mindset and the role it plays in modern organisations.
Students apply design thinking methods to develop creative solutions to real-world challenges.
Students analyse market and competitive data to identify opportunities and risks for new business ideas.
Students evaluate various financing options for start-ups in order to select the most suitable strategy for realising their business ideas.
Students work in teams to create innovative business ideas and develop comprehensive business models, which they present in a pitch demonstration.

Literature
Mandatory:
Hess, Thomas: Strategically managing digital transformation. Springer Fachmedien Wiesbaden GmbH, 2019
Osterwalder, Alexander; Pigneur, Yves et al: Business Model Generation, campus Verlag, 2011 (and more recent editions)
Ries, Eric: Lean Startup, 4th ed. Reline-Verlag Munich 2015
Michael Lewrick, Patrick Link, Larry Leifer: Design Thinking: The Handbook, Publisher: Vahlen, 2018
Kotsemir, M.; Abroskin, A.; Meissner, D.: Innovation Concepts and Typology - an evolutionary Discussion. Basic Research Programme, Working papers, SERIES: SCIENCE, TECHNOLOGY AND INNOVATION WP BRP 05/STI/2013

Supplementary:
Christensen, Clayton M.: The Innovators Dilemma, Harvard Business Review Press (1997 and current editions, also available in German)
Burkhardt, Christoph: Thinking error innovation; SpringerGabler 2017

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5001710
Logistics

Module profile

Exam number
5001710

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karl Liebstückel

Lecturer(s)
Prof. Dr. Karl Liebstückel

Applicability	BWI
Semester according to SPO	3. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Fundamentals of economics
Accounting

Content
Introduction to logistics: terms, types, objectives
Procurement logistics: determining material requirements, material requirements planning, supplier evaluation, forms of procurement, procurement quantities and dates, SRM systems
Warehouse logistics: warehouse systems, warehouse functions, warehouse types, inventory management, order picking, stocktaking
Production logistics: production programme planning, planned disposition, scheduling, capacity planning, availability check
Distribution logistics: external transport systems, distribution channels, internal/external transport, route planning, spare parts logistics
Maintenance logistics: Technical plant management, maintenance processing, preventive maintenance (time-based, performance-based), RBM
Logistics controlling: differentiation between commercial and logistics controlling, lists, analyses, key figures and systems, OLAP systems

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students deepen their knowledge of the fundamentals of business informatics by transferring basic questions of business informatics to the logistics environment.
Students are familiar with practical tasks, know the procedures and processes in an industrial environment and are able to solve problems under industrial boundary conditions by taking up, analysing and solving logistical issues on the basis of practical case studies.
Students have knowledge of the objectives of logistics and acquire the ability to plan logistics processes.
Students are familiar with the instruments of logistics and the traffic and transport systems used. Students know the interrelationships between procurement, warehouse and production logistics and understand logistics controlling.

Literature
Hans Corsten, Ralf Gössinger: Produktionswirtschaft, 14th edition, Oldenburg 2016.
Oeldorf, Gerhard; Olfert, Klaus: Material Logistics; 14th edition; Kiehl; Ludwigshafen, 2018
Ehrmann, Harald; Jockel, Otto: Compact training in logistics; 7th edition; Kiehl; Ludwigshafen, 2019
Bichler, Klaus; Schröter, Norbert: Practice-oriented logistics; 5th edition; Kohlhammer; Stuttgart, 2004
Schulte, Christof: Logistics - Paths to the Supply Chain; 7th edition; Vahlen; Munich, 2016
Wannenwetsch, A.: Integrierte Beschaffung, Logistik, Materialwirtschaft und Produktion, Supply Chain im Zeitalter der Digitalisierung, Springer-Verlag 6th edition 2021.

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003031
Software industry, education and economy in India

Module profile

Exam number
5003031

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Isabel John

Lecturer(s)
Prof. Dr. Isabel John,
Prof. Dr.-Ing. Erik Schaffernicht

Applicability	BDGD, BEC, BIN, BISD, BWI
Semester according to SPO	3. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
Good knowledge of English

Recommended prerequisites for the participation in the module
none

Content
Introduction to India and our partner university Christ University in Bangalore
Selection of topics for the intercultural presentations (e.g. politics, religion, IT industry) in preparation for the excursion.
Presentation of methods for developing presentations in terms of topic selection, structure and slide design.
Introduction to the topic for the joint projects with Christ University students, which will be worked on in small groups from October.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
Students recall basic facts about India and its importance in information technology.
Students analyse and evaluate differences between Germany and India.
Students use an image-orientated, free presentation style in their presentations.
Students apply basic communication techniques in the intercultural field using India as an example.
Students demonstrate successful co-operation with students from the partner university in the context of a technical project.

Literature
Will be announced in the seminar depending on the topics.

Module: 5001110,6910140
Software Development

Module profile

Exam number
5001110,6910140

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German/English

Organisation

Responsible lecturer
Prof. Dr.-Ing. Anne Heß

Lecturer(s)
Prof. Dr.-Ing. Tobias Fertig,
Prof. Dr.-Ing. Anne Heß

Applicability	BDGD, BWI
Semester according to SPO	3. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Programming skills

Content
The discipline of software development is part of practical computer science and deals with the engineering development of software.

After a historical consideration and an examination of the basic properties of software, the module provides an overview of all basic activities in software engineering. The following activities of the software life cycle are covered, together with the associated concrete methods, techniques and tools:

- Analysis
- specification
- Design (rudimentary)
- testing

In addition to these core activities, the following related topics are considered:

- UML modelling
- Open source software
- Usability / user experience design
- Software quality / quality assurance (testing, reviews / inspections)
- Configuration management (rudimentary)

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German/English

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students acquire the following competences, categorised into

- Competence areas: Professional competence (F), methodological competence (M), social competence (S) and
- Complexity: knowledge (level 1), familiarity (level 2) and application (level 3).

Introduction SE / SE processes

- You know how software engineering came about and where it can be categorised (F, level 1).
- You can discuss special characteristics of software that distinguish software from other products (F, level 2).

Analysis and specification

- You are familiar with various techniques for determining requirements (M, level 1) and can select suitable determination techniques based on a given project context (M, level 2).

You can systematically elicit requirements in discussions with customers (S, level 3).

- You are familiar with various techniques for documenting requirements in a natural language (M, level 1) and can specify requirements in a structured way using selected techniques (M, level 3).
- You are able to model requirements on the basis of the diagram types provided by UML for analysis (use case diagrams, class diagrams, activity diagrams, sequence diagrams, etc.) (M, level 3).
- You know the basic principles and phases of creativity processes (F, level 1).
- They know different creativity techniques (M, level 1), can assign them to the different phases in the creativity process (F, level 2) and apply selected techniques (M, level 3).

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Design

- You are familiar with various methods, techniques and principles for developing design solutions (M, level 1) and can prototype early design concepts for UIs (M, level 3).
- You are familiar with licence and business models relating to open source and free software (F, level 1).
- You understand the problems of integrating software modules (F, level 1) and can perform rudimentary operations with the configuration management tool git (clone, pull, commit, push, checkout) (M, level 3).

Test / quality assurance

- You know the meaning and subcategories of software quality and understand the associated implications (F, level 1).
- You are familiar with the meaning, principles and methods for ensuring good usability / positive user experience of interactive software products (M, level 1).
- You are familiar with various test procedures (dynamic vs. static test procedures) (M, level 1) and can plan / design and implement selected procedures (M, level 3).

Literature

Ludewig, J. and Lichter, H.: Software Engineering - Grundlagen, Menschen, Prozesse Techniken, 4th edition, 2023
Sommerville, Ian: Software Engineering. Pearson, 2018
Oestereich, Bernd: Analysis and design with UML 2.5 /UML 2.5.1; Oldenbourg; Munich, 2013/2020
Rupp, Chris: UML 2 crystal clear; Hanser; Munich, 2012
McLaughlin: Object-oriented analysis and design from head to toe, O'Reilly, 2013
Thomas Geis, Guido Tesch: Basic knowledge of usability and user experience, dpunkt.verlag GmbH, 2023
Beate Hartwig: User Experience Design, Design Future Publishing, 2022
Holtzblatt Karen, Beyer Hugh: Contextual Design - Design for Life, Morgan Kaufmann, 2nd edition 2016

4. semester

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5002130
Business Software

Module profile

Exam number
5002130

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karl Liebstückel

Lecturer(s)
Prof. Dr. Karl Liebstückel

Applicability	BWI
Semester according to SPO	4. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Marketing and sales, logistics, accounting

Content
Basics of business software
- Software classification and software market
- Characteristics and limits of business software

ERP Live with SAP S/4HANA
- Management of master data (supplier, material, customer, bill of materials, etc.)
- Purchase to Pay: Processing of procurements
- Plan to Prouce: Processing of production orders
- Order to Cash: Processing of customer orders
- Quality management in logistics
- Selected accounting functions
- Selected functions from controlling
- Selected functions from human resources

Analytics with SAP Lumira

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Participants will be able to describe the basics of business software (such as a software classification with categorisation of business software or the characteristics of business software). Participants know the most important providers on the business software market.
Participants understand the limits of business software.
Participants will be able to apply important functions and business processes in business software systems.
Participants know the difference between business software solutions for large companies and for SMEs.
Participants know the difference between cloud solutions and on-premises solutions.
Participants can use an analytics tool to obtain analyses and key figures from business data.

Literature
Gronau, Norbert: Enterprise Resource Planning: Architecture, Functions and Management of ERP Systems, 4th edition, Oldenburg-Verlag, Munich 2021.
Martin Munzel: Quick introduction to SAP, 2nd edition, Espresso-Verlag, Gleichen 2017.
Olaf Schulz: Der SAP-Grundkurs für Einsteiger und Anwender, Rheinwerk-Verlag, Bonn 2016.

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5001820
Business Technologies

Module profile

Exam number
5001820

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction, Exercise

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Gabriele Saueressig

Lecturer(s)
Michael Rott,
Prof. Dr. Gabriele Saueressig

Applicability	BWI
Semester according to SPO	4. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Business informatics
Databases

Content
Business processes - basics
Business process modelling

- Importance of business process modelling
- Process description and documentation
- Models and model types
- Reference process models
- Company process models
- Process map
- Principles of proper modelling
- EPK - Event-driven process chains
- BPMN - Business Process Modelling Notation
- Practical exercises on process modelling with EPK and BPMN
- Workflow Management

Business Intelligence

- Importance of analytical information systems
- Data warehousing and multidimensional data modelling (overview)
- Introduction to data analysis techniques and data visualisation using low-code platforms

The theoretical content is rounded off by practical presentations in the areas of business intelligence and business process management as well as practical exercises.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- understand issues, methods and techniques in the field of business technology management
- model business processes using various modelling languages
- process initial simple data analysis tasks on company data using suitable tools

Subject-related competences:

- Students deepen the fundamentals of business informatics by applying and practising elementary knowledge and methods of business technology management (business process and workflow management, business intelligence)
- Students are familiar with the methods and design principles for the design, organisation and optimisation of operational business processes and are able to apply these.
- Students acquire the basic ability to model and map business processes.
- Students acquire basic knowledge of business intelligence including data warehousing
- Students acquire basic knowledge of data analysis techniques and their use in the BI / business context
- Students acquire essential skills in the use of techniques and methods in business process management and business intelligence and can apply these to simple problems
- students acquire an understanding of issues and challenges in the modelling and analysis of company data

Interdisciplinary competences:

- in the exercises, students learn about and apply modelling tools that can also be used effectively in other courses (e.g. for the Business Technologies specialisation)
- Students are able to use practical examples to independently apply the methods they have learnt and outline solution scenarios

Literature
Allweyer, T.: "Business Process Management: Strategy, Design, Implementation, Controlling", W3L
European Association of Business Process Management (EABPM) (ed.): "BPM CBOK - Business Process Management Common Body of Knowledge, Version 3.0, Leitfaden für das Prozessmanagement", Verlag Dr Götz Schmidt
Fischermanns, G.: "Praxishandbuch Prozessmanagement", Verlag Dr Götz Schmidt
Gadatsch, Andreas: Basic course in business process management; Vieweg; Wiesbaden
Schmelzer, H.J., Sesselmann, W.: "Business Process Management in Practice", Hanser
Staud, Josef L.: Business Process Analysis; Springer; Berlin
Aalst, Wil van der; Hee, Kees van: Workflow Management - Models, Methods, and Systems, The MIT Press
Christoph Engels: Basiswissen Business Intelligence; W3L

Roland Gabriel, Peter Gluchowski, Alexander Pastwa: Data Warehouse & Data Mining; W3L
Andreas Bauer, Holger Günzel: Data Warehouse Systems; dpunkt
Hans-Georg Kemper, Walid Mehanna, and Carsten Unger; Business Intelligence - Fundamentals and Practical Applications: An introduction to IT-based management support; Vieweg
The current edition of the literature listed applies.
Further literature will be announced in the course.

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003220
Information and Technology Management

Module profile

Exam number
5003220

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Kristin Weber

Lecturer(s)
Michael Rott,
Prof. Dr. Ivan Yamshchikov

Applicability	BWI
Semester according to SPO	4. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Basics of business informatics, databases

Content
The Information and Technology Management module consists of two parts.

Part 1 has the following methodology:
The course starts with an introductory lecture. Students are given an overview of the applications of artificial intelligence (AI) and machine learning as well as an introduction to methodologies for managing AI adoption.
The main part of the course is a case study analysis. Students will use the Evidently AI resource to analyse AI use cases (https://www.evidentlyai.com/ml-system-design) and submit them for discussion. In further teaching units, students will present their use cases in the form of short presentations (lightning talks), which will then be discussed together.
At the end of the course, there is a summary and a self-assessment test to check the knowledge acquired.

Part 2 deals with XML. Topics include XML basics, XML standards, structure of XML documents, structure of a DDT, XML schema definition, XSLT and XPath.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Throughout this course, students will acquire specific skills and knowledge that will enable them to effectively manage and apply technologies, particularly Artificial Intelligence and Machine Learning, in different business contexts. Core competences that will be developed include:

- Understanding AI technologies: Students will learn the fundamental concepts and applications of Artificial Intelligence and Machine Learning. This includes an understanding of how large language models work and how they can be used in practice.
- Analytical skills: By analysing 500 AI use cases, students will develop the ability to identify and evaluate the potential and challenges of AI solutions in different industries.
- Presentation and communication skills: Students practice presenting their analyses and proposed solutions clearly and persuasively in the form of short presentations, which sharpens their ability to communicate effectively in professional settings.
- Teamwork: By working in small groups, students improve their ability to collaborate and share ideas and solutions in a team.

Problem-oriented thinking: Students learn how to structure scientific and practical problems and develop solutions based on solid data-driven analyses.

- Adaptability: The course fosters students' ability to quickly adapt to new technologies and develop innovative approaches to solving real-world problems. These competences prepare students to take leading roles in the design and implementation of technology management strategies in their future careers, especially in areas that are strongly influenced by technological innovation.

Students will gain initial insights into the subject area of XML. This will be practically developed and implemented using practical tasks and tools.

Literature
"Artificial Intelligence: A Guide for Thinking Humans" by Melanie Mitchell - This book provides an in-depth introduction to AI and its applications, ideal for students who want to explore the fundamentals and ethical considerations of the technology.
"Prediction Machines: The Simple Economics of Artificial Intelligence" by Ajay Agrawal, Joshua Gans, and Avi Goldfarb - This work explains how AI is changing the economy and how businesses can use this technology to make economic decisions.
"Machine Learning Yearning" by Andrew Ng - Although primarily technical, this book offers valuable insights into strategic decision making when using machine learning in real-world applications.
Vonhoegen, H.: Getting started with XML; 8th edition; Rheinwerk, 2015
Saage, Sattler, Heuer: Databases concepts and languages; 6th edition; mitp, 2018
Further literature recommendations will be announced in the course

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5001010
Software Development Project

Module profile

Exam number
5001010

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 12 hrs

Self-study: 138 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Tristan Wimmer

Lecturer(s)
Prof. Dr. Peter Braun,
Prof. Dr.-Ing. Sebastian Biedermann,
Prof. Dr. Tristan Wimmer

Applicability	BWI
Semester according to SPO	4. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
Programming I

Recommended prerequisites for the participation in the module
Programming I
Programming II
Databases
Software development

Content
The students should realise their own application in groups. An application could, for example, be a game, a three-tier web application or a comparable application. Possible parts of the application could be a graphical user interface (including a web interface), database connection including schema design, network communication, AI, etc. The students also create documentation (general overview, various use cases, the most important activity and sequence diagrams, etc.).

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Practical study achievement

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- develop a first larger application in a team of 4-6 people
- apply the programming concepts they have learnt
- carry out and implement project planning
- break down a task into sub-problems.
- carry out and implement a task distribution
- apply knowledge of software design
- work out or look up the required content themselves using suitable literature

Literature
None

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5001610
Statistics and Operations Research

Module profile

Exam number
5001610

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Patrik Stilgenbauer

Lecturer(s)
Michael Rott,
Prof. Dr. Sabrina Klos

Applicability	BWI
Semester according to SPO	4. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Mathematics I and II

Content
Statistics

Descriptive statistics
- Statistical data, frequency distributions
- Position measures, measures of dispersion
- Correlation and regression analysis

Probability calculation:
- Events and probabilities
- Conditional probability and independence
- Random variables and their distributions, key figures
- Binomial and normal distribution
- Approximation using the normal distribution

Inductive statistics:
- Confidence intervals
- Statistical tests

Operations Research:
- Linear optimisation, in particular simplex methods
- Transport problems
- Non-linear optimisation
- Network planning

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Statistics:
Students are familiar with basic concepts and methods of descriptive statistics, probability theory and inductive statistics.
They are able to confidently apply statistical methods to analyse, process and present data and correctly interpret the results.

Operations Research:
Ability to create, analyse and critique models
Ability to apply optimisation methods
Ability to create your own programs to solve optimisation procedures

Literature
Bamberg, G.; Baur, F. and Krapp, M.: Statistik, Oldenburg Verlag, Munich/Vienna
Bourier, G.: Descriptive Statistics, Gabler Verlag, Wiesbaden
Bourier, G.: Probability theory and inferential statistics, Gabler Verlag, Wiesbaden
Henze, N.: Stochastics for Beginners, Vieweg Verlag, Wiesbaden

Horst, Reiner; Isermann; Heinz; Müller-Merbach, Heiner: Fundamentals of Operations Research I; Springer; Berlin
Runzheimer, Bodo; Cleff, Thomas; Schäfer, Wolfgang: Operations Research I; Lineare Planungsrechnung und Netzplantechnik; Gabler; Pforzheim
Lapin, Lawrence L.: Quantitative methods for business decisions with cases; Wadsworth Publishing
Neumann, Klaus; Morlock, Martin: Operations Research; Hanser; Munich

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5002810
Business and IT Law

Module profile

Exam number
5002810

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Oliver Ehret

Lecturer(s)
Prof. Dr. Oliver Ehret

Applicability	BWI
Semester according to SPO	4. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
General contract law
Special contract law with regard to IT, special types of contracts
Basics of copyright law
Overview of relevant areas of industrial property law
Internet law
Data protection law

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students should be able to understand the law, basic legal concepts of our legal system and its basic structures. They should be able to recognise the role that law plays for computer scientists. In particular, they should be able to understand and categorise the basic principles of general private and public law as well as IT law terms. The overview of the main IT-relevant areas of law and contractual areas should enable them to recognise and evaluate legal risks and thus also to counter them. Students will understand the fundamentals of copyright law, particularly in the area of software and databases, and the principles of data protection, with special consideration of IT.

