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Faculty of Computer Science and Business Information Systems

Technical University of Applied Sciences Würzburg-Schweinfurt

Module Handbook

Bachelor E-Commerce (B. Sc.)

Summer semester 2026
Winter semester 2025

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

Contents

1. semester

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6150030
Backend Programming

Module profile

Exam number
6150030

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. Tristan Wimmer

Lecturer(s)
Prof. Dr. Tristan Wimmer, Christine Zilker

Applicability	BEC
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
This module aims to teach students the basics of programming using the Python programming language. It introduces the basic concepts of programming languages and programming paradigms and creates the basis for further modules in the degree programme.
The following topics are covered:

- Elementary data types, data structures and operators
- Control structures: loops and conditional statements
- Programming with functions
- Introduction to object-orientated programming
- Introduction to the concept of inheritance
- Introduction to exception handling

In addition to these topics, this module demonstrates the appropriate structuring options for code, as well as documentation options for a clean and readable programming style. Furthermore, students are shown how best to encounter and solve problems.

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 identify and name the basic data types, data structures and operators and apply them in the Python programming language.

- Students will be able to explain how control structures such as loops and conditional statements control the flow of programmes and how these are implemented in Python.
- After successfully completing the module, students will be able to write simple Python programmes that use functions and parameter passing to solve specific tasks, applying the principle of divide and conquer.
- Students will be able to apply object-oriented programming to improve the structure and maintainability of a programme through encapsulation.
- After successfully completing the module, students will be able to design and implement an object-oriented programme in Python for a specific requirement using the basic principles of inheritance.
- After successfully completing the module, students will be able to apply exception handling for incorrect inputs and data type incompatibilities.

Literature
Häberlein, Tobias. Programming with Python: An Introduction to Procedural, Object-Oriented and Functional Programming. 1st ed. 2024. Berlin, Heidelberg: Springer Berlin Heidelberg, 2024. https://doi.org/10.1007/978-3-662-68678-2.

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Module: 6150040,6920020
Discrete Mathematics and Linear Algebra

Module profile

Exam number
6150040,6920020

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. Patrik Stilgenbauer

Lecturer(s)
Prof. Dr. Patrik Stilgenbauer

Applicability	BEC, BDGD
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: 6100820
English for E-Commerce

Module profile

Exam number
6100820

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. Graeme Dunphy

Lecturer(s)
Prof. Dr. Graeme Dunphy

Applicability	BEC
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
Written and spoken English at B2 level

Content
Technical and commercial vocabulary, including maths and statistics; reading, understanding and commenting on authentic journalistic and scholarly texts including newspaper articles on e-commerce, excerpts from text books, and one full-length scholarly journal article; listening comprehension (authentic recordings relevant to business and career), oral communication skills (including talking about studies and work, and job interview practice); written communication (emails, abstracts, summaries, graph-related statistical reports, CVs and letters of application).

This seminar is at level B2 of the CEFR; the readings include some texts at level C1.

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 will be able to discuss topics related to their studies in English. Having made a close reading of a full-length scholarly research paper under supervision, they will be well placed to read and evaluate English-language scholarship in the field of E-Commerce. They will be able to write short professional texts such as e-mails or data reports in an appropriate English style.

Literature
Course script, scholarly and journalistic articles, listening materials.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6150060
Fundamentals of Business Administration with Accounting

Module profile

Exam number
6150060

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. Christina Völkl-Wolf

Lecturer(s)
Prof. Dr. Eva Wedlich,
Christian Holleber

Applicability	BEC
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 of business administration and economics
- Meaning of economic activity, types of goods, economic principle
- Economic sectors and production factors

Key figures of corporate management
- Productivity, profitability, return on equity, return on assets, return on sales

Choice of location: Criteria and decision factors
Legal forms of companies
- Partnerships and corporations, advantages and disadvantages

Fundamentals of company accounting
- Tasks, structures, basic concepts of bookkeeping and cost accounting