Literature
o Kallwass, Abels: Privatrecht, Verlag Franz Vahlen Munich, 24th edition, 2022
o Vogel/ Dreier: Software-und Computerrecht, 1st edition, UTB, Bern/ Stuttgart/Vienna 2008.
o Hoeren: IT Vertragsrecht, 2nd edition, Verlag Otto Schmidt, Cologne 2012.
o Schneider: Computerrecht, 10th edition, Beck dtv, Munich 2012.
o Marly: Praxishandbuch Softwarerecht, 6th edition, C.H.Beck, Munich 2014.
o Härting: Internetrecht, 5th edition, Verlag Otto Schmidt, Cologne 2013.
o Hoeren: Skript Internetrecht Uni Münster, April 2014
o Haug: Basic knowledge of internet law, Verlag W. Kohlhammer, 3rd edition, 2016
o Redeker: IT law, C.H.Beck, 6th edition, 2017
o Schneider: Handbook, IT law, Otto Schmidt, 5th edition, 2017
o Kühling, Sack, Hartmann: Data protection law, C.F.Müller, 2018

5. semester

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5011250
Supervised Internship

Module profile

Exam number
5011250

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
1

ECTS-Credits (CP)
25.0

Workload
Guided study time:
Presence time: 15 hrs

Self-study: 735 hrs

Total: 750 hrs

Teaching format
Practice

Language of instruction
German/English

Organisation

Responsible lecturer
Christine Zilker

Lecturer(s)
Christine Zilker

Applicability	BWI
Semester according to SPO	5. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
> 90 ECTS credits, of which 55 ECTS credits from the first year of study

Recommended prerequisites for the participation in the module
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Content
- As part of a larger IT project, you will be required to work independently in as many project phases as possible (system analysis, system planning, implementation, system introduction and testing). This project should last at least 12 weeks.
- Ideally, the intern will familiarise themselves with various departments and areas of the company prior to the project in order to gain a rough understanding of other departments and the company as a whole.

The contact person/supervisor at the FHWS is the representative for the supervised practical phase, Prof. Dr Michael Müßig

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Documentation, Presentation

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German/English

Condition for the award of credit points
None

Learning outcomes
The trainee should

- acquire relevant, practice-orientated knowledge of operational processes
- learn (through guidance) to work independently and autonomously in IT projects.
- combine competences acquired during their studies with practical experience.
- learn to understand problems and requirements (e.g. customer requirements).
- learn to design and implement solutions to problems (e.g. for company processes and/or IT projects).
- experience working in a team.
- get to know and experience embedding in the company, its processes and organisational procedures.
- get to know and experience the IT profession.
- learn to approach the right people when problems arise.
- learn about the unconditional will to successfully and professionally realise projects.
- experience excellence and professionalism.
- experience how employees are captivated.
- recognise and feel the meaning of their work.

Literature
No general literature recommendation possible

Module: 5002350,6101110
Soft and Professional Skills

Module profile

Exam number
5002350,6101110

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
6

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Christina Völkl-Wolf

Lecturer(s)
Prof. Dr. Mario Fischer,
Prof. Dr. Christina Völkl-Wolf,
Aylin Heilsberg,
Katja Hollerbach,
Julia Holleber,
Christian Genheimer,
Prof. Dr.-Ing. Anne Heß

Applicability	BEC, BWI
Semester according to SPO	5. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
The module provides basic theoretical and practical knowledge of essential soft and professional skills. As part of 1-day workshops and seminars, students are introduced to moderation techniques using the Metaplan method, negotiation techniques using the Harvard method, the basics of body language, team management, conflict management and the basics of scientific work.
In addition to imparting knowledge, the focus is on application: in practical exercises, role plays and group work, students take on specific tasks and test the effect of various methods. In addition, scientific working methods such as formulating questions, literature research, correct citation and the creation of structured, argumentative scientific papers are covered.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Presentation

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- Apply moderation techniques (especially Metaplan) as well as negotiation techniques according to the Harvard method,
- understand and consciously use the basics of body language (facial expressions, gestures, posture, external appearance),
- organise team-building processes and apply team management methods,
- analyse conflicts in groups and deal with them using suitable communication and solution strategies,
- recognise and reflect on the importance of methodical action in the application of soft and professional skills,
- develop scientific questions, research suitable sources, cite correctly and write a short scientific paper independently.

Literature
Foppa, K.: Communication. Introduction to language and dialogue. Munich, current edition.
Schulz von Thun, F.: Miteinander reden (Vol. 1-3), Reinbek, current edition.
Fisher, R.; Ury, W.; Patton, B.: The Harvard Concept. The classic of negotiation techniques. Frankfurt a. M., current edition.
Theisen, M. R.: Scientific work. Technique - Methodology - Form. Munich, current edition.
Further up-to-date materials and practical examples are provided in the workshops and seminars.

6. semester

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6322190
Augmented Reality

Module profile

Exam number
6322190

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction, Exercise

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Mark Vetter

Lecturer(s)
Stefan Sauer

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
The event is organised by the Faculty of Polymer Engineering and Surveying (FKV):
(https://geo.thws.de/studium/bachelor-geovisualisierung/studienablauf/modulhandbuch-bgv-ab-ws-202223/?tx_fhwsmodule_fe%5Bmodul%5D=2025&tx_fhwsmodule_fe%5Baction%5D=show&tx_fhwsmodule_fe%5Bcontroller%5D=Modul&cHash=920ba0c23b4af5fe5fc9e5002ee3b2a5)

The lecture will be held as an online event in 2025ss. Date expected Wednesday 08:15 - 09:45 (lecture) and 10:00 - 12:30 (exercise)

Augmented and mixed reality and their applications
- Realisation of marker-based applications
- Realisation of image-based applications
- Realisation of LBS applications

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
1. students know the basic concepts of augmented reality (AR) and mixed reality (MR) and their areas of application.
2. students understand the differences between marker-based, image-based and location-based applications (LBS) in AR technology.
3. students use appropriate services to plan and realise AR applications.
4. students analyse requirements and possible uses for AR applications in relation to various content-based approaches.
5. students evaluate the effectiveness of different techniques for visualising content relative to spatial objects and markers.
6. students independently create AR applications that are both marker-based and image-based and can successfully publish them.
7. understand concepts for integrating AR applications into existing systems and services.

Literature
Dörner, R.; Broll, W.; Grimm, P.; Jung, B.: Virtual and Augmented Reality (VR/AR): Fundamentals and Methods of Virtual and Augmented Reality. 2nd edition, Springer-Verlag Berlin, Heidelberg, 2019. ISBN 978-3-662-58860-4.
Vetter, M. & Olberding, H.: E-learning material on geovisualisation, [online] smart.vhb.org, 2019/2020.

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003836
BSI BCM Practitioner and BSI Incident Practitioner

Module profile

Exam number
5003836

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Alexander Schinner

Lecturer(s)
Prof. Dr. Alexander Schinner,
Liane Kiesewalter

Applicability	BIN, BWI, BEC
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
BCM practitioner
- Introduction to BCM
- BCM process and stage model
- Standards and regulatory principles
- Initiation, planning and set-up
- Structure and empowerment of the BAO
- BIA pre-filter and BIA
- Risk analysis
- Emergency planning (BC strategies, CFPs and WAPs)
- Practising and testing
- Performance review and key figures

Incident practitioner
- Introduction to the cyber security network including framework conditions for digital first responders, incident practitioners and incident experts
- Summary of the content of the basic course
- Behaviour on the phone incl. non-technical measures
- Threats and forms of attack and overview of the current threat situation
- Sequence of standard procedures
- Handling of IT security incidents
- Remote support
- Incident handling for IT systems "away from the usual office environment"
- "After the incident is before the incident" preventive measures

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Teaching the BCMS process in accordance with BSI Standard 200-4 with practical relevance
- Effective detection, analysis and management of security incidents in accordance with BSI standards
- Preparation for the relevant BSI audits as part of the cyber security network (CSN)

Literature
https://www.bsi.bund.de/DE/Themen/Unternehmen-und-Organisationen/Standards-und-Zertifizierung/IT-Grundschutz/Zertifizierte-Informationssicherheit/Schulungen-zum-BCM-Praktiker/Schulungen_zum_BCM_Praktiker_node.html
https://www.bsi.bund.de/DE/Themen/Unternehmen-und-Organisationen/Informationen-und-Empfehlungen/Cyber-Sicherheitsnetzwerk/Qualifizierung/Vorfall_Praktiker/Vorfall_Praktiker.html

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003816
Behavioural Pricing

Module profile

Exam number
5003816

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Tobias Aubele

Lecturer(s)
Juliane Richter

Applicability	BEC, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
Students learn about the influence of prices on consumer behaviour from a psychological perspective. They understand the intrapersonal processes of perception, evaluation and storage of price information and can apply price psychological effects themselves.

Contents:
Basics of price management
- Introduction to the price management process
- Basic models of business price theory
- Starting points for price determination

Introduction to behavioural pricing
- Behavioural pricing as a branch of behavioural economics
- Psychological processes and constructs for processing price information
- Behavioural science theories on price perception, assessment and storage

Behavioural pricing in practice
- Design of price information from the supplier's perspective
- Price psychological effects and application examples
- Use of behavioural pricing in various industries

Possibilities and limitations of (behavioural) pricing
- Empirical price research
- Innovative (digital) pricing approaches from a practical and theoretical perspective
- Ethical and legal aspects of (behavioural) pricing

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
General learning objectives:
You are familiar with the methodological and ethical aspects of pricing and can assess pricing approaches from a business and behavioural economics perspective

Sub-objectives:
1. students understand the behavioural pricing approach and know the theoretical principles of the psychological effect of price information.
a. Professional competence: Students know the basics of behavioural pricing management. They understand the psychological effect of price information in different phases of the purchasing process.
b. Problem-solving and assessment skills: Students understand the approach of behavioural pricing as a sub-discipline of behavioural economics and how it differs from classical price theory.
c. Methodological competence: Students practise interpreting behavioural and psychological models and applying them to price management.
d. Communication skills: Students are able to discuss the concepts and models presented in the lecture in a precise and technically correct manner.
e. Self-competence: Students can deepen their knowledge independently with specific specialised articles.

2. students can apply price psychological effects themselves and are familiar with various areas of application.
a. Professional competence: Students understand the influence of different pricing parameters on price perception and consumer behaviour.
b. Problem-solving and assessment skills: Students can assess price-psychological measures in different contexts and explain them on the basis of the relevant theory. They can independently derive suitable price-psychological measures and apply them to specific practical cases.
c. Methodological competence: Students are able to transfer the effects demonstrated in the lecture to price-related issues in practice.
d. Communication skills: Students are able to contribute to discussions on price-psychological measures and present their own approaches. In doing so, they communicate precisely, effectively and correctly using technical language.
e. Social competence: Students work together effectively in a team as part of a practical case.
f. Self-competence: Students work independently, creatively and use feedback for their personal development.

3. students are familiar with the business principles of pricing policy.
a. Professional competence: Students understand the significance and decision-making areas of pricing policy. They are familiar with the classic concepts of pricing theory and the starting points for determining prices.

b. Problem-solving and judgement skills: Students can correctly classify the concepts and approaches of price management and apply them to case studies.
c. Methodological competence: Students know empirical methods for price determination, understand their challenges and can apply selected survey methods themselves.
d. Self-competence: Students are able to expand on the fundamentals covered by studying the literature independently.

4. students critically analyse current trends in price management and innovative, digital pricing approaches.

Literature

Beck, H. (2014). Behavioural Economics - An introduction (focus on chapters 1, 4-6). Wiesbaden: Springer Gabler.
Diller, H., Müller, S., Ivens, B., & Beinert, M. (2021). Pricing: Principles and processes of corporate pricing policy. Stuttgart: Kohlhammer.
Holzwarth et al (2020). Applying behavioural science to health and financial decisions. In: Behavioural Economics Guide 2020.
Kopetzky, M. (2015). Price psychology: four steps to optimised pricing. Wiesbaden: Springer Gabler.
Krämer, A. (2020). Dynamic and individual prices from a company and consumer perspective. In R. Kalka & A. Krämer (Eds.), Price communication. Wiesbaden: Springer Gabler.
Mazumdar, T., Raj, S. P., & Sinha, I. (2005). Reference price research: Review and propositions. Journal of Marketing, 69(4), 84-102.
Meehan, B., Rosenberg, S., & Duke, C. (2018). How to double savings rates: A case study for nudging for good. In: Behavioural Economics Guide 2018.
Pechtl, H. (2014). Price policy: Behavioural pricing and pricing systems. Constance: UVK Verlagsgesellschaft mbH.
Pechtl, H. (2004). The price knowledge of consumers: a theoretical-conceptual analysis (No. 01/2004). Economic Discussion Papers.
Simon, H. (2015). Confessions of the pricing man. Wiesbaden: Springer Gabler.
Simon, H. & Fassnacht, M. (2016). Price management: strategy - analysis - decision - implementation. Wiesbaden: Springer Gabler.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003843
Business Data Visualization with Power BI and AI

Module profile

Exam number
5003843

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Isabel John

Lecturer(s)
Dr. Soundarabai Beaulah Paulsingh

Applicability	BIN, BWI, BEC
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
A basic understanding of problem-solving skills such as simple excel calculations, creating graphs and charts along with preliminary idea on database concepts are sufficient.

Content
In this course, students will learn how to transform and visualise business data using Power BI, integrating advanced features such as AI-driven insights. Students will gain skills in data cleaning and modelling, designing interactive dashboards, and deriving actionable business insights. Through hands-on exercises, students will develop practical expertise in the following areas:

- Introduction to Business Data Visualisation: Power BI overview and setup, Navigating Power Query Editor.
- Data Transformation and Modelling for Analytics: Using Power Query for Data transformation, Relationships between Data models.
- Building Interactive Dashboards: Data preparation with Power Query, Basic visuals, usage of interactive elements: Filters, slicers, Drill-throughs, visualising data in business dashboards using Power BI.
- Incorporating AI Insights: Using Power BI's built-in AI insights: Influencers, Decomposition Tree and Q&A features.
- Case Study: Perform end-to-end analysis and create interactive dashboard on Stock Market Dataset to identify key trends, patterns, and actionable insights.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Presentation

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
By the end of this course, students will be able to

- Demonstrate an understanding of the fundamental concepts of data analysis and its significance.
- Clean and transform data with Power Query ensuring well-structured data for analysis.
- Incorporate built-in AI features into Power BI to create effective dashboard visuals.
- Design and build interactive Power BI dashboards to communicate business insights effectively.

Literature
Literature will be given in the course

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Module: 5003823
Computer Networks and Cyber Security

Module profile

Exam number
5003823

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr.-Ing. Sebastian Biedermann

Lecturer(s)
Siavosh Haghighi Movahed

Applicability	BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
Indicative content:
- Fundamentals of enterprise campus network design
- Network protocols and models
- Fundamentals of IP routing and switching
- IP addressing (IPv4/IPv6)
- Network security concepts and principals
- Configure and verify secure Inter-switch connectivity
- Implementing, optimising, and securing switched networks
- Implementing secure device access and access control systems
- Define key security concepts (threats, vulnerabilities, exploits, and mitigation techniques)
- Firewall Technologies

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
By engaging successfully with this module, students will be able to:
1. Explain the fundamentals of computer network and cyber security.
2. design, implement, configure, and troubleshoot high available secure scalable network infrastructures.
3. implement network security and access control solutions using routers, switches, and firewalls.
4. explain how vulnerabilities, threats, and exploits can be mitigated to enhance network security.

Literature
1. the students know the fundamentals of computer networks and cyber security principles.
2. the students understand the importance of securing network infrastructures against potential threats and vulnerabilities.
3. the students apply best practices in designing, implementing, configuring, and troubleshooting high-availability, secure, and scalable network infrastructures.
4. the students understand how threats and exploits can undermine network security and identify measures to mitigate these risks.
5. the students evaluate network security solutions, including access control measures implemented through routers, switches, and firewalls.
6. the students create comprehensive strategies to secure information assets and maintain robust network infrastructures based on theoretical knowledge and practical exercises.
7. the students develop the practical skills needed to prepare for the 200-301 Cisco® Certified Network Associate (CCNA®) exam, applying their learning to real-world scenarios.

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Module: 5003817
Computer Vision: Artificial Intelligence Applied

Module profile

Exam number
5003817

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr.-Ing. Pascal Meißner

Lecturer(s)
Prof. Dr.-Ing. Pascal Meißner

Applicability	BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
None

Recommended prerequisites for the participation in the module
None

Content
Have you ever wondered how self-service checkouts scan items, self-driving cars recognise pedestrians, computers detect skin cancer, and 3D models of iconic places like the Colosseum are scanned?

This module aims to answer these questions and many more by

- Giving an overview of the problems and approaches in computer vision, for applications as diverse as automation, robotics, medical imaging, and photogrammetry.
- Introducing the fundamentals of neural networks, required for constructing artificial systems with human-level perception capabilities.

The module spans from selecting the appropriate equipment for visual inspection tasks to image classification with convolutional neural networks and image retrieval with bag-of-visual-words models. The topics covered are:

01. introduction - nomenclature, history, state of the art, module logistics
02. image acquisition & digitisation - image sensors & representations, A/D conversion, Fourier transform
03. image enhancement - point operations, contrast adjustment, smoothing filters
04. feature extraction - edge detection, detection and description of local features
05 Segmentation and Morphology - Region growing, Hough transform, morphology operators
06. camera modelling - 3-D transformations, pinhole camera model, camera calibration
07. stereo vision - epipolar geometry, correlation methods, triangulation
08 Classification - Classifier evaluation, generalisation, nearest-neighbor, decision trees
09. ensemble methods - boosting and bagging, random forests, AdaBoost
10. neural networks - multi-layer perceptron, gradient descent, backpropagation

11. convolutional neural networks - Convolution and pooling layers, example architectures
12. bag-of-visual words - K-means clustering, TF-IDF, histogram comparison

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Colloquium

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
By the end of the module, students should be able to:

- Select appropriate camera systems and convert image representations, as well as discuss causes and avoidance of aliasing
- Implement and apply smoothing and morphology operators, edge detectors, and segmentation techniques
- Differentiate between contrast adjustment methods and compare the various approaches to detect and describe local features
- Determine and compute rigid body transformations. Specify camera models and project image and scene points.
- Determine epipolar geometries and lines. Calculate and discuss different correlation methods
- Assess and implement the various techniques for visualising and cleaning data for training classifiers
- Apply feature engineering and selection to classification tasks
- Differentiate between the quantities in the bias-variance problem and apply it to classifiers
- Assess, implement, and train neural networks and discuss their application to vision tasks

This module will be taught in English and delivered online and on campus. All sessions will be recorded. Colloquia can be done in English or German.