Pricing on markets
- Demand from households, supply from companies, market mechanism

National accounts: structure and significance
Economic goals: Magic square and conflicting objectives

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

- Define and explain the basic terms and concepts of business and economics,
- understand the economic principle and the meaning of scarcity and apply it to practical examples,
- calculate, interpret and critically compare key business figures,
- differentiate between different forms of company law and assess their suitability,
- apply the basics of accounting, in particular to record and analyse economic facts,
- analyse market mechanisms of supply and demand and assess their influence on pricing,
- categorise and critically reflect on national accounts and central economic policy objectives.

Literature
Wöhe, G.; Döring, U.: Einführung in die Allgemeine Betriebswirtschaftslehre, current edition
Schmalen, H.; Pechtl, H.: Fundamentals and Problems of Economics, current edition
Coenenberg, A. G.; Haller, A.: Annual financial statements and financial statement analysis, current edition
In addition, current lecture notes, legal texts and materials for the course

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Module: 6150050
User Experience and Consumer Psychology

Module profile

Exam number
6150050

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. Tobias Aubele

Lecturer(s)
Prof. Dr. Tobias Aubele, Matthias Schloßareck

Applicability	BEC
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
Usability and interface design in relation to applications on the web.

- Basics of usability and user experience of websites (DIN standards, heuristics)
- Information architecture

Navigation concepts (mobile / stationary)
Internal search
Mental user models
Information intake and processing (incl. cognitive distortions)

- Website design

Effect of images and text
Layout / colour effect
Multi-device design aspects

- Texts on the web
- Prototyping: Creating prototypes to develop high-quality user interfaces with prototyping tools
- Usability testing

Test preparation and test execution
Different test and testing concepts for testing user acceptance
Design of order and payment channels

- Conversion optimisation

a/b and multivariate testing

- Accessibility on the web
- Exercise: Methods of prototyping and usability evaluation in practical 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
The students

- understand basic criteria for user-orientated web design, web usability and accessibility.
- understand basic theoretical concepts for the development of web-oriented user interfaces based on psychological effects and their relevance for different end devices.
- apply principles of information structuring and psychology to design user-friendly websites.
- analyse existing web interfaces with regard to usability, user guidance and accessibility.
- evaluate web design decisions in terms of user acceptance, mobile use and accessibility.
- create simple web-orientated user interfaces taking usability and accessibility criteria into account.
- create concepts for the continuous optimisation and success monitoring of web applications.

Literature
Alan Cooper, Robert Reimann, Dave Cronin: About Face The Essentials of Interaction Design, Wiley Publishing, Inc., 2007
Florian Sardornik, Henning Brau: Methoden der Usability Evaluation: Wissenschaftliche Grundlagen und praktische Anwendung, Huber, Bern; 2nd edition 2011
Jakob Nielsen, Hoa Loranger: Web Usability, Verlag Addison-Wesley, German edition, 2006
Jakob Nielsen: Usability Engineering, Morgan Kaufmann, 1993
Markus Bühner: Introduction to test and questionnaire construction, Pearson Studium, 2nd edition 2006
Michael Richter, Markus Flückiger: Usability Engineering kompakt: Benutzbare Produkte gezielt entwickeln, Springer, 3rd edition 2013.
Steve Krug: Don't Make Me Think, New Riders, 3rd edition 2013
Steve Krug: Rocket Surgery Made Easy, New Riders, 1st edition 2010

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6150020
Webanalytics

Module profile

Exam number
6150020

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. Rolf Schillinger

Lecturer(s)
Prof. Dr. Rolf Schillinger

Applicability	BEC
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
In this module, students acquire practical knowledge in the field of web analytics. They learn how to collect and evaluate usage data from websites and apps effectively and in compliance with data protection regulations and how to derive strategic measures for optimising e-commerce websites. They will learn the technical basics, analytical concepts and the use of modern tools such as Google Analytics 4 (GA4) and data protection-friendly alternatives.

In detail, this module deals with
- Goals and benefits of web analytics in e-commerce (engagement, customer journey, conversions)
- Technical and organisational framework conditions for data collection such as HTTP cookies, consent management, GDPR / TTDSG
- Selection and definition of suitable key performance indicators (KPIs)
- Analysis tools and technical implementation options

- Client-side web analytics (e.g. Google Analytics 4, Plausible Analytics)
- Tag management systems incl. server-side tagging (e.g. GA4 Server Container)
- Log file-based analysis methods

- Control and optimisation of (online) marketing campaigns through suitable analyses
- Comparison and application of different attribution models
- Introduction to dashboards, reporting and visualisation of analysis results (e.g. with Looker Studio, Tableau)

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 successfully completing the module, students will be able to

- apply common analysis methods to e-commerce websites in a targeted manner
- define key performance indicators (KPIs) on the basis of individual requirement profiles and implement their collection and evaluation with GA4
- differentiate between various web analysis techniques (e.g. attribution, funnel analysis, heat maps) in terms of their suitability for and informative value in specific e-commerce scenarios
- critically assess the impact of web analytics techniques on user data protection
- strategically plan the use of web analytics technologies in an e-commerce context and assess existing implementations in terms of target achievement and technology

Literature
Kaushik, A. (2010). Web analytics 2.0: The art of online accountability and science of customer centricity. Wiley. ISBN: 978-0-470-59644-9

Chaffey, D., & Ellis-Chadwick, F. (2022). Digital marketing (8th ed.). Pearson. ISBN: 978-1-292-40099-0

Solmecke, C. (2023). Law in online marketing. Rheinwerk Computing. ISBN 978-3-8362-9601-4

Documentation of the tools:

- https://skillshop.withgoogle.com/ (Google Platform)
- https://support.google.com/analytics/answer/10089681 (GA4)
- https://plausible.io/docs (GA4 Alternative)
- https://developers.google.com/tag-platform/tag-manager?hl=de (GTM)

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

Module: 6150010
Website Development and Accessibility

Module profile

Exam number
6150010

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. Rolf Schillinger

Lecturer(s)
Prof. Dr. Tobias Aubele, Prof. Dr. Rolf Schillinger, Jannik Fuhr

Applicability	BEC
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
In this module, students learn the basic activities, knowledge and tools required to create modern and accessible websites. They acquire the skills to design simple websites from scratch, implement them using Wordpress as a content management system and finally publish them on the Internet. Special emphasis is placed on the early consideration of accessibility in accordance with the Web Content Accessibility Guidelines (WCAG). The latest AI tools are used in all phases to efficiently create and optimise content and structures.

In detail, this module deals with

- The basics of HTML and CSS (semantics, structure, design, responsiveness)
- Introduction to content management systems, in particular WordPress
- Use of AI to create and optimise websites
- Basics of web hosting
- Introduction to digital accessibility and application of the WCAG 2.1/2.2 guidelines

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

- create simple, standards-compliant websites independently using HTML and CSS
- publish created websites online independently
- use Large Language Models (LLMs) in a targeted manner to generate the technical foundations and specific content for Wordpress-based websites
- apply the basic requirements of the Web Content Accessibility Guidelines (WCAG 2.1/2.2) when creating new websites
- systematically analyse and evaluate existing websites with regard to their accessibility

Literature
Google Developers (https://web.dev)

Grigorik, I. (2013). High Performance Browser Networking: What every web developer should know about networking and web performance. O'Reilly Media. ISBN 978-1-4493-4476-4, available online: https://hpbn.co/
Mozilla Developer Network (https://developer.mozilla.org/de/)
Müller, P. (2022). Getting started with HTML and CSS: Programming and designing websites (2nd ed.). Rheinwerk Verlag. ISBN 978-3-8362-9089-0
Springer, S. (2022). React: The comprehensive handbook for modern front-end development. With practical examples of Redux, TypeScript, SSR and PWA (2nd ed.). Rheinwerk publishing house. ISBN 978-3-8362-9254-2
W3C. (2023). Web Content Accessibility Guidelines (WCAG) 2.2. World Wide Web Consortium (W3C). https://www.w3.org/TR/WCAG22/