Literature

- Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, 4th ed. Pearson, 978-0133356724, 2017
- Learning OpenCV 3: Computer Vision in C++ with the OpenCV Library, Adrian Kaehler and Gary Bradski, O'Reilly Media, 978-1491937990, 2017
- Introduction to Machine Learning, Ethem Alpaydin, 4th ed. MIT Press, 978-0262043793, 2020

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003818
Containerization and orchestration of microservices

Module profile

Exam number
5003818

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Tristan Wimmer

Lecturer(s)
Lars Hick

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
Containerisation plays a very important role in today's enterprise software development and the cloud. In the course "Containerisation and Orchestration of Microservices", you will learn the basics of containerisation with Docker, create efficient microservice architectures and learn how Kubernetes works as an orchestration platform. From design to development and deployment, the practice-orientated course covers all aspects of microservices and enables students to prepare their knowledge for everyday working life. Through group projects and active participation, they are optimally prepared for the challenges of modern application development.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successful participation in the event, participants will be able to

- Recognise usage scenarios for Docker
- Use Docker as a developer tool
- Use Kubernetes as a container orchestration framework for application development
- Delineate, classify and design a microservice architecture

Literature
Will be announced in the course.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003806
Data Science with R

Module profile

Exam number
5003806

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Achim Wübker

Lecturer(s)
Prof. Dr. Achim Wübker

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
None

Recommended prerequisites for the participation in the module
Mathematics I+II

Content
R
1. introduction to R (R Studio, packages,...)
2. R Basics (Names and values, Vectors, Control structures, functions,...)

Data Analysis
1. read in data with R
2. data visualisation with R (packages ggplot2, tydyr, dplyr), histograms, boxplots,...

Labs: (Practical computer exercises): Read in Example Data-Files and graphical representation

3. basic data analysis with R
a. Visual Correlation Analysis
b. Effect measurements and parameter identification - Linear and Multiple Regression

Labs: Write your own book-recommendation engine in R

4. stochastic simulation
Monte Carlo Method in R with application to Measuring deviations from random pattern, Newcomb-Benford Law

Labs: Fraud detection: Read in manipulated data-file
Writing your own fraud detection programme and apply this program to the data

5. advanced data analysis with R
Face recognition with ,,eigenfaces'' based on principal component analysis with R

Labs: Writing a program to recognise you own face

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
1. the students know how to use R as a calculator for performing basic arithmetic operations.
2. the students understand fundamental programming tasks in R, including variable assignment and control structures.
3. the students apply methods to read data into R and display it graphically using various visualisation tools.
4. the students analyze data to recognize patterns both visually and analytically, enhancing their interpretative skills.
5. the students evaluate the quality of simple statistical models, assessing their fit and appropriateness for the data.
6. the students create simulated data and use Monte Carlo simulations to verify regularities experimentally or to identify underlying patterns.
7. the students implement a procedure for face recognition based on Principal Component Analysis (PCA) using Eigenfaces, demonstrating practical application of the concepts covered.

Literature
Efron, B.; Tibshirani, R.: An Introduction to the Bootstrap. Chapman & Hall/CRC, 1993. Faraway, J.: Linear Models with R. 2nd ed., Chapman & Hall/CRC, 2016.
Freedman, M.; Ross, J.: Programming Skills for Data Science. Addison-Wesley, 2019.
Matloff, M.: The Art of R Programming. No Starch Press, 2011.
Strang, G.: Introduction to Linear Algebra. 5th ed, Wellesley-Cambridge Press, 2016.
Wickham, H.: Advanced R. 2nd ed., Chapman & Hall/CRC, 2019.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003135
Design Thinking & Innovation

Module profile

Exam number
5003135

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Michael Müßig

Lecturer(s)
Lisa Straub

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
- Interest in creative but challenging problem-solving approaches
- Entrepreneurial thinking
- Willingness to rigorously put your own ideas to the test

Content
In this course, the basic principles and background of innovation management and especially design thinking are explained and illustrated with clear examples. It is particularly important to convey to the participants that today's innovation processes place people at the centre and attempt to harmonise their customer needs with technical feasibility and economic efficiency. The students are given the first tools to organise and carry out simple design thinking innovation processes independently.
They need to understand which basic elements an innovation or design thinking process is based on and how these can be skilfully run through exercises. This makes it clear in a practical way what differences there are to the classic development process and what advantages a customer-centred approach offers, but also what disadvantages are associated with the DT approach.
The course is divided into two main modules:
1. a brief introduction to innovation management
Participants will gain an insight into common innovation models and processes, as well as the background and basic concepts of innovation research.
2. learning and going through Design Thinking yourself
Design Thinking is based on an iterative, customer-centred and playful problem-solving process that makes it possible to think outside the box in order to realise or strive for the previously unconsidered, seemingly impossible, possibly illogical and unattainable. In the course of this course, participants will go through a design thinking process and develop their own ideas as a project. The course is therefore designed to be interactive, which is why a high degree of proactive participation is expected. In return, participants can expect a course full of creativity, interesting discussions and crazy ideas.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio, Presentation

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
1. students know the basic components of the design thinking process and can name them.
2. students understand the role of design thinking in the context of other innovation models and processes and can categorise them.
3. students apply methods of effective problem definition to identify relevant challenges in the innovation process.
4. students analyse the basics of user studies in the design thinking process and can explain their significance for solution development.
5. students evaluate innovation-relevant assumptions and hypotheses in order to be able to (de)construct them effectively.
6. students organise and conduct brainstorming sessions to generate creative ideas.
7. students create prototyping processes, describe them conceptually and can explain their practical application.

Literature
Wobser, Gunther (2022): Agile innovation management: overcoming dilemmas, mastering ambidexterity and achieving long-term success with innovations. Springer Gabler. 978-3662645147
Hasso Plattner Institute (A): What is Design Thinking. https://hpi-academy.de/en/design- thin- king/what-is-design-thinking.html.
Hasso Plattner Institute (B): The six steps in the Design Thinking innovation process. https://hpi.de/school-of-design-thinking/design-thinking/hintergrund/design-thinking- process.html.
Ideo: Design Thinking. https://designthinking.ideo.com/?page_id=1542.
d.School: An Introduction to Design Thinking. PROCESS GUIDE. Institute of Design at Stanford. https://dschool-old.stanford.edu/sandbox/groups/designresources/wiki/36873/ attach- ments/74b3d/ModeGuideBOOTCAMP2010L.pdf.
Brown, Tim (2009): Change by Design. How Design Thinking Transforms Organisations and Inspires Motivation. 1st edition. Harper Business. 978-006176608-4.
Lewrick, Michael; Link, Patrick; Larry, Leifer (2017): The Design Thinking Playbook. With traditional, current and future success factors. Verlag Franz Vahlen GmbH. 978-3039097050.
Uebernickel, Falk; Brenner, Walter; Pukall, Britta; Naef, Therese; Schindholzer, Bernhard (2015): Design Thinking. The handbook. 1st edition. Frankfurter Allgemeine Buch. 978-3956010651.
Wobser, Gunther: Reinventing yourself: What SMEs can learn from Silicon Valley. BESHU BOOKS. 978-3982195025

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003115
Digitization Strategy – Document Management in the SAP Environment

Module profile

Exam number
5003115

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karl Liebstückel

Lecturer(s)
Christian Fink

Applicability	BEC, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
1) SAP processes and documents - how do they interact?
2) Basic aspects of a digitisation strategy for documents with SAP technology.
3) SAP's strategy for digitising document-based processes with SAP.
4) Various practical units to apply the theory learnt in the SAP system and the SAP Business Technology Platform.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Presentation

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students know the relationship between SAP processes and documents (unstructured content).
Students will be able to explain the options for integrating documents into business processes in the SAP standard.
Students are familiar with the compliance requirements for unstructured content such as documents.
Students can set up various scenarios for the management of documents in S/4HANA and in the SAP Business Technology Platform.
Students will familiarise themselves with SAP's strategy and new technologies in document management for on-premise and cloud and will be able to set these up.

Literature
Enterprise Content Management with SAP; Christian Fink; 2019, SAP PRESS, ISBN 978-3-8362-6524-9
Business process-orientated document management with SAP; Heck, Rinaldo, ISBN: 978-3-8362-1316-5, Galileo Press
Commercial Code - HGB
Retention obligations; Dauen, Sabine; ISBN: 978-3-448-08042-1; Haufe-Mediengruppe, 2007

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003845
Emotional and Persuasive Design in E-Commerce

Module profile

Exam number
5003845

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Tobias Aubele

Lecturer(s)
Petteri Markkanen

Applicability	BIN, BWI, BEC
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
The course aims to guide students in designing and building an e-commerce website over the course, applying principles of good user experience with a particular focus on theories and strategies related to emotional and persuasive design. During the course, students test each other's projects using various methods, such as interviews and observational studies, in addition to employing analytics tools to enhance their understanding.

- Core Principles of User Experience (UX) in E-Commerce
- Theories and Strategies of Emotional Design and Their Application in E-Commerce
- Persuasive Design Methods and Their Impact on User Behaviour
- Key Concepts of User Segmentation and Targeting Strategies
- Essential Strategies for Growth and Optimisation of E-Commerce Platforms
- Practical Development, Implementation, and Iterative Improvement of E-Commerce Websites

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
After completing the course, students will have a solid foundational understanding of:

- The fundamental principles of user experience (UX) in e-commerce and their practical applications.
- Emotional Design theories and strategies, and how to effectively apply them to e-commerce websites.
- Persuasive design techniques to influence user behaviour in digital environments.
- Qualitative and quantitative research methods, such as interviews and web analytics, and how they contribute to user-cantered design.
- User segmentation and targeting strategies, allowing them to identify and reach different user groups effectively.
- Growth and optimisation strategies to enhance the performance of e-commerce platforms.
- The process of designing, implementing, and iteratively improving a fully functional e-commerce website.

Literature
Norman, D. A. (2004) Emotional Design: Why We Love (or Hate) Everyday Things. New York, NY: Basic Books.
Yocco, V. S. (2016) Design for the Mind: Seven Psychological Principles of Persuasive Design. Brooklyn, NY: Manning Publications.
Ellis, S. and Brown, M. (2017) Hacking Growth: How Today's Fastest-Growing Companies Drive Breakout Success. New York: Currency.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003846
Ethical AI Hacking

Module profile

Exam number
5003846

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Frank-Michael Schleif

Lecturer(s)
Paulius Baltrušaitis

Applicability	BIN, BWI, BEC
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Python, ML/AI basics

Content
This course provides a comprehensive understanding of Artificial Intelligence (AI) security,
with a focus on ethical hacking principles, attacks on ML models and data, and defence strategies and techniques.

Students will gain theoretical and practical knowledge of key threats such as evasion, model extraction, model inversion, data extraction, data poisoning, backdoor attacks. How to provide attacks for testing purposes and what detection and protection techniques to use and how to use them.

Machine learning models such as Linear Regression, Support Vector Regression, K-Nearest Neighbours, Logistic Regression, Support Vector Machines (SVM), Decision Trees will be used.

Red and blue team scenarios will be used for practical exercises. Each student will play a role on both sides. The course will use several different scenarios for different attacks and machine models.

There is an example of a scenario for a red and blue team exercise focused on data poisoning and detection:
The company is developing a machine learning model to predict customer churn. The red team wants to reduce the accuracy of the logistic regression model by poisoning the data with label flipping. The goal of the blue team is to detect and mitigate the attack.
Red team tasks: Analyse the data set, develop the poisoning strategy, execute the attack, document the attack. The success of the red team is measured by the degree to which they degrade the performance of the model.
Blue team tasks: Establish a baseline (train a baseline model and evaluate the model's performance), Implement detection mechanisms - use techniques such as outlier detection (e.g. Isolation Forest), Mitigate the attack, Document the defence. The Blue Team's success is measured by their ability to detect and mitigate the attack and restore the model's performance.
Both teams will be judged on the clarity and thoroughness of their documentation and presentation of their findings to the whole group

of students, showing and commenting on their Python code and explaining their strategies.
Tools for coding: Jupyter Notebook environment for Python (scikit-learn, pandas, numpy, matplotlib, seaborn), e.g. Google Colab.

By the end of the course, students will work in teams to formulate responsible AI security testing methodologies that meet ethical and legal standards. They will discuss and evaluate the ethical implications of AI vulnerabilities and develop a set of ethical guidelines for AI security and ethical hacking.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
1 Understand basic AI security concepts, ethical hacking principles, and key machine learning threats.
2 Identify and classify AI-specific attacks, including evasion, model extraction, and data poisoning.
3 Simulate red team (attacker) and blue team (defender) AI security scenarios.
4. apply ethical hacking techniques to assess and exploit vulnerabilities in AI models.
5. evaluate AI attack detection and protection strategies to improve security.
6. investigate AI security breaches and analyse countermeasures.
7. develop ethical guidelines for responsible AI security testing and vulnerability disclosure.

Literature
To be clarified while lesson

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Module: 5003825
Ethical Hacking

Module profile

Exam number
5003825

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr.-Ing. Sebastian Biedermann

Lecturer(s)
Prof. Dr. Minal Moharir

Applicability	BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Basic knowledge of Computer Networks.

Content
1 Introduction to Ethical Hacking and Vulnerability Analysis
Fundamentals of key issues in the information security world, including the basics of ethical hacking,. Different vulnerability assessment and penetration testing tools: Shodan, Nmap, Nexpose, Netcraft, privateeye, Google advanced search operators, Harvester, Burpsuite
2. social engineering and session hijacking
Social engineering concepts and techniques, including how to identify theft attempts. Case Study: Phishing attack MiM attack: Kali Linux, BettrCap, SetTool Kit, GoFish
3. hacking web servers and hacking web applications
Web server attacks, including a comprehensive attack methodology used to audit vulnerabilities in web server and web applications. web application hacking methodology, SQL Injection attack, HTTrack
4 IoT and Cloud Hacking
IoT and Cloud attacks, hacking methodology, hacking tools, IoT and cloud security techniques and tool

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Practical study achievement

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
The students gain a solid understanding of hacking concepts, techniques, and methodologies.
The students develop a strong foundation in computer and network security fundamentals.
The students acquire skills in identifying and exploiting vulnerabilities in systems.
The students learn how to conduct penetration tests and vulnerability assessments.
The students gain hands-on experience with tools like Wireshark, Metasploit, Nmap, and others.

Literature
Yaacoub JP, Noura HN, Salman O, Chehab A. A survey on ethical hacking: issues and challenges. arXiv preprint arXiv:2103.15072, 2021 Mar 28.
Berger H, Jones A. Cyber security & ethical hacking for SMEs. Proceedings of the 11th International Knowledge Management in Organisations Conference on The Changing Face of Knowledge Management Impacting Society, pp. 1-6, 2016.

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Module: 5003095
IT Risk Management

Module profile

Exam number
5003095

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Kristin Weber

Lecturer(s)
Dr. Thomas Lohre

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Basic knowledge of information systems and IT security

Content
The FWPM IT Risk Management considers the following topics
- Risk management versus IT risk management
- Standards, norms and best practice for IT risk management
- Organisational structures for IT risk management
- IT risk management process
- Methods and tools for IT risk management
- Risk management in IT operations, IT projects and IT outsourcing
- Introduction of IT risk management

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Colloquium

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the course IT Risk Management
- know the regulatory requirements for IT risk management,
- structure the process of IT risk analysis and successfully identify IT risks,
- be able to select and apply quantitative and qualitative methods for identifying and analysing risks depending on the situation,
- know how IT risks can be assessed,
- understand how standard software can be used to implement efficient IT risk management.

Literature
Literature will be announced in the first session.
Introductory source: BITKOM: IT risk and opportunity management guidelines for small and medium-sized enterprises

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Module: 5003139
Introduction in Machine Learning

Module profile

Exam number
5003139

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Magda Gregorová

Lecturer(s)
Dana Simian

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
This module introduces the core ideas and the basis techniques of machine learning. It covers theory, algorithms and applications, focusing on real understanding of the principles of inductive learning theory and of several machine learning techniques.

- Concept Learning
- Decision Tree Learning
- Bayesian Learning
- Artificial Neural Networks
- Support Vector Machines

Phyton is the programming language used in this module but prior knowledge of Python programming is not required. Students will gain all required knowledge in a step-by-step fashion, through examples.

The module complements courses on data management and data processing by teaching machine learning algorithms to analyze data.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Colloquium

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
Students will:

- develop a basic understanding of the field of machine learning and theory behind it.
- acquire theoretical knowledge about the most effective machine learning techniques.
- identify basic theoretical principles, algorithms, and applications of machine learning.
- identify and compare different solutions based on machine learning techniques.
- apply different techniques to improve the results.
- learn how to evaluate the performance of machine learning algorithms.
- gain the practical know-how needed to apply machine learning techniques to practical problems.
- know how to code a machine learning algorithm in python using machine learning library scikit-learn.
- apply machine learning techniques in developing practical projects.

Literature
Mitchel, Tom M.: Machine Learning. McGraw-Hill, 1997. http://www.cs.cmu.edu/~tom/
VanderPlas, Jake: Python Data Science Handbook. O'Reilly Media, 2022.
https://jakevdp.github.io/PythonDataScienceHandbook/ scikit-learn User Guide.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003837
Introduction to Artificial Intelligence

Module profile

Exam number
5003837

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Lecture

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Andreas Lehrmann

Lecturer(s)
Prof. Dr. Andreas Lehrmann

Applicability	BIN, BWI, BEC
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Basic knowledge in programming (Python) and mathematics (linear algebra, analysis).

Content
Over the last few years, artificial intelligence (AI) has profoundly changed the way we process information and make decisions, both in our personal and professional lives. A thorough understanding of the principles underlying AI is therefore a critical skill in many industries.

This course serves as a broad introduction to AI and its subfields. We are going to discuss - from scratch - the design, training, and operation of an AI system. Motivated by intuitive concepts and visual insights, we are going to introduce a technical framework that allows us to express the fundamental building blocks of an intelligently operating system (e.g., an autonomous robot). Such a system needs to:

- Organise task-dependent data and use this data to make predictions.
- Understand its environment by connecting sensory information to physical location.
- Interact with its environment by planning routes and manipulating objects.

The course will be accompanied by small coding projects in Python that demonstrate the application of these concepts in a series of practical scenarios.

In particular, the course covers the following topics:

[The State of AI] Historical developments, emerging trends, and open questions
[Tools & Techniques] AI-assisted productivity & creativity
[The AI Pipeline] From hard-coded rules to learned decisions
[Data] Collection, representation, and analysis of data
[Hello World] Algebraic, analytical, and statistical foundations of AI
[Supervised Learning I] Data-driven models of reality: classification and regression
[Supervised Learning II] Data-driven models of reality: model complexity and regularisation

[Unsupervised Learning] Finding patterns without annotations
[Reinforcement Learning] No data, no problem: learning actions from interactions
[From Perception to Action I] Visual AI: understanding information in images
[From Perception to Action II] Visual AI: localising information in images
[From Perception to Action III] Embodied AI: manipulating environments
[From Perception to Action IV] Embodied AI: navigating environments
[Guest Lecture] Industrial applications of AI in the automotive industry
[AI & U] Working with and contributing to the future of AI

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes

- The students understand the structure of the AI landscape, including its different subfields and how they are connected.
- They can express industry tasks as learning problems (supervised, unsupervised, reinforcement) and select an appropriate AI framework for the type of data at hand. - They are familiar with the individual components of the selected AI framework - (1) data acquisition and representation; (2) model specification and optimisation; and (3) performance evaluation and analysis - and can set up and execute this pipeline.
- The students understand the role of embodied AI and the challenges and solutions that come with it, such as perception, kinematics, and navigation.