2. 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	BEC, BISD, BDGD
Semester according to SPO	2. 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: 6150100
Analysis

Module profile

Exam number
6150100

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)
Prof. Dr. Patrik Stilgenbauer

Applicability	BEC
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, discrete mathematics and linear algebra

Content
Complex numbers
Elementary functions and function properties
Differential calculus in one and more variables
Integral calculus in one variable
Application of analysis in 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:
Students acquire in-depth knowledge of central concepts and techniques of analysis. In particular, they master basic methods of differential and integral calculus, which are required for subjects such as statistics (especially probability theory) and as a basis for operations research

The ability to develop and implement solution strategies:
Students will be able to analyse typical problems in differential and integral calculus and develop and implement suitable solution strategies. The methodological skills acquired in the course "Discrete Mathematics and Linear Algebra" are further developed by working independently on exercises.

Ability to think logically, analytically and conceptually:
By understanding mathematical texts and systematically working on mathematical tasks, students further develop their ability to think abstractly, logically and analytically.

Literature
Brill, Manfred: Mathematics for Computer Scientists; Hanser Verlag; Munich/Vienna.
Hartmann, Peter: Mathematics for Computer Scientists; Vieweg + Teubner, Wiesbaden.
Ihrig, Holger; Pflaumer, Peter: Finanzmathematik - Intensivkurs; Oldenbourg Verlag; Munich.
Oberguggenberger, Michael and Ostermann, Alexander: Analysis für Informatiker, Springer Vieweg, Berlin.
Papula, Lothar: Mathematics for Engineers and Scientists 1 and 2, Vieweg + Teubner, Wiesbaden.
Schubert, Matthias: Mathematics for Computer Scientists, Vieweg + Teubner, Wiesbaden.
Teschl, Gerald and Teschl, Susanne: Mathematics for Computer Scientists - Volume 2 (Analysis and Stochastics), Springer Vieweg.
Tietze, Jürgen: Einführung in die Finanzmathematik, Vieweg + Teubner, Wiesbaden.

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

Module: 6150090
Cloud and Infrastructure

Module profile

Exam number
6150090

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
English

Organisation

Responsible lecturer
Prof. Dr. Rolf Schillinger

Lecturer(s)
Prof. Dr. Rolf Schillinger, Christine Zilker

Applicability	BEC
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
none

Content
This module first deals with the basics of network communication and then builds on this to introduce central concepts of modern cloud technologies.

In particular, the following topics are covered:

- Communication processes in the IP environment
- Tasks of the physical layer
- Structure and functionality of various Ethernet protocols
- Use of auxiliary protocols such as ICMP, ARP, DNS
- TCP/IP application protocols
- Basics of HTTP, HTTP caching and tuning, HTTP cookies
- Basics of secure communication via TLS and introduction to PKI
- Cloud computing and operating models
- Introduction to the service models: IaaS, PaaS (e.g. using Microsoft Azure as an example) and SaaS
- Properties and areas of application of public, private and hybrid clouds
- Containerisation and modern deployment
- Basic principles of containerisation
- Kubernetes as an example of an orchestration solution in the container environment

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
After successfully completing the module, students will be able to

- describe and analyse the communication of devices and applications within a TCP/IP network
- explain the most important communication processes in the IP environment (e.g. addressing and routing)
- differentiate between the most important protocols of the TCP/IP application layer (e.g. HTTP, HTTPS, DNS, ...)
- differentiate between the various cloud operator models (Iaas, Paas, Saas, public / hybrid / private cloud) and use them in a targeted manner
- plan, implement and evaluate the deployment of a simple web application in a cloud environment