Literature
W. Ertel: Introduction to Artificial Intelligence, Springer, 2024.
C. Bishop: Pattern Recognition and Machine Learning, Springer, 2016.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003069
Mobile Applications

Module profile

Exam number
5003069

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 50 hrs

Self-study: 100 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Peter Braun

Lecturer(s)
Prof. Dr. Peter Braun

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
Good programming skills (e.g. from Programming 1 and 2, Web Programming 1 to 3) or similar.

Recommended prerequisites for the participation in the module
none

Content
This module introduces software development of mobile devices. The Android operating system and/or iOS will be used in the course. The development environment will be Flutter on Android Studio or VS Code. Dart will be used as the programming language. No prior knowledge of Dart programming is expected, but a good understanding of other languages (e.g., Java, Python, or JavaScript) is required.

Introduction to Dart Programming
- Short Overview of Flutter: History, advantages, and architecture.
- Introduction to Dart programming language.
- Setting up the development environment.

Introduction to Flutter - Flutter GUI development
- Understanding widgets and basic UI elements.
- Understanding Stateful and Stateless widgets.
- Layout widgets: Row, Column, Stack, etc.
- Basic interaction elements: Buttons, sliders, and switches.

Navigation and State Management
- Navigation patterns: push/pop navigation, named routes.
- State management basics: setState, Provider.
- Implementing forms and user input handling.

Working with External Data
- Fetching data from the internet (APIs).
- JSON serialisation and deserialisation.
- Firebase

Integrating Device APIs like Location and Camera
- Introduction to Device APIs in Flutter.
- Implementing location services: getting and using GPS data.
- Accessing and using the camera: taking pictures and video recording.
- Permissions handling for location and camera.

Testing Advanced Features and Best Practices

- Animations and transitions.
- Using custom fonts and assets.
- Best practices in Flutter development.
- Testing Flutter Apps

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes

- The students understand the fundamentals of mobile application development using Flutter for Android and iOS, focusing on professional programming practices.
- The students apply concepts of asynchronous programming and thread management to handle complex tasks in mobile applications efficiently.
- The students analyse architecture concepts for mobile solutions, including the distribution between client and server and communication protocols for mobile devices.
- The students design mobile user interfaces based on reusable software components, ensuring an intuitive and consistent user experience.
- The students implement mobile applications that integrate sensor data evaluation and server communication, following best practices in mobile development.
- The students evaluate different mobile architecture approaches and technologies to choose the most suitable solutions for specific application requirements.
- The students create a fully functional mobile application for Android or iOS, including publishing and deployment.

Literature
Dieter Meiller: Modern App Development with Dart and Flutter 2: A comprehensive introduction to Flutter. De Gruyter Oldenbourg, 2021.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003821
Penetration Testing

Module profile

Exam number
5003821

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German/English

Organisation

Responsible lecturer
Prof. Dr.-Ing. Sebastian Biedermann

Lecturer(s)
Prof. Dr.-Ing. Sebastian Biedermann

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
Students learn about the profession of penetration tester or security researcher with the associated framework conditions and procedures. In this context, the focus is on identifying, understanding and exploiting common vulnerabilities in IT systems.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German/English

Condition for the award of credit points
None

Learning outcomes

- Students understand the job description of "penetration tester" or "security researcher" and know the process of penetration tests
- Students know popular classes of vulnerabilities in web applications and classic applications and can exploit them
- Students understand so-called post-exploitation strategies and lateral movement strategies in networks that have already been infiltrated
- Students know the legal basis and framework conditions for carrying out penetration tests
- Students can systematically evaluate potential vulnerabilities, categorise them based on standards and present them
- Students are able to develop appropriate countermeasures to close vulnerabilities

Literature

The Web Application Hacker's Handbook. Dafydd Stuttard and Marcus Pinto. 2nd ed, Wiley, 2011.
Penetration Testing: A Hands-On Introduction to Hacking. Georgia Weidman. No Starch Press, 2014.
Hacking: The Next Generation. Nitesh Dhanjani, Billy Rios, and Brett Hardin. O'Reilly Media, 2009.

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003809
Principles of Autonomous Drones

Module profile

Exam number
5003809

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Frank Deinzer

Lecturer(s)
Marcel Kyas

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
You will learn the fundamental methods for endowing aerial autonomous drones with perception, planning, and decision-making capabilities. You will learn algorithmic approaches for robot perception, localisation, and simultaneous localisation and mapping, as well as the control of non-linear systems, learning-based control, and aerial drone motion planning. You will learn methodologies for reasoning under uncertainty.

On day one, you will learn to describe the basic control loop of an autonomous robot. You will explain the basics of drone locomotion and kinematics (how drones move). On day two, you will learn to enumerate the purpose of sensors on a drone. You will explain the structure and applications of Bayesian filters. On day three, you will learn to implement a simple localisation system. On day four, you will learn to explain behavior trees as a formalism to describe drone behaviour. You will learn to define principles of planning algorithms (Dijkstra's Algorithm, A* Search, D* Search). You will apply reinforcement learning to solve drone planning problems.

You will design a simulation in Robot Operating System 2 (ROS2) for demonstrations and hands-on activities.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Colloquium

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
1. the students know the fundamental principles of motion control applied to aerial autonomous drones.
2. the students understand basic concepts of perception, distinguishing between classic approaches and deep learning methods for robot perception.
3. the students can explain principles of localisation and Simultaneous Localization and Mapping (SLAM), including their importance for autonomous navigation.
4. the students analyze navigation algorithms, focusing on planning and decision-making processes necessary for effective drone operation.
5. the students apply algorithmic approaches for robot perception, localisation, and planning in practical scenarios.
6. the students implement learning-based control techniques for aerial drones to enhance their motion planning capabilities.
7. the students utilize the Robot Operating System (ROS) in demonstrations and hands-on activities, reinforcing the theoretical concepts covered in the course.

Literature
Roland Siegwart, Illah Reza Nourbakhsh, and Davide Scaramuzza. Introduction to Autonomous Mobile Robots, second edition. 2011, The MIT Press
Sebastian Thrun, Wolfram Burgard, and Dieter Fox. Probabilistic Robotics. 2005, The MIT Press

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5002910
Project Work

Module profile

Exam number
5002910

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
4

ECTS-Credits (CP)
10.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 240 hrs

Total: 300 hrs

Teaching format
Project

Language of instruction
German/English

Organisation

Responsible lecturer
Prof. Dr. Frank Hennermann

Lecturer(s)
Prof. Dr. Frank Hennermann,
Prof. Dr. Karsten Huffstadt,
Prof. Dr. Karl Liebstückel,
Prof. Dr. Michael Müßig,
Prof. Dr. Gabriele Saueressig,
Prof. Dr. Kristin Weber,
Prof. Dr. Eva Wedlich,
Prof. Dr. Frank-Michael Schleif,
Prof. Dr. habil. Nicholas Müller

Applicability	BWI
Semester according to SPO	6. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
100 ECTS points

Recommended prerequisites for the participation in the module
none

Content
The project work is usually teamwork (at least three students). It involves either end-to-end software development according to the rules of software engineering or another task from the IT field (e.g. software comparison, software implementation, process modelling). Each project is supervised by a professor from the Faculty of Computer Science and Business Informatics. As part of the project work, learned techniques and methods of business informatics are practised in a practical professional context (teamwork, project organisation, practical tasks).
The content of the written project work is specified by the supervising professor.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
error

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German/English

Condition for the award of credit points
None

Learning outcomes
Students are able to methodically process and solve comprehensive, practical tasks in business informatics.
Students will be able to select suitable business informatics methods depending on the situation and use them effectively.
Students can develop and implement suitable solution strategies independently in a team.
They know how team processes work and how they can contribute their own personality to them.
They can document and present project procedures and results in a target group-orientated manner.

Literature
depending on the respective project work

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003844
Business Software Processes (with SAP certification TS410)

Module profile

Exam number
5003844

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karl Liebstückel

Lecturer(s)
Prof. Dr. Karl Liebstückel

Applicability	BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
As part of the FWPM, participants have the opportunity to acquire the SAP certification "TS410 SAP Certified Associate - Business Process Integration with SAP S/4HANA Edition 2023".

Topics:
SAP S/4HANA Enterprise Management
SAP Fiori UX
SAP S/4HANA Basics
Financial Accounting
Management Accounting
Human Capital Management
Purchase to Pay
Warehouse Management
Plan to Produce
Order to Cash
Project System
Enterprise Asset Management

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students know the organisational structures of an ERP system and can explain their use.
Students know the most important applications of an ERP system, can explain their use and are able to describe the most important integration aspects of the applications.
Students know the most important basic functions of an ERP system and are able to use them.
Students know the most important master data of an ERP system and are able to use it in an ERP system.
Students know the most important business transactions of a company and can apply these in an ERP system.
Students will be able to analyse user interfaces and their strengths and weaknesses.
Students know different database concepts and can analyse and evaluate them.

Literature
Sales with SAP S/4HANA by Alena Bauer, Fatjon Hoxha, Jochen Scheibler, 2018, SAP PRESS.
Liebstückel, Karl: Praxishandbuch Instandhaltung mit SAP, 6th edition, Sappress-Verlag 2023.
SAP S/4HANA Finance by Janet Salmon, Thomas Kunze, Daniela Reinelt, Petra Kuhn, Florian Roll, Christian Giera, 2nd edition 2018, SAP PRESS.
Logistics with SAP S/4HANA by Jasmin Burgdorf, Mario Destradi, Martin Kiss, Maik Schubert, 2nd edition 2019, SAP PRESS.
Materials Management with SAP S/4HANA, Business Processes and Configuration, by Jawad Akhtar, Martin Murray, 2nd edition, SAP PRESS 2020.
Alexander Wolf, Christoph Sting: Production Planning and Control with SAP S/4HANA, Sappress-Verlag 2021.
Mario Franz Project Management with SAP Project System, SAP PRESS 5th edition 2017.
Justin Ashlock: Sourcing and Procurement with SAP S/4HANA, SAPPRESS 2nd edition 2020.
Praxishandbuch SAP-Personalwirtschaft, Anja Marxsen, Christian Buckowitz, Nathalie Cuello, Sven-Olaf Möller SAP PRESS, 6th, updated and expanded edition 2016
Jörg Lange, Frank-Peter Bauer, Christoph Persich, Tim Dalm, Gunther Sanchez, Tobias Adler, Jennifer Massucci, Denis Vonscheidt: Warehouse Management mit SAP EWM, SAPPRESS, 4th edition 2019.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003067
Requirements Engineering

Module profile

Exam number
5003067

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Isabel John

Lecturer(s)
Prof. Dr. Isabel John,
Dr. Anne Heß,
Dr.-Ing. Benedikt Kämpgen

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Software Engineering /Software Development

Content
This module focuses on the crucial initial phase of the software development lifecycle, where the needs and constraints of the system are gathered, analysed, and documented. Similarly, machine learning (ML) system development projects benefit from RE. So this module covers requirements engineering techniques for traditional systems as well as for ML systems.

Basics of Requirements Engineering
Task Oriented, Goal Oriented RE
Elicitation Techniques
Analysis techniques
Specification / Modelling techniques
Validation techniques
RE in User Experience Engineering
RE Skills
Case Studies and Applications of Requirements Engineering
Requirements Engineering for machine learning systems
Requirements Engineering in the age of ChatGPT / generative artificial intelligence

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes

- Understand the importance of RE for software development
- Gain knowledge of common RE models and methods
- Ability to select and apply different requirements elicitation techniques
- Ability to analyze requirements (negotiation, prioritisation)
- Ability to model and structure requirements based on UML and other modelling techniques
- Ability to model textual Use Cases, Use Case diagrams and non functional requirements
- Ability to specify requirements using (structured) natural language (use cases, scenarios, user stories)
- Ability to validate requirements against quality criteria for requirements
- Knowledge of stakeholder analysis and ability to perform basic stakeholder analysis
- Selection and planning of appropriate RE methods for different case studies and scenarios
- RE in International projects
- Understand (and practice) relevant skills
- Understand the specialities of Requirements Engineering in machine learning context
- Ability to apply Requirements Engineering techniques for machine learning applications
- Ability to adapt Requirements Engineering techniques for generative artificial intelligence based systems

Literature

Cockburn, Writing Effective Use Cases, Addison Wesley
Hull, Requirements engineering, Springer Verlag
Berenbach, Software & Systems Requirements Engineering: In Practice, McGraw Hill
Chris Rupp & die SOPHISTen , Requirements Engineering (in German), Hanser
Huyen, Chip. Designing machine learning systems. " O'Reilly Media, Inc.", 2022.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003841
SemML: Seminar on Machine Learning

Module profile

Exam number
5003841

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Dominik Seuß

Lecturer(s)
Prof. Dr. Dominik Seuß

Applicability	BIN, BWI, BEC
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
In this seminar, students are given the opportunity to deal individually with various aspects of machine learning. From a selection of topics, they choose those that correspond to their interests and strengths. The topics range from programming tasks to theoretical questions.

At the beginning of the semester, basic knowledge of machine learning is taught, which is then deepened and expanded by the students in the form of presentations. Current approaches in various disciplines such as computer vision are covered. In addition to the technical discussion, great emphasis is placed on the development of soft skills.

The basics of presentations are introduced in order to prepare students for the presentation of their topics. The aim is to train not only subject-specific knowledge, but also presentation and communication skills.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Multimedia presentation

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Specialist specialisation:
- Acquisition of basic knowledge in the field of machine learning
- Specialisation in a selected topic from a variety of current disciplines, such as computer vision
- Understanding of modern approaches and methods in machine learning, both on a theoretical and practical level

Methodological competences:
- Ability to familiarise oneself independently with machine learning topics
- Development and structuring of scientific presentations
- Critical analysis of current research results and approaches

Social and communication skills:
- Confident and goal-oriented presentation in front of a group
- Communicating complex content in an understandable way
- Receiving and integrating feedback to improve your own performance

Personal development:
- Developing skills to communicate technical content clearly and effectively
- Training self-confidence in dealing with scientific topics and discussions

Literature
Depending on the selected topic

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003810
Software Testing

Module profile

Exam number
5003810

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Peter Braun

Lecturer(s)
Pascal Moll

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
None

Recommended prerequisites for the participation in the module
Programming I, Programming II, Programming project/software development project

Content
This module deals with different types of tests and their application in software development. The SOLID principles and the 4-layer concept for test architectures are taught. It also covers the automated testing of interfaces and APIs as well as the use of mocking. Another focus is on behaviour-driven development with Cucumber. Exploratory testing and the integration of automated tests into a DevOps life cycle are also discussed. The module includes practical content for which a virtual machine is provided. The prerequisite for this is the installation of VirtualBox.

- Fundamentals of testing (test coverage, test paths, black box, white box, grey box, functional and non-functional tests, test pyramid)
- Test automation (goals, success factors, differences between different types, test framework JUnit, annotations, assertions, exception testing, parameterisation, test types, record replay, scripted testing, keyword-driven testing)
- Test architecture (SOLID principles, 4-layer concept, test modelling layer, test definition, test execution, test adaptation, interfaces, design and development, important design patterns for testing)
- Testing of graphical user interfaces (introduction to Selenium, drivers, PageObject patterns, identifiers, waits, cookies)
- Mocking (Wiremock)
- Behaviour Driven Development (Feature Files & Step Files, Cucumber & Gherkin, Parameters, Data Tables, Scenario Outlines and Background, Runner Classes)
- Exploratory testing (methods and techniques)
- Build Server (Jenkins basics & DevOps basics, gPipelines, DevOps process from a testing perspective)

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes

- Students can select and define test objectives for software
- Students can select suitable test types for the test objectives
- Students can translate test types into automated tests
- Students can select and apply design patterns for testing
- Students understand Behaviour Driven Development
- Students can set up and configure a build server for testing

Literature
Essentials of Software Testing by Ralf Bierig, Stephen Brown, Edgar Galván, Joe Timoney, 2021, Cambridge University Press

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 100002
Usability for Engineers and Computer Scientists

Module profile

Exam number
100002

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 0 hrs

Self-study: 150 hrs

Total: 150 hrs

Teaching format
Lecture

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Isabel John

Lecturer(s)

Applicability	BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=18586,81,816,1

Recommended prerequisites for the participation in the module
none

Content
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=18586,81,816,1
In our highly technical and networked world, the usability of products, services and interactive systems is becoming an increasingly important feature for users and users on the one hand and a competitive advantage for manufacturers on the other. With a comparable range of functions, many products are being offered at increasingly favourable prices in global competition. The user has a choice and will opt for the advantages of a product that has been tested and optimised for usability and user experience. By using usability engineering methods, manufacturers can meet these requirements and develop unique selling points for their products. Usability and user experience objectives should therefore be considered as early as possible in the development process and implemented using suitable methods, among other things to avoid costly misdevelopments and increase the benefits for customers. Prospective engineers and computer scientists must be able to recognise this problem and know in which phases of product development suitable methods are used.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=18586,81,816,1
Naming the content of the analysis phase in usability engineering.

- Independent application of analysis methods and techniques of usability engineering
- Application-specific identification of relevant parts of the DIN/ISO 9241 series of standards
- Describe and apply terms (usability) and principles (dialogue design)
- Describe and apply a process for designing usable interactive systems
- Describe the essential aspects of cognitive psychology and industrial psychology
- Identify and name criteria for evaluating colour design in order to identify and name associated usability problems.
- Describe fundamental aspects of contrasts and their use in design.
- Recognise in which development phases design laws must be observed and how these simple laws help to identify usability problems
- Apply design laws in a targeted manner in the context of usability evaluations
- Describe the typical procedure in interface and interaction design.
- Name different types of prototypes and describe their function in usability engineering
- Describe and apply usability metrics from the areas of \"Usability Performance Metrics\" and \"Usability Issue based Metrics\".

Literature
see course

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5005203
Business Intelligence

Module profile

Exam number
5005203

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Frank-Michael Schleif

Lecturer(s)
Prof. Dr. Frank-Michael Schleif

Applicability	BWI
Semester according to SPO	6. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
120 ECTS credits, course 5002530

Recommended prerequisites for the participation in the module
Databases, Programming I, basic maths knowledge

Content
The module is largely replaced by the VHB course Business Intelligence and Reporting
course. In addition to the VHB course, 2-3 dedicated courses on BI are offered
(from the spectrum of the original BI module, see description below)

- as well as an enrichment lecture, probably in June 2025.

- -

The aim of the module is to use a blended learning concept with Moodle as a platform, new approaches from the data science and Business Intelligence field for data collection, pre-processing, prediction models and data visualisation.

The knowledge imparted is worked on and tested in demo projects. Various learning methods and knowledge transfer techniques are used,
which take particular account of individual prior knowledge.

The course allows participants to follow the main content, deepen individual topics or fill any gaps in their knowledge by gaps in knowledge through more intensive work on additional material.

Module content:

- Refreshing minimally necessary mathematical concepts (statistical measures, matrix calculation, eigenvalue analysis)
- Introduction to data analysis tools (focus: KNIME)
- Opportunities, limits and risks of data analysis / data science
- Mathematical foundations of data science
- Data pre-processing and cleaning
- Models, modelling, evaluation methods
- Unsupervised and supervised learning
- Data visualisation
- Enrichment topics (expected)
- External industry contribution to data analysis
- Deep learning and neural networks

- Further topics according to the interests / prior knowledge of the participants

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- analyse data analysis issues in companies and develop a conceptual solution
- model and implement data analysis projects in KNIME
- Participants will be able to evaluate and compare alternative solutions

and understand the specifics of the respective methods

- participants are able to present the results of a data analysis
- students are aware of the limits and possibilities of data analysis

and have developed a self-critical understanding

Literature

- The Data Science Design Manual, Steven Skiena, Springer International Publishing, 2017
- The Elements of Statistical Learning, Trevor Hastie, Springer, 2009
- Python Data Science Handbook, Jake VanderPlas, O'Reilly Media, 2016
- Deep Learning, I. Goodfellow, The MIT Press, 2016
- Further literature as required

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5107203
Computer Graphics

Module profile

Exam number
5107203

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 50 hrs

Self-study: 100 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Frank Deinzer

Lecturer(s)
Prof. Dr. Frank Deinzer

Applicability	BIN, BWI
Semester according to SPO	6. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
120 ECTS credits,, Course 5X02530

Recommended prerequisites for the participation in the module
Linear algebra, knowledge of C++

Content
Theoretical topics
- Mathematical basics of computer graphics
- Fundamentals of physically motivated lighting
- Ray tracing

Algorithmic topics
- Overview of basic computer graphics algorithms
- Lighting
- Texturing
- Shadows
- Volume rendering

Practice orientated topics
- Computer graphics with OpenGL
- Realisation of ray tracing
- Shader programming

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Colloquium

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students expand and deepen their knowledge of computer graphics and acquire the skills to analyse and structure complex tasks.
Students understand tasks in the field of computer graphics, analyse them and develop solutions.
Students apply their knowledge in practice within the scope of their tasks.
Students realise high-performance computer graphics applications.
Students understand the mathematical principles of computer graphics.

Literature
Foley, van Dam, Feiner: Fundamentals of Computer Graphics. Introduction, concepts, methods. Addison Wesley Publishers, 1999
Zeppenfeld, K.: Textbook of graphics programming: basics, programming, application. Spektrum Akademischer Verlag, 2003
Peter Shirley: Fundamentals of Computer Graphics. AK Peters LTD, 3rd edition, 2009
Hearn, Baker, Carithers: Computer Graphics with OpenGL. Prentice Hall, 4th edition, 2010
Matt Pharr, Greg Humphreys: Physically Based Rendering, Second Edition: From Theory To Implementation, Morgan Kaufmann, 2010

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5007211
Mobile and Ubiquitous Concepts and Development

Module profile

Exam number
5007211

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karsten Huffstadt

Lecturer(s)
Prof. Dr. Karsten Huffstadt

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
120 ECTS credits, course 5002530 or 5102530 or 6102410

Recommended prerequisites for the participation in the module
none

Content
In this module, students gain an in-depth insight into mobile application scenarios and business models.
They gain the necessary knowledge of operating platforms and architecture concepts for mobile business applications.
Integration aspects (ERP integration) of mobile solutions and communication paradigms (SOA, REST, SOCKETS) are also covered.
Another important point is the development using cross-platform development (HTML5).

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Students can describe, implement and analyse mobile solutions and their development platforms.
- They will be able to assess investment decisions based on business model developments.
- Students will be able to develop integration concepts for mobile solutions.

Literature
Literature will be announced in the lecture

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5004201
Business Software Processes

Module profile

Exam number
5004201

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karl Liebstückel

Lecturer(s)
Prof. Dr. Karl Liebstückel

Applicability	BWI
Semester according to SPO	6. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
Course Practical module; 120 ECTS credits

Recommended prerequisites for the participation in the module
Business Software, Logistics, Accounting, Business Technologies

Content
SAP S/4HANA Enterprise Management
SAP Fiori UX
SAP S/4HANA Basics
Financial Accounting
Management Accounting
Human Capital Management
Purchase to Pay
Warehouse Management
Plan to Produce
Order to Cash
Project System
Enterprise Asset Management

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students know the organisational structures of an ERP system and can explain their use.
Students know the most important applications of an ERP system, can explain their use and are able to describe the most important integration aspects of the applications.
Students know the most important basic functions of an ERP system and are able to use them.
Students know the most important master data of an ERP system and are able to use it in an ERP system.
Students know the most important business transactions of a company and can apply these in an ERP system.
Students will be able to analyse user interfaces and their strengths and weaknesses.
Students know different database concepts and can analyse and evaluate them.

Literature
Sales with SAP S/4HANA by Alena Bauer, Fatjon Hoxha, Jochen Scheibler, 2018, SAP PRESS.
Liebstückel, Karl: Praxishandbuch Instandhaltung mit SAP, 6th edition, Sappress-Verlag 2023.
SAP S/4HANA Finance by Janet Salmon, Thomas Kunze, Daniela Reinelt, Petra Kuhn, Florian Roll, Christian Giera, 2nd edition 2018, SAP PRESS.
Logistics with SAP S/4HANA by Jasmin Burgdorf, Mario Destradi, Martin Kiss, Maik Schubert, 2nd edition 2019, SAP PRESS.
Materials Management with SAP S/4HANA, Business Processes and Configuration, by Jawad Akhtar, Martin Murray, 2nd edition, SAP PRESS 2020.
Alexander Wolf, Christoph Sting: Production Planning and Control with SAP S/4HANA, Sappress-Verlag 2021.
Mario Franz Project Management with SAP Project System, SAP PRESS 5th edition 2017.
Justin Ashlock: Sourcing and Procurement with SAP S/4HANA, SAPPRESS 2nd edition 2020.
Praxishandbuch SAP-Personalwirtschaft, Anja Marxsen, Christian Buckowitz, Nathalie Cuello, Sven-Olaf Möller SAP PRESS, 6th, updated and expanded edition 2016
Jörg Lange, Frank-Peter Bauer, Christoph Persich, Tim Dalm, Gunther Sanchez, Tobias Adler, Jennifer Massucci, Denis Vonscheidt: Warehouse Management mit SAP EWM, SAPPRESS, 4th edition 2019.

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5004100
Seminar Business Software

Module profile

Exam number
5004100

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 40 hrs

Self-study: 110 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Eva Wedlich

Lecturer(s)
Prof. Dr. Karl Liebstückel

Applicability	BWI
Semester according to SPO	6. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
Course Practical module; 120 ECTS credits

Recommended prerequisites for the participation in the module
Business Software

Content
At the beginning of the seminar, topics relating to SAP S/4HANA, SAP Solution Manager, SAP Business ByDesign, ProAlpha or similar business software systems are assigned.
The participants prepare an elaboration on this topic and design exercises for all seminar participants. The developed solution is presented in the seminar and discussed with sufficient time.
The participants are given ample opportunity to reproduce the topic presented using the exercises designed by the organisers.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Term paper, Colloquium

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students can familiarise themselves independently with a new topic and plan the aspects to be presented.
Students know the organisational structures for their topic and are able to explain them.
Students know the master data for their topic and are able to apply it.
Students know the business processes for their topic and are able to apply them.

Literature
It is part of the character of a seminar that the participants search for the literature required for the seminar work themselves.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5005100
Seminar Business Technologies

Module profile

Exam number
5005100

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 40 hrs

Self-study: 110 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Gabriele Saueressig

Lecturer(s)
Prof. Dr. Gabriele Saueressig,
Prof. Dr. Frank-Michael Schleif

Applicability	BWI
Semester according to SPO	6. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
120 ECTS credits, course 5002530

Recommended prerequisites for the participation in the module
none

Content
Seminar content:

- Various current topics from the areas of Business Intelligence and Business Process Management will be covered
- Scientific work including literature research and methodological tips for writing a seminar paper
- A seminar paper will be written and presented on the assigned topic by the student or in a team of two students

The seminar papers should provide an overview of selected concepts, software architectures, processes, methods or technologies or technologies and, if applicable, their implementation in software systems.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Term paper, Multimedia presentation

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- understand and apply specific issues, methods and techniques in the field of business intelligence and business process management
- work independently on a given specialised topic, process it in a technically correct manner and present it both orally and in writing in a scientific form
- present the contents of their own topic in a manner appropriate to the target audience

Subject-related competences:

- Students expand and deepen their knowledge of specific problems in the subject areas of "Business Intelligence" (BI) and "Business Process Management" (BPM).
- Based on a specific topic, students learn to describe the underlying problem and to identify solutions using modern technologies in the BI and BPM environment.
- By working on their own topic and discussing the other topics in the seminar, students learn to recognise and evaluate current issues.
- students learn to select suitable methods for solving subject-specific problems and apply them to a specific example situation
- students learn to independently acquire and apply the specialised knowledge required to work on the seminar topic
- they acquire the skills to recognise significant technical developments and test them in practice using the seminar topics from BI and BPM as examples
- students analyse various practical tasks, learn about application examples and the appropriate IT support for them

Interdisciplinary competences:

- Skills for the comprehensible presentation and documentation of scientific findings are learnt and applied in practice (preparation of the seminar paper and presentation of the results in the seminar)
- Students learn to discuss their own and other seminar topics in the critical discourse of the seminar
- Students learn about and apply essential concepts for academic work (literature research, rules for text typesetting, citation, structure of an academic paper, etc.)
- acquire new and advanced skills in the effective use of typesetting systems, literature research and presentation tools

Key qualifications:

- students learn to familiarise themselves in depth with a subject-specific but unfamiliar topic and to make the content accessible
- students deepen their skills in presenting new, subject-specific content and are able to document and communicate the material they have developed and apply it in an exemplary or prototypical manner

Literature
The literature relevant to the specific seminar topic will be announced in the seminar.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5107100
Seminar Media Computer Science

Module profile

Exam number
5107100

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 40 hrs

Self-study: 110 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Frank Deinzer

Lecturer(s)
Prof. Dr. Arndt Balzer

Applicability	BIN, BWI
Semester according to SPO	6. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
120 ECTS credits, course 5X02530

Recommended prerequisites for the participation in the module
none

Content
Contents: The specific seminar topics will be announced at the beginning of the semester.

The seminar topics always cover areas such as audio processing and synthesis, image processing, computer vision, signal processing or sensor data fusion methods.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Multimedia presentation, Colloquium

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Ability to formulate complex problems

- Students describe and solve problems from the area of the seminar.
- Students apply the necessary basics of computer science and mathematics to work through the seminar topics.

Selection and safe application of suitable methods

- Within the scope of their tasks, students select methods they have learnt and acquire additional confidence in their application

Knowledge of practically relevant tasks

- Students understand the techniques and methods used in the seminar as part of their assignment.

Ability to present and document results in a comprehensible manner

- Students present and demonstrate their results in the seminar.
- Students generalise their ability to expand existing knowledge independently: Students understand and explain content and apply this to deepen and expand content independently.

Expertise in recognising significant technical developments

- The seminar topics deal with current and future-oriented technologies and methods. Students understand and discuss the state of the art.

Literature
Will be announced in the seminar

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5007110
Seminar Mobile and Ubiquitous Solutions

Module profile

Exam number
5007110

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karsten Huffstadt

Lecturer(s)
Prof. Dr. Karsten Huffstadt,
Prof. Dr. Isabel John

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
120 ECTS credits, course 5X02530

Recommended prerequisites for the participation in the module
none

Content
- In the in-depth seminar, scientific questions are identified and empirically analysed in the context of overarching topics from the fields of mobility, AR, VR and ubiquitous computing.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Students in the specialisation seminar are enabled to carry out a scientific investigation.
- They will analyse the current state of research and evaluate their own research results.
- They should also be able to deal with, analyse and classify English-language literature.
- Finally, they will be able to develop their own conclusions from the results, understand and categorise questions posed by other students and document the need for further research.

Literature
Literature will be announced in the lecture

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6322200
Virtual Reality

Module profile

Exam number
6322200

Duration
1 semester

Frequency
Every summer semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction, Exercise

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Mark Vetter

Lecturer(s)
Stefan Sauer

Applicability	BEC, BIN, BWI
Semester according to SPO	6. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
The event is organised by the Faculty of Polymer Engineering and Surveying (FKV):
(https://geo.thws.de/studium/bachelor-geovisualisierung/studienablauf/modulhandbuch-bgv-ab-ws-202223/?tx_fhwsmodule_fe%5Bmodul%5D=2026&tx_fhwsmodule_fe%5Baction%5D=show&tx_fhwsmodule_fe%5Bcontroller%5D=Modul&cHash=8af82bbabaa82a62a346795d4cba76ed)

The lecture will be held as an online event in 2025ss. Date expected Wednesday 08:15 - 09:45 (lecture) and 13:30 - 16:00 (exercise)

- Creation of 3D models for transfer to game engines
- Dealing with game engines
- Rendering pipeline
- Integration of VR functionalities in game engines
- Creation of fully functional 3D models in game engines
- Realisation of virtual tours

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After participating in the module, students can independently plan, realise and set up VR applications or publish them using appropriate services.

Game engines are used to create VR environments. Students therefore learn the basics of importing and operating geodata in game engines, as well as the settings for rendering and preparing the data for VR applications, including programming controllers and the interface to VR glasses.

Literature
Akenine-Möller, T.; Haines, E.; Hoffman, N.; Pesce, A.; Iwanicki, M.; Hillaire, S.: Real-Time Rendering, 2018, 4th edition, Milton: Chapman and Hall/CRC, London, ISBN: 9781138627000 Edler, D.; Husar, A.; Keil, J.; Vetter, M. & Dickmann, F.: Virtual Reality (VR) and Open Source Software: A Workflow for Constructing an Interactive Cartographic VR Environment to Explore Urban Landscapes, 2018. In: Kartographische Nachrichten, Journal of Cartography and Geographic Information, 68(1), p. 5-13, ISSN: 2524-4965
Edler, D.; Kühne, O.; Jenal, C.; Vetter, M.; Dickmann, F.: Potentials of spatial visualisation in virtual reality (VR) for social constructivist landscape research, 2018. In: Kartographische Nachrichten, Journal of Cartography and Geographic Information, 68(5), p. 245-254, ISSN: 2524-4965
Vetter, M.: Technical Potentials for the Visualisation in Virtual Reality, 2020. in D. Edler, C. Jenal, & O. Kühne (Eds.), Modern Approaches to the Visualisation of Landscapes, 2020, Wiesbaden: Springer VS, ISBN: 978-3-658-30956-5

7. semester

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003028
ABAP/4 Development Workbench

Module profile

Exam number
5003028

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karl Liebstückel

Lecturer(s)
Martin Espenschied

Applicability	BIN, BWI, BEC
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
Basics of programming with ABAP
- Overview of the ABAP programming language
- Creating and testing an ABAP report
- Output statements
- Programme data - types and variables
- Multilingualism - Text elements
- Reading database tables
- Control statements
- Programme data - field strings and internal tables
- Modularisation through function blocks and classes

Dialogue programming
- Dialogue programs from the developer's perspective
- Developing a simple dialogue program
- The graphical elements of a screen
- Transferring definitions from the data dictionary
- The Menu Painter
- Dynamic screen sequence
- Field input checks/messages
- Dynamic screen modifications
- Database changes and locks

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students are familiar with the architecture and use of the ABAP/4 Development Workbench.
They can create simple programmes and use SAP-specific instructions. They can analyse and rectify errors. They can create function modules and classes and design interfaces

Literature
ABAP Development for SAP S/4HANA by Constantin-Catalin Chiuaru, Sebastian Freilinger- Huber, Timo Stark, Tobias Trapp, Rheinwerk-Verlag, 2nd edition, Bonn 2021.
ABAP - Das umfassende Handbuch by Felix Roth, Rheinwerk-Verlag, 3rd edition, Bonn 2023.
Agile ABAP Development by Winfried Schwarzmann, Rheinwerk-Verlag, Bonn 2018.
BOPF - Developing Business Objects with ABAP by Felix Roth, Stefan Stöhr, Rheinwerk-Verlag, Bonn 2017.

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003850
AI and Security

Module profile

Exam number
5003850

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Benjamin Weggenmann

Lecturer(s)
Prof. Dr. Benjamin Weggenmann

Applicability	BIN, BWI, BEC
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Linear Algebra

Content
In this module, students learn about the basic concepts and methods of artificial intelligence (AI) and specifically apply them to information security issues.
First, various classification strategies -- such as Naive Bayes or neural networks -- are introduced, and their possible applications in a security context are explained. In practical exercises, students develop and train their own models, e.g. for the automated detection of phishing emails or attacks in network traffic.
Another component of the module is the critical examination of the use of AI by attackers.
Here, application scenarios are discussed in which AI is used to improve digital attacks, for example to optimize social engineering strategies or to generate deceptively authentic content.
Finally, students deal with issues concerning the security and privacy of AI systems themselves.
Among other things, forms of attack such as data poisoning, adversarial examples, and backdoors are discussed, which can be used specifically to manipulate AI models.
The aim of the module is to develop a sound understanding of the responsible and security-conscious use of AI in cybersecurity.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes

- Students know the basics of artificial intelligence and at least two classification strategies (e.g., Naive Bayes Classifier, neural networks).
- Students can analyse a given application scenario and accordingly select and use suitable models (e.g., using Python).
- Students can train their own models with suitable data (incl. pre-processing) and evaluate the results.
- Students recall various scenarios in the field of information security in which AI models are already being used successfully and understand how.
- Students understand the fundamental security-related problems of AI models. They can apply corresponding attacks and basic defences.

Literature

Introduction to Artificial Intelligence (3rd edition), Wolfgang Ertel, 2025
Machine Learning and Security: Protecting Systems with Data and Algorithms, Clarence Chio and David Freeman, O'Reilly 2018
Machine Learning for Hackers, Drew Conway, 2012
Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurélien Géron, 2022

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003180
Advanced Database Techniques

Module profile

Exam number
5003180

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Peter Braun

Lecturer(s)
Michael Rott

Applicability	BIN, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Databases, Databases I, Backend Systems

Content
As part of this module, students acquire practical and interdisciplinary skills in the field of modern database management. The content taught is designed to combine technological fundamentals with current requirements from practice and research.

The following aspects are covered in particular:

- In-depth examination of the CAP theorem, taking into account real distributed database systems.
- Systematic selection of suitable database management systems (DBMS) on the basis of concrete application scenarios. This includes both relational (e.g. PostgreSQL, MySQL, SQL Server, Oracle) and non-relational systems (e.g. MongoDB, Redis, Riak).
- Use of a data modelling tool (e.g. erwin Data Modeler) to create conceptual and physical data models.
- Use and evaluation of monitoring and performance tools, in particular with regard to load distribution, system monitoring and analysis of query execution plans.
- Investigating different fragmentation strategies for the efficient storage and management of large amounts of data in distributed database systems.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Students recognise basic concepts, terms and architectures of relational database systems.
- Students understand the structure and functionality of various database management systems (DBMS).
- Students apply relational modelling techniques to create conceptual data models (e.g. ER diagrams).
- Students analyse requirements for database systems in order to select suitable technical solutions.
- Students evaluate simple database designs with regard to freedom from redundancy, normalisation and performance.
- Students create relational database schemas using suitable modelling and implementation tools.