Literature
Grigorik, I. (2013). High Performance Browser Networking: What every web developer should know about networking and web performance. O'Reilly Media. ISBN 978-1-4493-4476-4, available online: https://hpbn.co/
Mozilla Developer Network (https://developer.mozilla.org/de/)
Tanenbaum, A. S., & Bos, H. (2014). Modern operating systems (4th ed.). Pearson International. https://elibrary.pearson.de/book/99.150005/9781292061955. ISBN 978-1-292-06195-5
Turnbull, J. (2021). The Docker book: Containerisation is the new virtualisation (latest ed.). Self-published. ISBN 978-0988820203

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6101810
Statistics

Module profile

Exam number
6101810

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. Patrik Stilgenbauer

Lecturer(s)
Prof. Dr. Patrik Stilgenbauer

Applicability	BEC
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
none

Content
Descriptive statistics:
- Basic concepts
- Frequency distributions
- Location parameters, scattering parameters, concentration measures
- Linear correlation and regression calculation
- Spearman correlation (with SEO application)
- Time series analysis
- Preparation and presentation of statistical results with Excel and R

Probability theory:
- Result set, events, concept of probability
- Conditional probability and independence
- Combinatorics
- Theorem of total probability and Bayes' theorem
- Law of large numbers
- Discrete and continuous random variables (in particular binomial and normal distribution)
- Limit theorem of de Moivre-Laplace

Inductive statistics:
- Estimation methods
- Significance tests
- AB tests and multivariate test procedures

Application and visualisation of statistical methods using programming examples in Excel and R

Examination

Required prerequisites for the participation in the examination according to the SPO appendix

-

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

-

Learning outcomes

Students acquire basic knowledge of descriptive statistics, probability theory and inductive statistics. They are able to apply statistical methods for data preparation, data analysis and for testing hypotheses in the application field of e-commerce. In addition, they recognise the importance of statistical evaluations in a business context and can interpret statistical results appropriately.

The module contributes to the following competence areas of the degree programme:

Mathematical and scientific fundamentals: Understanding basic mathematical concepts of statistical methods.

Problem-solving skills: Derivation and application of suitable statistical methods for processing data-related issues.

Methodological competence: Structured selection and safe application of basic statistical methods and promotion of analytical and logical thinking.

Practical experience and professional competence: Application of statistical methods to practically relevant issues in e-commerce.

Literature

Bamberg, G., Baur, F. and Krapp, M.: Statistics, De Gruyter Oldenbourg, 2022.
Bourier, G.: Descriptive Statistics, Springer Gabler, 2025.
Bourier, G.: Probability theory and inferential statistics, Springer Gabler, 2018.
Henze, N.: Stochastics for beginners, Vieweg + Teubner, 2011.
Kurt, N.: Stochastics for Computer Scientists, Springer Vieweg, 2020.
Teschl, G. and Teschl, S.: Mathematics for Computer Scientists - Volume 2 (Analysis and Stochastics), Springer Vieweg, 2014.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6150070
System Communication

Module profile

Exam number
6150070

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. Tristan Wimmer

Lecturer(s)
Prof. Dr. Tristan Wimmer

Applicability	BEC
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
none

Content
The System Communication module teaches fundamental and practically relevant skills in the field of technical communication between software systems. The focus is on understanding how modern applications and services exchange data, provide functions and are integrated via interfaces (APIs).

Students learn about different types of interfaces, including REST, GraphQL, SOAP and file-based interfaces (e.g. CSV/XML via FTP or API). The advantages and disadvantages, areas of application and typical integration challenges are analysed theoretically and practically.

A special application context is the connection of Product Information Management (PIM) systems, as they are used in practice to manage and distribute product data. This includes communication with web shops, ERP systems or external data sources via APIs.