Literature

Kofler, Michael: Datenbanksysteme - Das umfassende Lehrbuch; 2nd edition; Rheinwerk Verlag; Bonn, 2024
Heuer, Andreas; Saake, Gunter: Databases - Concepts and Languages; 6th ed.; MITP-Verlag; Bonn, 2018
Rahm, Saale, Sattler: Distributed and Parallel Data Management; Springer Vieweg; Berlin Heidelberg, 2015

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003123
Agile Enterprise - Agile Methods in Practice

Module profile

Exam number
5003123

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Isabel John

Lecturer(s)
Christoph Schüll,
Christian Dewein

Applicability	BEC, BIN, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Basic knowledge of IT project management, IT process models

Content
- Agile values & principles
- Scrum, Kanban and XP
- Agile estimating, planning and reporting
- Setting up agile IT projects
- Continuous integration, delivery and deployment
- DevOps basics
- Scaling Agile
- Communication & leadership

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Students can identify the prerequisites of current agile concepts based on different company models, explain their practical effects and assess key success factors in their application.
- Students can confidently name terms and methods of agile concepts, explain their meaning, apply them to specific situations and differentiate between different approaches.
- Students can explain agile values and principles, analyse their relevance in typical project situations and critically evaluate typical conflicts and contextual factors.
- Students can plan and apply Scrum and related agile methods in a project context, orchestrate their process components and formulate and evaluate the effects on results.
- Students can implement DevOps practices in development, plan and execute continuous integration, delivery and deployment in the project and critically assess efficiency, quality and risk.

Literature

Extract from recommended literature on the topics:

- Mike Cohn: Agile Estimating and Planning.2005, Prentice Hall
- Ken Schwaber: Agile Project Management with Scrum.2004, Microsoft Professional
- Mike Cohn: User Stories applied.2010, MITP
- Boris Gloger: Scrum. 2016, Hanser
- Fritz B. Simons: Introduction to systems theory and constructivism.
- Paul Watzlawick, Janet H Beavin: Human Communication: Forms, Disorders, Paradoxes.
- Friedemann Schulz von Thun: Talking to each other 1: Disruptions and clarifications: General psychology of communication.
- T. Groth, G.P.Krejci. S.Günther: New Organising

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003847
Algorithms for Distributed Systems

Module profile

Exam number
5003847

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr.-Ing. Erik Schaffernicht

Lecturer(s)
Prof. Dr.-Ing. Erik Schaffernicht

Applicability	BIN, BWI, BEC
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Courses on computer networks and communication (e.g. internet communication, backend systems), algorithms and data structures, operating system basics

Content

Introduction/recap regarding of communication models for distributed systems
- Remote procedure calls
- Blackboards and Event-based models

Fundamentals for distributed algorithms
- differences between algorithms in distributed systems, parallel algorithms and single machine algorithms
- consensus problems
- failure models
- physical clocks and logical clocks

Algorithms for
- coordination
- leader election
- searching
- failure tolerance / failure handling
- consistent data replication

The course will be given in English.
The course is programming language agnostic, students can choose their preferred languages to implement seminar assignments.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
none

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
none

Learning outcomes
After completing the course students are able to

- understand the capabilities and limitations of distributed systems,
- explain different failure models,
- utilise remote procedure call frameworks to program in distributed systems,
- design and implement solutions to common problems in distributed systems,
- choose algorithms to handle conflicts and failures in distributed systems,
- discuss the major challenges in distributed systems both in general and for specific tasks,
- compare different algorithmic solutions to common problems in distributed systems and discuss potential trade-offs

Literature
M. van Steen and A.S. Tanenbaum, Distributed Systems, 4th ed., 2023
Additional specific reading recommendations will be provided during the course

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003828
Automotive and Industrial Cybersecurity

Module profile

Exam number
5003828

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German/English

Organisation

Responsible lecturer
Prof. Dr.-Ing. Sebastian Biedermann

Lecturer(s)
Dr.-Ing. Rodrigo Daniel do Carmo

Applicability	BEC, BIN, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
Part I: Automotive Cybersecurity

Introduction to Automotive Cybersecurity
- Architecture of Modern Vehicles
- Cybersecurity Challenges of Modern Vehicles and E/E Architectures

Legislation and Standardisation for Cybersecurity in the Automotive Industry
- Introduction to Automotive Cybersecurity Regulations and Standards: UN ECE WP.29 and the UN Regulations No. 155 and 156, Vehicle Type Approval, Overview of Global and European Approach
- Introduction to the International Standard ISO/SAE 21434
- Related and Upcoming Standards

Automotive Threat Analysis and Risk Assessment (TARA) According to ISO/SAE 21434
- Introduction to Risk Management and TARA
- Scope of a TARA, Attacker Model, Item Definition
- Asset Identification (Typical Assets for Automotive Embedded Systems)
- Cybersecurity Properties (CIA Triad and Other Properties)
- Definition of Damage Scenarios
- Identifying Threats: Overview of Threat Modelling, STRIDE, Brainstorming, MITRE ATT&CK, OWASP
- Definition of Attack Paths: Identification and Description of Attack Paths, Attack Trees, Vulnerabilities
- Attack Feasibility Evaluation
- Risk Evaluation
- Risk Treatment Decision: Cybersecurity Goals
- Cybersecurity Claims, Typical Controls for Automotive Embedded Systems

Part II: Industrial Cybersecurity

Introduction to Industrial Networks and Control Systems
- Industrial Security, Basic Process Control Systems, Differences Between IT and OT Systems

- Components and Architecture of Industrial Control Systems: Field Devices, Programmable Logic Controllers, Distributed Control Systems, Supervisory Control and Data Acquisition (SCADA) Systems, Network Transmission Media, Field Device Architecture, Industrial Network Protocols, Enterprise Network Protocols, Industrial Safety and Protection Systems, Safety Instrument Systems (SIS), OT/IT Network Integration, Purdue Reference Model

Industrial Cybersecurity and Secure OT Architectures

- Introduction to Cybersecurity Challenges in the Modern Industry (Industry 4.0): Examples of Attacks, MITRE ATT&CK Database, SHODAN
- Overview of Relevant EU Cybersecurity Regulations: NIS2, Cyber Resilience Act (CRA), Regulation on Machinery, Radio Equipment Directive (RED)
- Secure OT Architecture: Boundary protection, Firewalls, Industrial Demilitarised Zone, Proxies, Network Zoning, Data Diode, Zero Trust Architecture (ZTA)

The International Standard IEC 62443

- Overview of the International Standard ISA/IEC 62443
- Basic Terminology
- Security of Industrial Networks: Security Programme, The Automation Solution Security Lifecycle, Security Levels and Maturity Levels, Security Objectives and Foundational Requirements, Defense-in-Depth Principle, Threat-Risk Assessment, Security Zones and Conduits
- Security of Products: Risk-based Approach and Relation to Cyber Resilience Act, Security Levels and Functional Requirements, Secure Development Lifecycle

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Practical study achievement

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German/English

Condition for the award of credit points
None

Learning outcomes

- Students understand the architecture and cybersecurity challenges of modern vehicles, including the basics of E/E architectures.
- Students know the essentials of risk management and threat modelling, including terminology, standards, and methods for conducting threat analysis and risk assessment (TARA) in both automotive and industrial contexts.
- Students know fundamental cybersecurity protection concepts for industrial control systems (ICS), understand the differences between OT and IT, understand terminology and concepts of the IEC 62443 standard, and are aware of relevant guidelines and new European regulations.
- Students are capable of performing comprehensive threat analysis and risk assessment (TARA) for automotive systems and industrial/operational technology (OT) environments, identifying vulnerabilities, and evaluating risks.
- Students are able to manage and develop the work products of automotive development projects in accordance with the international standard ISO/SAE 21434.
- Students can design and implement secure network architectures for industrial systems, applying principles such as zoning, Zero Trust, and Defence-in-Depth.
- Develop analytical, structured, and logical thinking skills to systematically evaluate and address cybersecurity challenges in both automotive and industrial contexts.
- Enhance abstraction skills to understand and apply complex cybersecurity concepts, standards, and risk management techniques.

Literature

- N. Ferguson, B. Schneier, T. Kohno, "Cryptography Engineering - Design Principles and Practical Applications", Wiley, 2010
- C. Paar, J. Pelzl, "Understanding Cryptography - A Textbook for Students and Practitioners", Springer, 2010
- M. Rosulek, "The Joy of Cryptography", 2021. URL: https://joyofcryptography.com
- L. Van Houtven, "Crypto 101", 2013. URL: https://www.crypto101.io
- C. Smith, "The Car Hacker's Handbook: A Guide for the Penetration Tester", 1st edn. No Starch Press, San Francisco, 2016
- M. Wurm, "Automotive Cybersecurity: Security Building Blocks for Automotive Embedded Systems", Springer Berlin Heidelberg, Berlin, Heidelberg, 2022
- A. Shostack, "Threat Modelling: Designing for Security", 1st edn. Wiley Publishing, 2014
- ISO/SAE 21434:2021, "Road vehicles - Cybersecurity engineering", International Standard
- R. do Carmo, A. Schlensog, "Automotive Threat Analysis and Risk Assessment in Practice", Springer, 2024
- IEC 62443 International Series of Standards (Parts 1-1 to 4-2)
- The MITRE Corporation, MITRE ATT&CK®. URL https://attack.mitre.org/
- OWASP Foundation, "OWASP Top Ten". URL https://owasp.org/www-project-top-ten/

- C. Brooks, P. Craig, "Practical Industrial Cybersecurity - ICS, Industry 4.0, and IIoT", Wiley, 2022
- P. Kobes, "Guideline Industrial Security: IEC 62443 is easy", VDE Verlag, 2023
- NIST SP 800-82r3, "Guide to Operational Technology (OT) Security", 2023
- P. Ackermann, "Industrial Cybersecurity - Second Edition: Efficiently monitor the cybersecurity posture of your ICS environment", Packt Publishing, 2021

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003600
Bachelor Thesis / Bachelor Seminar

Module profile

Exam number
5003600

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
1

ECTS-Credits (CP)
15.0

Workload
Guided study time:
Presence time: 40 hrs

Self-study: 410 hrs

Total: 450 hrs

Teaching format
Seminar

Language of instruction
German/English

Organisation

Responsible lecturer
Prof. Dr. Frank Hennermann

Lecturer(s)
Prof. Dr. Frank Hennermann,
Prof. Dr. Karsten Huffstadt,
Prof. Dr. Karl Liebstückel,
Prof. Dr. Michael Müßig,
Prof. Dr. Gabriele Saueressig,
Prof. Dr. Kristin Weber,
Prof. Dr. Eva Wedlich,
Prof. Dr. Frank-Michael Schleif,
Prof. Dr. habil. Nicholas Müller

Applicability	BWI
Semester according to SPO	7. semester
Type of module	Compulsory module

Required prerequisites for the participation in the module according to the SPO
120 ECTS credits, all modules of the first two semesters, as well as soft and professional skills modules, practical module, project work

Recommended prerequisites for the participation in the module
none

Content
The Bachelor's thesis module consists of the Bachelor's thesis (12 CP) and the Bachelor's seminar (3 CP).

The Bachelor's thesis comprises own studies and research on the state of the art and science in the respective subject area. The thesis must abstract from boundary conditions that are not technically based in nature, but result from the specific circumstances of the company. If software engineering solutions are required as part of the assignment, this usually means that prototypes are implemented, but does not include ensuring product features (including accompanying manuals etc.). The basics of scientific work are taught and practised in the Bachelor's seminar.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Thesis, Presentation

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German/English

Condition for the award of credit points
None

Learning outcomes
With the Bachelor's thesis / Bachelor's seminar, students prove that they are capable of independently solving a challenging problem in the field of Information Systems (possibly interdisciplinary) and that they have mastered the methodological and scientific principles of the subject and can adequately present the results.

Literature
depending on the topic; scientific literature must be intensively analysed, used and cited according to the topic

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Module: 5003848
Big Data Analytics

Module profile

Exam number
5003848

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Isabel John

Lecturer(s)
Rajesh Ramachandram

Applicability	BIN, BWI, BEC
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
- Basic programming knowledge (Java/Python)
- Prior exposure to databases and Linux recommended

Content
This comprehensive course provides an in-depth introduction to Big Data technologies, focusing on Hadoop and its ecosystem. Participants will learn core concepts such as the Big Data 4 Vs, analytics types, and Hadoop architecture, followed by hands-on programming skills with MapReduce, Hadoop Streaming, Pig, Hive, and Kafka. The modules combine theoretical knowledge with practical projects, including real-world case studies and an integrated data pipeline, preparing learners to handle large-scale data processing and analytics.
The course has the following content:
- Understanding Big Data concepts, including the 4 Vs and analytics types
- Overview of the Hadoop ecosystem and architecture components
- Programming with MapReduce using Java, including advanced techniques
- Developing Hadoop Streaming applications with Python/Shell scripts
- Exploring real-world case studies and mini projects for practical experience
- Data analysis with Pig Latin and scripting operators
- Building data warehousing solutions using Hive and HiveQL
- Learning Kafka architecture, topics, and data pipeline integration
- Hands-on exercises with HDFS, YARN, Pig, Hive, and Kafka
- Final project focusing on designing an end-to-end data processing pipeline

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
Upon successful completion of this module, students will be able to:

- LO1: Explain the fundamental characteristics of Big Data systems and analytics.
- LO2: Operate Hadoop HDFS and perform distributed storage and processing.
- LO3: Implement MapReduce programs using Java, including advanced features like distributed cache and joins.
- LO4: Use Pig Latin and HiveQL for high-level querying over large datasets.
- LO5: Demonstrate understanding of real-time streaming using Apache Kafka.
- LO6: Develop integrated solutions using multiple Hadoop ecosystem components.

Literature
Tom White, Hadoop: The Definitive Guide (2012), O'Reilly
Garry Turkington, Hadoop Beginner's Guide (2013), Packt Publishing
Pethuru Raj et al, High-Performance Big Data Analytics (2015), Springer
Official Apache Docs: Hadoop, Pig, Hive, Kafka (2018)

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003188
Blockchain and Smart Contracts

Module profile

Exam number
5003188

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr.-Ing. Tobias Fertig

Lecturer(s)
Prof. Dr.-Ing. Tobias Fertig, Andreas Schütz

Applicability	BEC, BIN, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
In this module, students gain deep insights into blockchain technology and smart contracts. After learning the basics, students are divided into teams to develop prototypes for suitable use cases. At the end of the module, students are able to evaluate use cases and implement them in practice.

The following content is taught to students:
- Evaluating use cases
- How blockchains work
- How the various consensus models work
- Introduction to contract-oriented programming
- Introduction to Solidity and suitable development environments
- Introduction to programming smart contracts
- Testing and debugging smart contracts
- Common design patterns for smart contracts
- Deployment and management of smart contracts
- Basics of decentralised applications (DApps)
- Frameworks for programming DApps
- Development of DApps
- Deployment of DApps
- Testing of DApps

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
1. students recall the basic concepts of blockchain technology and its functionalities.
2. students understand the principles and functioning of smart contracts and their significance within the blockchain ecosystem.
3. students apply the Solidity programming language to develop and implement smart contracts.
4. students develop decentralised applications (DApps) for the Ethereum blockchain and integrate smart contracts.
5. students analyse security vulnerabilities in smart contracts and can formulate and implement strategies to avoid these risks.

Literature
https://www.rheinwerk-verlag.de/blockchain-the-comprehensive-guide-to-blockchain-development-ethereum-solidity-and-smart-contracts/

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 100000
Business Intelligence and Reporting

Module profile

Exam number
100000

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 0 hrs

Self-study: 150 hrs

Total: 150 hrs

Teaching format
Lecture

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Frank-Michael Schleif

Lecturer(s)

Applicability	BEC, BIN, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=19535,82,1508,1

Recommended prerequisites for the participation in the module
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=19535,82,1508,1

Content
The module currently replaces the Business Intelligence course in the Business Technologies specialisation.
It can therefore only be selected once either as an FWPM or (exclusively) for the Business Intelligence course.
If the BT specialisation is selected, the module is recognised as specialisation I.

This is an offer of the Virtual University of Bavaria. Further information:
https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=19535,82,1508,1

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=19535,82,1508,1

Literature
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=19535,82,1508,1

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003829
CANVA – simple but great design

Module profile

Exam number
5003829

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Christina Völkl-Wolf

Lecturer(s)
Verena Rempel

Applicability	BEC, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Install Canva Pro version as a test account on your own computer

Content
The seminar CANVA - Simple. Good. Design. is aimed at beginners who want to learn how the CANVA software works from scratch and how to use it. Attendance is compulsory on all seminar days.

In this seminar, students acquire basic design and media technology skills for creating digital content with the online design tool Canva. The focus is on the practical application for social media, in particular reels, stories, videos and other content formats.

Content:

Introduction to the Canva design tool (free/pro version)
Canva editor for image and video editing
Overview of platform formats: Instagram, LinkedIn, TikTok, Facebook, YouTube etc.
Basics of visual design (colour, font, layout, imagery)
Analysing different formats with regard to their design components.
Colour management & visual hierarchy
Image composition with grid, white space and contrast
Use of typography and graphic elements
Creation of social media content (posts, stories, reels, videos)
Introduction to storyboards & visual scripting for reels, video
Photo editing & integration of icons, animations and videos
Creation of own templates and consistent design lines
Project-related work on real or fictitious communication tasks

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
Attendance is compulsory.

Learning outcomes
After successful participation, students will be able to

Students understand the structure and functions of Canva for designing digital media formats.
Students use Canva confidently to create their own posts, reels, stories and videos.
Students remember basic principles of visual design such as colour effects, typography and composition.
Students analyse existing templates with regard to design and target group relevance.
Students evaluate design decisions with regard to brand impact and media-appropriate implementation.
Students create their own projects in the area of social media by applying the content they have learnt in a targeted manner in order to realise a specific final project or a set task.

Literature
https://www.canva.com/de_de/

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003804
Cloud Native Enterprise Java

Module profile

Exam number
5003804

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Rolf Schillinger

Lecturer(s)
Matthias Reining

Applicability	BEC, BIN, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Programming I/II

Content
The lecture teaches the basics of Jakarta EE (https://jakarta.ee/), also known under its predecessor name Java EE (EE: Enterprise Edition). The focus of the course is on the creation of modern cloud native enterprise applications, divided into the following topics

- General requirements for business applications
- Web services (JAX-RS - Restful Web Services)
- Enterprise software patterns (CDI - Context and Dependency Injection)
- Data persistence (JPA - Java Persistence API)
- Use of microservice architecture patterns (via Microprofile https://microprofile.io/)
- Different runtimes (on-prem and cloud)

Most of the topics will be demonstrated and discussed directly using source code and live coding examples.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- Differentiate between terms such as Java, Java EE and Jakarta EE and categorise buzz words from the Java Enterprise world.
- efficiently implement applications in different runtime environments based on the Jakarta EE APIs
- design and implement microservice architectures using Jakarta EE / Quarkus.
- use Docker in the Jakarta EE / Quarkus environment
- Analyse Docker cloud deployments.