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

- apply different types of interfaces,
- understand the structure and function of APIs in general,
- analyse and use common communication protocols and data formats (e.g. HTTP, JSON, XML, CSV),
- consume APIs with Python,
- understand the role of PIM systems in system landscapes and implement their integration using APIs,
- consider security aspects such as authentication (e.g. API keys, OAuth2) when using interfaces
- recognise and rectify typical sources of error and integration problems.

Literature
Ritter, Thomas (2021): Understanding interfaces and APIs - A practice-orientated introduction
Hepp, Martin (ed.): Product information management - basics, concepts, systems

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6150080
Web Design and Prototyping

Module profile

Exam number
6150080

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. Christina Völkl-Wolf

Lecturer(s)
Prof. Dr. Christina Völkl-Wolf, Marius Müller

Applicability	BEC
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
none

Content
The module provides a basic introduction to central concepts, theories and methods of visual communication and web-based design. The focus is on the perception and effects of visual design in digital media and its structured, user-centred application in web and mobile interfaces.

Students acquire basic and initial in-depth skills in the design of digital interfaces and in prototyping with the web-based design and collaboration tool Figma. They deal with central design concepts from morphology, colour design, typography, semiotics as well as font and character systems and learn to use these concepts specifically for web interfaces, campaigns and interactive prototypes. A particular focus is on critically reflecting on the effect of visual design elements and analysing existing digital design work and websites.

Practical exercises form the didactic backbone of the module. These include exemplary image and interface analyses, creative finger exercises to recreate and vary existing interfaces as well as manual and digital design tasks. Students go through all the basic phases of the digital design process - from wireframes and structured layouts to clickable high-fidelity prototypes. They apply basic UI/UX principles, develop interactive user flows and use design components, auto-layout and variables for consistent design.

In addition to technical and design skills, communicative competences as well as presentation and reflection skills are also specifically promoted.

Practical case: science4all competition
As part of the module, students work on a practice-orientated competition (science4all) on a variety of topics. The aim is to develop a digital platform for the comprehensible and appealing visualisation of scientific or socially relevant content.
Students analyse existing applications and best practices, develop a design and content concept on this basis and implement this in the form of wireframes and clickable prototypes in Figma. The practical case includes the design of web interfaces, interactive user flows and any accompanying digital campaigns.

The work includes structured documentation of the design process, reflection on design decisions and presentation of the results in a final pitch. Design quality as well as user-orientation and conceptual stringency are assessed.

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 achieve the following learning outcomes:
Students will recall key terms, concepts and terminology of visual communication, web design and UI/UX design.
Students understand the effect of form, colour, typography, interaction and visual structure on the perception, user experience and usability of digital interfaces.
Students apply basic methods and principles of user-centred design in the conception of web interfaces, campaigns and mobile applications.
Students use Figma as a collaborative design and prototyping tool to create low- and high-fidelity prototypes using components, auto-layout and variables.
Students analyse existing websites and digital interfaces in terms of design quality, structure, interaction and user guidance.
Students evaluate their own and third-party prototypes on the basis of basic usability criteria, best practices and initial user feedback.
Students create user-centred, interactive prototypes in a team and present them in a structured and comprehensible manner in suitable presentation formats.

Literature
Web design & UX/UI design:

- Krug, Steve (2014). Don't Make Me Think: A Common Sense Approach to Web Usability. New Riders.
- Garrett, Jesse James (2011). The Elements of User Experience: User-Centered Design for the Web and Beyond. New Riders.
- Norman, Don (2013). The Design of Everyday Things. Basic Books.
- McElroy, Kathryn (2016). Prototyping for Designers. O'Reilly.
  Soegaard, Mads (n.d.). The Basics of User Experience Design. Interaction Design Foundation (online)

3. semester

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6101210
Databases

Module profile

Exam number
6101210

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. Frank-Michael Schleif

Lecturer(s)
Michael Rott

Applicability	BEC
Semester according to SPO	3. 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 module teaches the basic concepts and techniques of database development. The relational data model and the relational algebra are introduced as theoretical foundations. One focus is on database modelling, in particular the creation of entity-relationship models (ER models) and their conversion into relational schemas, taking normal forms into account. Introduction to the SQL language, including data manipulation, data queries and the definition of schemas and transaction management. Database development and administration is practised in practical exercises and semester-long projects.