Literature
https://eclipse-ee4j.github.io/jakartaee-tutorial/
https://jakarta.ee/
https://microprofile.io/
https://www.adam-bien.com/roller/abien/

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003812
Data-driven Team Psychology

Module profile

Exam number
5003812

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German/English

Organisation

Responsible lecturer
Prof. Dr. Christina Völkl-Wolf

Lecturer(s)
Urs Merkel

Applicability	BEC, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
In the Data-Driven Team Psychology module, students learn the data-based collection, analysis and interpretation of psychometric data points. With the help of people interaction mining, both formal and informal data sources are used to visualise information flows, decision-making processes and group dynamics.
A central focus is on informal social network analysis (SNA) in companies, which serves as the basis for designing agile teams - both physical and digital - in a data-driven way. Students deal with people intelligence, a combination of business intelligence and people analytics, in order to manage transformation processes in groups. They also develop the ability to recognise psychometric patterns, analyse group dynamics in a targeted manner and plan and implement data-based interventions to improve team performance.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Colloquium

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German/English

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- systematically collect psychological and sociological dimensions and facets in a data-based manner,
- apply methods of social network analysis and people interaction mining to group processes using suitable (open source) software,
- apply people intelligence as a combination of business intelligence and people analytics in order to manage data-based transformation processes in teams,
- analyse and understand psychometric group dynamics in agile teams and influence them in a targeted manner through data-based interventions,
- evaluate the effectiveness of interventions by measuring effect sizes and feed this back into team management.

Literature
Borgatti, S. P.; Everett, M. G.; Johnson, J. C. (2018): Analysing Social Networks. 2nd edition. SAGE Publications, London.
Pentland, A. (2014): Social Physics: How Social Networks Can Make Us Smarter. Penguin Press, New York.
Pease, A.; Pease, B. (2016): The Definitive Book of Body Language. Bantam, London.
McAfee, A.; Brynjolfsson, E. (2017): Machine, Platform, Crowd: Harnessing Our Digital Future. W. W. Norton & Company, New York.
Current scientific articles and documentation will be announced in the course.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003814
Digital Accessibility

Module profile

Exam number
5003814

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Tobias Aubele

Lecturer(s)
Joschi Kuphal

Applicability	BEC, BIN, BWI, BDGD
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Experience in the design and/or development of web applications (HTML, CSS, JavaScript)

Content
The event is divided into theoretical and practical parts, each with a specific focus on digital accessibility:

- Fundamentals of digital accessibility, design and development models
- Types of disabilities, assistive technologies and adaptation strategies
- Types and modes of action of barriers and allocation of responsibilities
- Relevant standards, norms and laws to support accessibility in the national and international environment
- Strategies for implementing accessible design & development processes
- Recognising, reducing and avoiding barriers in digital media: web, documents (e.g. MS Word, MS PowerPoint, PDF, e-book), audio-visual media (e.g. video, audio)
- Conception, design, implementation and testing of accessible web applications
- Setting up and working with screen readers and other assistive technologies

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students are familiar with various approaches to thinking and design that are associated with accessibility and are aware of their similarities and differences.

- They know the most common types of disabilities and are able to characterise the dominant models in society and science.
- They understand the demographic development and know the most important key figures on disabilities worldwide, in Europe and in Germany.
- You will be able to identify different types of barriers that occur when interacting with digital products. They will be familiar with assistive technologies and adaptation strategies for overcoming these barriers.
- They are familiar with the standards, norms and laws relevant to accessibility at various levels (world, Europe, D-A-CH) and know their interrelationships.
- They have internalised the advantages of accessible design on a personal, social and business level and know strategies for implementing and anchoring accessibility in organisations and development processes.
- They understand the barriers that can occur in various digital media (web, documents, multimedia systems, e-books, apps, software, terminals, etc.) and know principles, techniques and tools for recognising, reducing and avoiding barriers.
- They have in-depth knowledge of the conception, design and implementation of accessible web applications, can evaluate them for accessibility and are familiar with relevant testing tools and methods.
- They have the skills to check, evaluate and correct digital documents for accessibility and to create accessible documents independently.
- They know how to use common screen readers on different platforms and are able to set up a suitable test environment for testing web and other applications.

Literature

- Matuzović, Manuel (2024) - Web Accessibility Cookbook: Creating Inclusive Experiences, O'Reilly
- Kalbag, Laura (2017) - Accessibility for Everyone, A Book Apart
- Silver, Adam (2018) - Form Design Patterns, Smashing
- Pickering, Heydon (2018) - Inclusive Components: The Book, Smashing
- Alexander, Kerstin (2019) - Image & Type: Communicating Accessibly with Typography and Image, Frank & Timme
- Miller, Susi (2021) - Designing Accessible Learning Content, Kogan Page

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003830
Introduction to SAP Business Technology Platform

Module profile

Exam number
5003830

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karl Liebstückel

Lecturer(s)
Christian Fink

Applicability	BEC, BIN, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
SAP user knowledge

Content

- What is SAP Business Technology Platform (SAP BTP)?
- History of SAP BTP
- SAP's strategy in the area of SAP BTP
- How is the BTP structured?
- What services does SAP BTP contain?
- Technical aspects of SAP BTP
- Overview of the areas of application of SAP BTP such as side-by-side extension, clean core, integration, analytics and AI, low-code / no-code
- Reference architectures with without S/4HANA

SAP BTP Custominzing

- Basic customising
- Roles and authorisations
- Development of sample applications

o A first app in SAP BTP
o Configuring the work zone
o Clean Core with S/4HANA
o Setting up an integration scenario
o First integration of Generative AI

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
1) Students will be familiar with the basic concepts and definitions of the SAP Business Technology Platform (SAP BTP) and its historical development.
2. understand the strategic importance of SAP BTP and its role in the context of a company's digitalisation strategy.
3. explain the structure and architecture of SAP BTP as well as the services it contains and their functions
4. apply basic customising techniques to adapt SAP BTP to specific application scenarios.
5. students analyse different areas of application of SAP BTP, such as side-by-side extensions, integration and analytics as well as low-code / no-code approaches.
6. students evaluate reference architectures of SAP BTP, including their integration with S/4HANA and the development of integration scenarios.

Literature
SAP Business Technology Platform - Administration, Martin Koch, Siegfried Ziegler, Rheinwerk-Verlag, Bonn 2024, ISBN 978-3-367-10020-0.
SAP Integration Suite, Jan Arensmeyer, Enrico Hegenbart, Rheinwerk-Verlag, Bonn 2024, ISBN 978-3-8362-9933-6
Enterprise Content Management with SAP, Christian Fink, Rheinwerk-Verlag, Bonn 2019, ISBN 978-3-8362-6524-9

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003851
Ethical Hacking (Blended Intensive Program)

Module profile

Exam number
5003851

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr.-Ing. Tobias Fertig

Lecturer(s)
Prof. Dr.-Ing. Tobias Fertig,
Franziska Königer

Applicability	BIN, BWI, BEC
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
n/a

Recommended prerequisites for the participation in the module
Before the course unit, the learner/student is expected to be able to have basic computer networking, Linux, programming skills and ML/AI basics.

Content
This intensive Ethical Hacking learning programme focuses on ethical hacking techniques and practices. The programme in 2025 is oriented towards network and AI security, and typically covers topics such as attacks on AI systems, penetration testing, vulnerability assessment, IDS, Packet Analysis, various testing and hacking tools, and defensive strategies. Participants can expect hands-on training and real-world simulations to enhance their skills in ethical hacking. Team-based learning approaches will be used. The competition will take place at the end. By the end of the programme, participants should be equipped with the knowledge and tools needed to conduct ethical hacking assessments, identify security weaknesses, and recommend solutions to strengthen cybersecurity defences.

This course will be offered as a Blended Intensive Programme with several online sessions and a study trip to Kaunas, Lithuania.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
n/a

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
n/a

Learning outcomes

- The students explain foundational ethical and legal principles of ethical hacking and organise effective teamwork norms.
- The students justify technical findings in clear oral and written presentations for diverse audiences.
- The students construct a controlled simulation environment (cyber range) to practice and test skills safely.
- The students analyse full packet captures with Wireshark to extract protocols, flows, and indicators.
- The students classify common cybersecurity attacks and select appropriate tools for safe reproduction and analysis.
- The students design basic penetration tests and interpret IDS outputs to assess detection and response.
- The students evaluate vulnerabilities in AI systems and propose defence strategies against adversarial attacks.
- The students plan a continuous-learning roadmap, selecting tools and resources that build knowledge and self-confidence.

Literature
Will be announced during class.

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003827
Governance, Risk, Compliance and Ethics (FWPM)

Module profile

Exam number
5003827

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Kristin Weber

Lecturer(s)
Prof. Dr. Kristin Weber,
Prof. Dr. Markus Oermann

Applicability	BIN, BWI, BEC
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
ISM Standards & Processes

Content
Many people and units inside and outside organisations are involved in the management of information security. Governance regulates how transparency, accountability and efficiency are ensured by defining structures, responsibilities and framework conditions, while at the same time safeguarding the interests of all stakeholders. This module shows which stakeholders are involved in information security management, how responsibilities are defined, decisions are made and optimal framework conditions for maximum information security are created.

The identification and assessment of IT risks helps organisations to deal with threats to information security in a targeted and structured manner. The risk-oriented approach is pursued in many ISMS frameworks (information security management system). The module teaches the basics of IT risk management, such as measures for identifying, analysing, assessing and handling IT risks in a structured risk management process.

In the section on ethics, essential conceptual foundations of moral philosophy are explained. On the basis of established schools of ethics, the normative justification of (information) security as a value and guiding principle is examined. The consideration of models for the integration of ethical considerations in development and system design processes builds a bridge to the application of ethical principles in practice. Questions of compliance with the applicable data protection law are also of particular relevance here. After an overview of its basic structures, the focus is on the requirements for technical and organisational data protection as well as the enforcement and consequences of legal violations. Finally, the basics of the reformed information security law are explained.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After completing the module, students will be able to

- name and specifically design basic governance mechanisms (e.g. responsibilities, guidelines, decision-making processes, committees) in the context of information security.
- describe relevant roles and stakeholders in information security management within and outside of organisations and differentiate between their tasks.
- explain the importance and function of IT risk management for information security and illustrate this using practical examples.
- identify and describe the organisational framework conditions for effective IT risk management.
- understand, apply and document a simple, structured IT risk management process.
- recognise ethical challenges in dealing with digital systems with security relevance and develop solutions for integrating ethical principles into work processes.
- explain the basic structures of data protection law and answer fundamental questions about data protection compliance.
- describe the main contents of information security law and assess their relevance for operational practice.
- communicate in a targeted manner with legal or regulatory experts on issues relating to data protection and information security law.
- reflect on the relationships between governance, risk and compliance management and ethics in security-critical IT environments.

Literature
Harich, T.: IT-Sicherheitsmanagement: das umfassende Praxis-Handbuch für IT-Security und technische Datenschutz nach ISO 27001. 3rd edition, MITP, 2021.
Johannsen, A.; Kant, D.: IT Governance, Risk and Compliance Management (IT-GRC) - A competence-orientated approach for SMEs. In: HMD - Praxis der Wirtschaftsinformatik, 57, 2020, pp. 1058-1074. https://doi.org/10.1365/s40702-020-00625-8
Kersten, H. et al: IT security management according to the new ISO 27001 - ISMS, risks, indicators, controls. 2nd, updated edition, SpringerVieweg, 2020.
Lang, M.; Löhr, H.: IT-Sicherheit - Technologien und Best Practices für die Umsetzung in Unternehmen. 2nd, revised edition, Hanser, 2024.
Lewinski/Rüpke/Eckhardt (2022): Data protection law. 2nd edition. Munich, C.H. Beck.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003198
Green IT (Blended Intensive Program)

Module profile

Exam number
5003198

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Peter Braun

Lecturer(s)
Prof. Dr. Peter Braun,
Prof. Dr. Frank-Michael Schleif

Applicability	BIN, BWI, BEC, BISD, BDGD
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
None

Recommended prerequisites for the participation in the module
None

Content
This module explores how sustainability principles can be integrated into the design, development, deployment, and management of IT systems. It offers a multidisciplinary perspective on the environmental, economic, and societal implications of information technology. Through lectures, case studies, and collaborative international projects, students gain both theoretical foundations and practical experience in Green IT strategies. Partnering with universities in the Czech Republic, Germany, and Iceland, the module includes cross-border collaboration and comparative analysis of regional IT sustainability approaches. This module contains a compulsory study trip to Prague, the Czech Republic.

- Introduction to Green IT: Definition, significance, and global relevance; real-world applications in industry and academia
- Environmental Impact of IT: Carbon footprint, e-waste, lifecycle analysis, and Green Computing standards
- Sustainable Software Engineering: Design principles and code optimisation for energy efficiency
- Green Algorithms and Data Structures: Techniques to reduce energy consumption and benchmark software for efficiency
- AI and Machine Learning for Green IT: Optimisation of energy use, environmental monitoring, and ethical implications
- Green IT Strategies in Mobile and Distributed Systems: Sustainable design and management of mobile technologies and data centres
- Life Cycle Assessment (LCA): Application of LCA in IT hardware and software development
- Education and Training for Green IT: Curriculum development, capacity building, and case studies
- Regulatory and Compliance Aspects: Overview of international standards, compliance practices, and green certifications

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
Upon successful completion of this module, students will be able to:

- Remember key concepts and terminology related to Green IT, including sustainability goals, environmental impacts, and regulatory frameworks
- Understand the ecological footprint of hardware and software systems and explain how IT contributes to global sustainability challenges
- Apply principles of sustainable software engineering, energy-efficient algorithms, and lifecycle assessments to practical use cases
- Analyse and compare national and regional Green IT strategies and regulatory approaches across Germany, Iceland, and the Czech Republic
- Evaluate the sustainability impact of IT systems and development practices using recognised metrics and standards
- Create innovative, practical solutions to real-world Green IT challenges by working on interdisciplinary, cross-national projects

Literature
It will be announced in class

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003849
Low Code Development with Open Source

Module profile

Exam number
5003849

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Michael Müßig

Lecturer(s)
Dietmar Fischer

Applicability	BWI, BEC
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
Digital transformation presents companies with the challenge of efficiently digitalising business processes - often with limited IT resources. Low-code developments can offer a modern and practical solution for this. In this module, students learn how operational applications can be implemented quickly and flexibly with the help of open source tools such as the Frappe Framework - even without in-depth programming knowledge.

The focus of this module is on the practical development of business applications, e.g. for managing customer relationships or internal company communication. By working with an open source tool such as the Frappe Framework, students develop a deeper understanding of the opportunities and challenges of low-code approaches in a corporate context.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Practical study achievement

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students acquire a basic understanding of the concepts and terms relating to low-code development and open source technologies in a business context. They recognise the importance of such tools for digital transformation in companies and are able to name and describe typical use cases.
In addition, they understand how the Frappe framework works and can use it specifically to digitally map operational processes. They will be able to analyse simple business processes, design suitable digital solutions and implement them as prototypes using the framework.

Literature
https://frappe.io/

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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003815
Media Psychology: The Magic of Media & Entertainment

Module profile

Exam number
5003815

Duration
1 semester

Frequency
Irregular

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Christina Völkl-Wolf

Lecturer(s)
Nayomi Polcar

Applicability	BEC, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
None

Recommended prerequisites for the participation in the module
None

Content
Media psychology deals with traditional media (radio & music, TV & streaming, books, etc.) as well as new media (online and mobile communication, social media, games, etc.). Media psychology attempts to describe and explain human behaviour, actions, thoughts and feelings in connection with the use of media. The module deals with the methods of media psychology, the motivation for the selection of media, as well as media reception and the effect of consumption.

The aim of the module is to convey the psychological principles of media use and to apply them to central issues of media selection, reception and effects. Students learn about theoretical approaches in media psychology and deal with central motives for media choice - such as entertainment, identity work, social connection or the need for information.

A particular focus is on understanding media psychological methods, e.g. experimental designs, reception studies and impact research. In addition, current developments such as media dependency, algorithm-controlled content and the psychology of digital platforms are covered. The module enables students to critically classify media phenomena and analyse them in a psychologically sound manner.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

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

- describe which classical and digital forms of media are considered in media psychology and which psychological issues are associated with them.
- explain how cognitive, emotional and motivational processes influence media usage behaviour.
- analyse which individual and situational factors lead to the selection of certain media formats.
- distinguish which theoretical models of media reception (e.g. uses-and-gratifications, mood management) are useful in which application contexts.
- assess which psychological effects can arise from media consumption - for example in the area of social media, digital games or streaming services.
- develop their own questions or research designs on media effects on the basis of theoretical and methodological principles.
- reflect on the extent to which media experiences can contribute to identity formation, social orientation or emotional regulation.

Literature
Wulf, T., Naderer, B., & Rieger, D. (2023). Media psychology. Nomos.
Hennighausen, C., Lange, B. P., & Schwab, F. (2024). Evolutionary media psychology. In M. Hammerl, S. Schwarz & K. P. Willführ (Eds.), Evolutionary social sciences. A tour (pp. 83-102). Springer VS. https://doi.org/10.1007/978-3-658-41860-7_5
Trepte, S., Reinecke, L., Gimmler, R., Gleich, U., Winter, S., Frischlich, L., Krämer, N., Appel, M., Hutmacher, F., Mengelkamp, C., Stein, J.-P., & Weber, S. (2023). Occupational fields of media psychology. University of Hohenheim. https://doi.org/10.18724/001c.81580
ZHAW Zurich University of Applied Sciences. (2023). JAMESfocus 2023: Mobile phone behaviour and sustainability - current trends. https://www.zhaw.ch/storage/psychologie/upload/forschung/medienpsychologie/james/2023/JAMESfocus_Nachhaltigkeit_Bericht_D.pdf

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6322290
Project-related geovisualization VI (deep sea VR)

Module profile

Exam number
6322290

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Project

Language of instruction
German

Organisation

Responsible lecturer
Stefan Sauer

Lecturer(s)
Stefan Sauer

Applicability	BIN, BWI, BEC
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
Interest in games
Experience with Unreal
Creation of small VR applications
Basic experience with Blender or 3ds max

Content
As part of the module, specific, application-related topics are developed and previously acquired specialist knowledge is applied to specific projects. The design of these modules allows a flexible, contemporary selection of topics as well as interdisciplinary work through the inclusion of other subject areas, e.g:

- Facility Management
- Property and insurance management
- transport logistics
- Telecommunications
- product design

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
none

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Presentation

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
none

Learning outcomes
By participating in the module, students are able to investigate and apply selected topics from the field of geovisualisation using practical examples/exercises, thereby expanding and deepening their knowledge. Participants are able to assess, evaluate and compare the results of the practical work and present them in a topic- and target group-specific manner.

Literature
Varies depending on the project

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003170
Project Management and Strategic Management

Module profile

Exam number
5003170

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Eva Wedlich

Lecturer(s)
Prof. Dr. Eva Wedlich,
Manuela Ziegler

Applicability	BEC, BIN, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
"IT Project Management" or "Project Management" and "Fundamentals of Economics" or "Fundamentals of Business Administration"

Content
This course consists of a two-day business game "Project Management" (SysTeams by RIVA) and a two-day business game "Strategic Management" (Global Strategy).
Structure:
I. Introduction to FWPM (organisational aspects),

II. part 1: "Project Management" block course

Content: Project management simulation game from SysTeamsProject by Riva.
The simulation game simulates a project management process from initial contact with the client to successful project completion. In small teams, the participants define, plan and control the project and also implement it themselves. Numerous project management tools are available for competent planning, e.g:

- Target plan
- work breakdown structure
- Milestone plan
- Gantt chart
- Project reports
- Risk analyses

The project is divided into several phases in which various project management tasks and work packages have to be completed, taking into account the available resources.

III Introduction "Strategic Management"

IV. Part 2: "Strategic Management" block course

Content: Global Strategy is an intensive general management simulation. Over the course of several rounds, participants develop a successful strategy for their company. The importance of strategic management for the company's success and business interrelationships are recognised and understood.

Contents and procedure:

- Profit and loss account, balance sheet
- Corporate and liquidity planning
- Costing
- Contribution margin accounting
- Cost management
- Break-even analysis
- Financing
- marketing
- Investment appraisal
- Balanced Scorecard
- SWOT analysis
- Value-orientated corporate management
- Investment appraisal
- Balanced Scorecard
- SWOT analysis
- Value-orientated corporate management

V. Review

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes

- Students understand the principles and methods required for the effective planning and implementation of projects and for the management of a company.

organisation.

- Students apply the knowledge they have learnt in realistic, simulated projects to gain practical experience.
- Students analyse the results of each phase of the project and each financial year to identify strengths and weaknesses.
- Students evaluate the effectiveness of the implemented strategies in project management and business management based on the simulation results.

simulation results.

- Students develop new strategies for future simulation periods based on the findings from the previous phases.
- Students reflect on their experiences in the simulation in order to set personal and team-related learning goals for future challenges.

Literature
Workbook and explanatory literature will be provided during the course.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003826
Social Engineering and Security Awareness

Module profile

Exam number
5003826

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar-style instruction

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Kristin Weber

Lecturer(s)
Prof. Dr. Kristin Weber,
Andreas Schütz

Applicability	BIN, BWI, BEC
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
The module Social Engineering and Security Awareness focuses on the human factor of information security. People make a decisive contribution to information security in companies with their behaviour - they are an important security factor. Due to this influence, they are increasingly targeted by cyber criminals. The module primarily looks at these two aspects - security factor and victim - of the human factor in information security.

Information security awareness describes the sensitisation of employees for information security (security factor). The module contains the following contents on awareness:
- Concept and models, psychological understanding of awareness
- Practical examples of awareness measures
- Promoting and measuring awareness

Social engineering is the targeted manipulation of people in order to seduce them into unintentional actions (victims). The following contents, among others, are dealt with in social engineering:
- Basics and forms
- Psychological tricks
- Phishing and phishing simulations

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
English

Condition for the award of credit points
None

Learning outcomes
Students see people as a solution and not as a problem for information security.
They explain the role of the human factor in information security using examples.
The students know and identify the principles of social engineering and can explain them using examples.
They name different forms of phishing and can discuss the advantages and disadvantages of phishing simulations.
They understand what information security awareness means and know methods to enhance the different aspects of awareness.
Students can create awareness measures in a targeted and individualised way.

Literature
Beißel, S.: Security Awareness, De Gruyter, 2019.
Cialdini, R.: Influence - The Psychology of Persuasion, Collins Business, 2007.
Hadnagy, C. (with Schulman, S.): Human Hacking - Win Friends, Influence People, and Leave Them Better Off for Having Met You, Harper Business, 2021.
Helisch, M.; Pokoyski, D. (eds.): Security Awareness - New Ways to Successfully Sensitise Employees, Vieweg+Teubner, 2010.
Schroeder, J.: Advanced Persistent Training, Apress, 2017.
Verplanken, B. (Ed.): The Psychology of Habit - Theory, Mechanisms, Change, and Context, Springer, 2018.
Weber, K.: Humans and Information Security, Hanser, 2024.
Weber, K.; Schütz, A.; Fertig, T.: Fundamentals and Application of Information Security Awareness, SpringerVieweg, 2019.
Take Aware Sec&Life Magazine, https://www.take-aware-events.com/news-post/magazinesecandlife

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003109
Data Protection - Technical Aspects

Module profile

Exam number
5003109

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Kristin Weber

Lecturer(s)
Prof. Dr. Alexander Schinner, Christian Wolff

Applicability	BIN, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content
Based on an overview of the current legal situation regarding the protection of personal data and the definition of informational self-determination and privacy, basic types of protection concepts and the applicable technologies and protective measures are discussed in detail.
The following core topics are covered:

- Basic protection goals and guarantee goals in the area of information security and data protection
- Technical-organisational measures for implementing the objectives/ requirements
- Measures for access and access control
- Data protection-relevant functions for mobile devices
- Security and data protection in cloud computing and big data analytics
- Special privacy-preserving technologies ("privacy-preserving technologies")

The second part deals with technical aspects of protecting data and systems. The aim of the lecture is to look at attacks on data from different perspectives. These include the perspective of the person who wants to store data securely, the person who wants to recognise or investigate attacks, but also the perspective of the attacker himself.
The lecture includes the following core topics:

- Cyber Kill Chain and MITRA Att&ck Framework
- Cryptography
- steganography
- Attacks on cryptography
- Quantum key exchange
- Authentication
- Passwords
- Zero Knowledge Proof
- attacks
- Blockchain
- Blockchain basics
- Attacks
- NFTs
- Ordinals
- Forensics

- Basic principles
- Preservation of evidence
- Carving

Practical demonstrations on the topics of incident response and cryptography complement the lecture.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
The aim of the course is to convey the basic requirements of data protection in Germany and the resulting measures in the area of information security and the protection of personal data. The focus is on technical aspects.
After successfully completing the module, students will be able to

- Understand and differentiate between terms such as "information security", "data protection", "informational self-determination", "privacy", "anonymity"
- Analyse legal and normative requirements with regard to the protection and guarantee objectives they contain and apply them to a given context
- Derive technical and organisational measures from the requirements with regard to their suitability for implementing protection and guarantee objectives and evaluate them with regard to their protective effect
- Know and understand the functioning of basic technologies and procedures in the field of information security and data protection (e.g. procedures from the areas of anonymisation, encryption, authentication, communication security, incident detection & response, security testing), including the associated potential vulnerabilities and attack possibilities
- Develop a protection concept for a given scenario or a given application context (e.g. protecting the data of a website or an end device) in which these measures are used

Literature
Literature:
Eckert, Claudia: IT Security: Concepts - Procedures - Protocols, Oldenbourg Wissenschaftsverlag, 10th edition, 2018
Schwenk, Jörg: Security and Cryptography on the Internet: From secure email to IP encryption, Vieweg+Teubner Verlag, 4th ed., 2014
Schneier, Bruce: Secrets & Lies. IT security in a networked world, dpunkt.verlag/Wiley, 2001
Blog: http://www.schneier.com

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5005202
Business Process Management

Module profile

Exam number
5005202

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Gabriele Saueressig

Lecturer(s)
Prof. Dr. Gabriele Saueressig,
Elias Heck

Applicability	BWI
Semester according to SPO	7. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
Course Practical module; 120 ECTS credits

Recommended prerequisites for the participation in the module
Business Technologies

Content
Phases of the BPM cycle
Strategic BPM
- Relationship between corporate goals - strategy - processes
- Approaches to strategic BPM
- Maturity level models
- Evolution of process management

Operational BPM
- Business process modelling and implementation
- Process organisation
- Process controlling
- Systems to support process management (Business Process Management Systems: BPMS)
- process mining
- Robotic process automation (RPA)
- Enterprise architectures for BPM (enterprise architecture management, service-oriented architecture, microservices, ...)
- Workshops with practice partners on various topics

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students deepen their specialised knowledge of business process management. They acquire the ability to analyse and structure practical tasks in business process management.
Intended learning outcomes:

- Develop an understanding of the basic paradigm of BPM
- Understand the connections between strategic and operational BPM
- Evaluate different approaches to strategic process management
- Knowledge of BPM standards and use of process description languages
- Characterise BPM-relevant IT architectures
- Gain experience in modelling and practical implementation of executable business processes
- Differentiate approaches to process controlling
- Gain knowledge and practical experience with innovative BPM applications (e.g. process mining, robotic process automation)

Literature
Aalst, Wil van der: Process Mining Handbook, Springer 2022.
Allweyer, T.: BPMN 2.0 - Business Process Model and Notation: Introduction to the Standard for Business Process Modelling, 2nd edition, 2020.
EABPM (ed.): " BPM CBOK Version 4.0: Guide to the Business Process Management Common Body Of Knowledge", 2019.
Dumas, M., et al: "Fundamentals of Business Process Management", Springer Vieweg 2021.
Fischermanns, G.: "Praxishandbuch Prozessmanagement", 11th edition, Verlag Dr Götz Schmidt 2013.
Freund, J., Rücker, B.: "Praxishandbuch BPMN: Mit Einführung DMN", 7th upd. Ed., Hanser 2025.
Gadatsch, A.: "Grundkurs Geschäftsprozessmanagement: Analyse, Modellierung, Optimierung und Controlling von Prozessen", 11th ed., Vieweg 2025.
Hanschke, I., Lorenz, R.: "Strategisches Prozessmanagement - einfach und effektiv: Ein praktischer Leitfaden", 2nd updated and expanded edition, Hanser 2021.
Müller, A., Schröder, H., von Thienen, L.: Digineering: Business Process Management in the Digital Age, Springer Vieweg 2021.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5107201
Digital Media and Multimedia Techniques

Module profile

Exam number
5107201

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Frank Deinzer

Lecturer(s)
Prof. Dr. Frank Deinzer

Applicability	BIN, BWI
Semester according to SPO	7. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
Course Practical module; 120 ECTS credits

Recommended prerequisites for the participation in the module
none

Content
Basics of media, computer science and maths:
- Media elements
- Coding
- Transformation of data

Media techniques
- Compression methods for images
- Compression methods for videos
- Audio compression techniques

Multimedia applications
- Consumer electronics and Internet

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students understand the basic algorithms for coding and transformation
Students analyse the various compression properties.
Students understand the principles of moving image compression and can explain motion estimation methods.
Students evaluate individual compression methods with regard to specific application requirements.
Students implement an image compression process in the practical part.

Literature
Will be announced in the seminar

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5007212
Mobile and Ubiquitous Design

Module profile

Exam number
5007212

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karsten Huffstadt

Lecturer(s)
Prof. Dr. Karsten Huffstadt

Applicability	BEC, BIN, BWI
Semester according to SPO	7. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
Course Practical module; 120 ECTS credits

Recommended prerequisites for the participation in the module
none

Content
In the Mobile and Ubiquitous Design module, students develop comprehensive skills in context-sensitive interaction design. The focus is on designing digital products and services that adapt flexibly to mobile usage situations and ubiquitous environments. The user-centred design process encompasses all relevant phases - from analysing the context of use, conception and prototype implementation through to systematic evaluation.

Particular emphasis is placed on the visual, functional and interactive quality of the solution: At the end of the module, students create a fully clickable high-fidelity prototype that realistically simulates central interactions, interface logic and design elements. This is developed using the Figma design tool and embedded in a structured, professionally designed design brochure that documents the usage scenario, the derivation of the design decisions and reflections on the development process. This results in design-based, practical solutions that are both convincing in terms of content and communicable.

Specific contents are
- Design principles of mobile and ubiquitous systems
- Context-sensitive interaction design (location, time, movement, environment)
- Methods of human-centred and participatory design
- UX/UI design for mobile contexts (touch, language, responsive design)
- Wireframing, low-fidelity and high-fidelity prototyping with Figma
- Design and construction of interactive click prototypes
- Usability testing, user testing and feedback integration
- Documentation and visualisation of design processes (structure, style, argumentation)
- Design ethics, accessibility and data protection in ubiquitous systems
- Project work: conception, prototyping and design brochure

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Practical study achievement

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
After successfully completing the module, students will be able to

- name central terms, interaction patterns and technologies of mobile and ubiquitous systems (to remember)
- explain the special features of mobile usage contexts and their influence on design decisions (to understand)
- use user-centred methods (e.g. personas, scenarios, customer journeys, wireframes) specifically in the design process (to apply)
- capture real-life usage scenarios and technical requirements and systematically translate them into design concepts (to analyse)
- evaluate designed interaction solutions in terms of user-friendliness, context sensitivity, accessibility and feasibility (to evaluate)
- develop context-sensitive application concepts, realise them with Figma as a high-fidelity prototype and document them professionally in a design brochure (to create)

Literature
Rogers, Y., Sharp, H., & Preece, J. (2023). Interaction Design: Beyond Human-Computer Interaction. Wiley
Schmidt, A., & Kranz, M. (2017). Mobile interaction. Oldenbourg
Norman, D. A. (2013). The Design of Everyday Things. Basic Books
Buxton, B. (2007). Sketching User Experiences. Morgan Kaufmann
Kuutti, K., & Bannon, L. (2014). The turn to practice in HCI: towards a research agenda. In CHI '14
Figma Design Tool: https://www.figma.com

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5004202
Tools for Business Software

Module profile

Exam number
5004202

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Karl Liebstückel

Lecturer(s)
Prof. Dr. Frank Hennermann,
Prof. Dr. Karl Liebstückel

Applicability	BWI
Semester according to SPO	7. semester
Type of module	Concentration module

Required prerequisites for the participation in the module according to the SPO
Course Practical module; 120 ECTS credits

Recommended prerequisites for the participation in the module
Business Software, specialisation Business Software 1: Processes, specialisation seminar Business Software

Content
- Authorisation concept: authorisation objects, authorisations, profile generator: single roles, composite roles and profiles, user master record
- Customizing: selected customising functions (document types, number ranges, screen control, field selection, status management, partner determination, etc.)
- Listing tools: Quick Viewer, queries
- Implementation tools: Legacy Migration Workbench, SAP Solution Manager, SAP Activate
- Evaluation tools: Logistics Information System, SAP Lumira Discovery

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
Students can explain the SAP authorisation concept and the various user types. They can develop their own roles and authorisation profiles, apply them with their own user master records and analyse the results.
Students know the triggers and objectives of customising. They will be able to develop their own strategies for given initial situations, set up the necessary customising and analyse the results achieved and correct errors if necessary.
Students can create lists with the SAP Quickviewer, interpret the automatically generated ABAP coding and test the results.
Students know the workbench for data transfer, can use it and are able to import data.
Students know the SAP Solution Manager, the system of systems, and can use its functions and analyse and correct errors.

Literature
Katharina Stelzner, Anna Otto: Authorisations in SAP, 2nd edition, Rheinwerk-Verlag, Bonn 2019
Maximilian Münkel: Materials Management with SAP S/4HANA - Customizing, Rheinwerk-Verlag, Bonn 2021.
Stephan Kaleske, Karin Bädekerl, Heinz Forsthuber: Praxishandbuch SAP Query-Reporting, Rheinwerk-Verlag, 2nd edition, Bonn 2013
Karl Liebstückel: Maintenance with SAP S/4HANA - Das Prxishandbuch, 6th edition, Rheinwerk-Verlag Bonn 2023.
Karl Liebstückel Maintenance with SAP - Customizing, Rheinwerk-Verlag, 2nd edition, Bonn 2020
Alexander Wolf, Christoph Sting: Production planning and control with SAP S/4HANA, Rheinwerk-Verlag, Bonn 2021
Markus Bechler and others: SAP Solution Manager, Rheinwerk-Verlag, 2nd edition, Bonn 2021
Sven Denecken and others: SAP Activate, SAP Press, 2nd edition, Boston 2022

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003834
Web-Intelligence

Module profile

Exam number
5003834

Duration
1 semester

Frequency
Every winter semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 60 hrs

Self-study: 90 hrs

Total: 150 hrs

Teaching format
Seminar

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Mario Fischer

Lecturer(s)
Dr.-Ing. Benedikt Kämpgen

Applicability	BEC, BIN, BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
none

Recommended prerequisites for the participation in the module
none

Content

- Methods and technologies for the systematic, preferably automatic collection and evaluation of business-relevant information from the Internet, in particular from the World Wide Web
- Web Intelligence as a type of "data reconnaissance/procurement via the web",
- for better decisions and
- for the development of more useful web applications.
- Practical insights into the following topics:
- Data analytics (e.g. pivot, OLAP, data warehousing, BigQuery),
- Web applications (e.g. Low-Code, AppSheet, MediaWiki),
- Data Lake (e.g. Big Data, NoSQL, Cloud, SaaS, MapReduce),
- Graph data (e.g. knowledge graph, semantic web, reasoning),
- Text data (e.g. natural language processing, large language model, ChatGPT),
- Internet of Things (e.g. sensor, actuator, micro:bit),
- Artificial intelligence (e.g. machine learning, responsible AI).

Each course consists of approximately 50% lecture and 50% exercise. The contents of the lecture are taught in lectures and presentations. Students are encouraged to study the literature and analyse the content of the topics.
In addition to the lecturer, up to two external speakers will give practical presentations.
In the exercises, students will work together in groups to answer specific questions and work on practical examples. You will need your own laptop or one laptop per group to complete the exercises.
The lecture slides, sample solutions for the exercises and additional material will be made available on the THWS e-learning platform (https://elearning.fhws.de).
The portfolio examination form is chosen for the award of credit points. This involves 6-8 portfolio tasks, which students are allowed to solve on predetermined dates in 1-3-page documents.

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Other exam (soP) according to §§ 26, 27 APO

Examination - length/format
Portfolio

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

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

- Identify appropriate data sources and data on the web and apply analysis tools to compare data.
- Identify systems on the web and apply low-code systems for their own systems.
- Illustrate the problem of big data and apply possible solutions.
- Identify, compare and demonstrate the use of text data and graph data.
- Illustrate the Internet of Things.
- Apply artificial intelligence to data on the web. Discuss further use cases for Artificial Intelligence on the web.

Literature
Jiming Liu, Ning Zhong, Yiyu Yao, and Zbigniew W. Ras. The Wisdom Web: New Challenges for Web Intelligence (WI). Journal of Intelligent Information Systems. 2003.
Tom Heath, and Christian Bizer. Linked Data: Evolving the Web into a Global Data Space. Vol. 1. Morgan & Claypool. 2011.
Sergey Melnik, Andrey Gubarev, Jing Jing Long, Geoffrey Romer, Shiva Shivakumar, Matt Tolton, Theo Vassilakis, Hossein Ahmadi, Dan Delorey, Slava Min, Mosha Pasumansky, and Jeff Shute. Dremel: A Decade of Interactive SQL Analysis at Web Scale. PVLDB. 2020.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 1000010
Web Programming

Module profile

Exam number
1000010

Duration
1 semester

Frequency
Every semester

Credit hours (SWS)
4

ECTS-Credits (CP)
5.0

Workload
Guided study time:
Presence time: 0 hrs

Self-study: 150 hrs

Total: 150 hrs

Teaching format
Lecture

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Rolf Schillinger

Lecturer(s)

Applicability	BWI
Semester according to SPO	7. semester
Type of module	FWPM

Required prerequisites for the participation in the module according to the SPO
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=19536,82,1218,2

Recommended prerequisites for the participation in the module
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=19536,82,1218,2

Content
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=19536,82,1218,2

Examination

Required prerequisites for the participation in the examination according to the SPO appendix
None

Examination - type
Written exam (sP) according to § 23 APO

Examination - length/format
90 minutes

The concrete length/format of the examination will be determined in the study plan.

Language of examination
German

Condition for the award of credit points
None

Learning outcomes
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=19536,82,1218,2

Literature
This is an offer of the Virtual University of Bavaria. Further information can be found at https://kurse.vhb.org/VHBPORTAL/kursprogramm/kursprogramm.jsp?kDetail=true&COURSEID=19536,82,1218,2