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 basic concepts of data persistence and the differences between persistent and non-persistent data.
- Students can define the central terms of relational databases, such as relation, primary key, foreign key and normalisation.
- Students understand relational algebra and can apply simple operations to it.
- Students can explain the connection between conceptual, logical and physical data modelling and justify their significance for database development.
- Students are able to create entity-relationship models (ERM) for given use cases and convert these into relational schemas.
- Students are able to formulate and execute SQL queries for data manipulation (DML) and schema definition (DDL).
- Students can analyse existing database schemas and evaluate them with regard to redundancy, consistency and normal forms.
- Students are able to analyse technical information requirements and derive suitable data structures and queries from them.

Literature

- Michael Kofler (2024). Datenbanksysteme - Das umfassende Lehrbuch (2nd edition). Bonn: Rheinwerk Verlag GmbH
- Kemper, A., & Eickler, A. (2015). Database Systems - An Introduction (10th edition). Munich: De Gruyter Oldenbourg Verlag
- Elmasri, R., & Navathe, S. B. (2015). Fundamentals of database systems (7th edition). Munich: Pearson Studium
- Garcia-Molina, H., Ullman, J. D., & Widom, J. (2013). Database Systems: The Complete Book (2nd ed.). Upper Saddle River, NJ: Pearson
- Saake, G., Sattler, K.-U., & Heuer, A. (2011). Databases - Concepts and Languages (3rd ed.). Munich: Pearson Studium

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6102700
Mobile Systems and Applications

Module profile

Exam number
6102700

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)
Prof. Dr. Karsten Huffstadt

Applicability	BEC
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
In the Mobile Systems and Applications module, students acquire the ability to understand, critically scrutinise and practically apply mobile technologies and ubiquitous systems in the context of digital business processes. The focus is on the technological fundamentals of mobile platforms as well as design and user-centred aspects.

Specifically, the following content is covered:

- Introduction to mobile operating systems and app ecosystems
- Device classes and platforms (smartphones, tablets, wearables)
- Architecture of mobile applications (client/server, webview, cross-platform)
- Development of graphical user interfaces (UI/UX design principles)
- Access to device sensors (GPS, camera, acceleration sensor, etc.)
- Mobile APIs and data communication (RESTful services, JSON)
- Introduction to frameworks and development environments (Flutter, Android SDK etc.)
- Data protection, security and performance aspects in mobile applications
- Project work on the design of a mobile application

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
At the end of the semester, students can...

- recall relevant theories, models and methods of digital business and place them in the context of the research question (to remember)
- analyse the current state of research and explain the meaning of key terms, concepts and relationships (to understand)
- apply scientific methods and models specifically to a practical or research topic (to apply)
- systematically break down complex problems and critically evaluate data and sources of information (to analyse)
- evaluate research results, methods and sources with regard to validity, relevance and significance (to evaluate)
- design, structure and realise an independent scientific work that provides new insights for research or practice in the field of digital business (to create)

Literature
Zettel, J. (2021). Mobile Computing: Basics - Concepts - Applications. Springer Vieweg.
Schmidt, A. & Kranz, M. (2017). Mobile Interaction: Fundamentals, Design and Development of Mobile Applications. De Gruyter Oldenbourg.
Broy, M. (ed.) (2019). Ubiquitous Computing - Fundamentals, Applications and Challenges. Springer Vieweg.
Nazaré, A. (2023). Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 3. Packt Publishing.
Mednieks, Z., Dornin, L., Meike, G., & Nakamura, M. (2021). Programming Android: Java + Kotlin Edition. O'Reilly Media.
Möller, A. (2020). Praxisbuch Mobile App Entwicklung: Konzepte, Design, Umsetzung. Carl Hanser Publishing House.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6102210
Online-Marketing

Module profile

Exam number
6102210

Duration
1 semester

Frequency
Every winter 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-style instruction

Language of instruction
German

Organisation

Responsible lecturer
Prof. Dr. Christina Völkl-Wolf

Lecturer(s)
Prof. Dr. Christina Völkl-Wolf,
Jonas Heppt

Applicability	BEC
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
In the module, students acquire in-depth knowledge of central strategies, instruments and success factors in digital, specifically online marketing. They learn how companies acquire, retain and convert customers in the digital space - using measures such as search engine marketing (SEO/SEA), social media marketing, email marketing, affiliate strategies, etc.. In addition, trends in content marketing, performance marketing and data-driven campaign management will be discussed.

A central component of the module is a practical project with real companies in which students work in teams to develop, implement and present a specific online marketing strategy. This includes analysing the market, defining target groups, planning measures and selecting suitable channels and tools. The collaboration with the practice partners provides an authentic insight into the entrepreneurial reality of digital marketing work.

The aim of the module is to understand and apply strategic and operational online marketing holistically - from planning and implementation to data-based success monitoring.

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

- strategically categorise key online marketing tools (e.g. SEO, SEA, social media, email, affiliate) and apply them in a targeted manner,
- develop an online marketing strategy taking into account market analysis, target groups and customer journey,
- select and justify suitable digital channels and tools for implementing and managing marketing measures,
- interpret data-based performance indicators and derive measures for optimisation,
- design, implement and present a real marketing task in collaboration with a practice partner,
- develop practice-orientated solutions in a team and communicate them professionally.
- Observing data protection and legal framework conditions in online marketing: knowing the essential legal regulations and provisions in online marketing.

Literature

Bruhn, M. (2022). Digitales Marketing: Grundlagen, Instrumente, Praxisbeispiele (3rd ed.). Vahlen.
Faber, H., & Bachem, M. (2022). Online marketing: The comprehensive practical handbook on strategy, SEO, SEA, e-mail, content, performance & Co. (3rd ed.). Rheinwerk.
Meier, A., & Stormer, H. (2020). E-Business & E-Commerce Management (4th ed.). Springer Gabler. https://doi.org/10.1007/978-3-658-29297-1
Ungar, M. (2021). Performance Marketing: Fundamentals and Strategies for Digital Marketing Practice. Springer Gabler. https://doi.org/10.1007/978-3-658-34610-0

Furthermore - articles on the above topics in web and print:
Adzine, Website Boosting, Marketing Börse, Onlinemarketing.de, OMR (Online Marketing Rockstars), t3n, Sistrix Blog, BASIC thinking etc.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6102010
Accountancy

Module profile

Exam number
6102010

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. Christina Völkl-Wolf

Lecturer(s)
Prof. Dr. Mario Fischer,
Prof. Dr. Christina Völkl-Wolf,
Christian Holleber

Applicability	BEC
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
Basic knowledge of Excel is required for the business game

Content
A. Basic principles and definitions

Tasks of accounting
Key figures
Reporting in companies
Legal basics

B. External accounting

Inventory and stocktaking
Balance sheet, balance sheet classification and balance sheet analysis
Double-entry bookkeeping system
Recording current business transactions
Further aspects (tax, goods movement, depreciation)

C. Internal accounting

Differentiation from external accounting
Full cost accounting system
Partial cost accounting system

D. Simulation game e-commerce
The business game takes place over 2 days as part of the accounting module

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 the basics of accounting (internal/external) from an operational perspective.
- Students will be familiar with the basics of business accounting (GB) and cost and performance accounting (KLR).
- They will be able to apply double-entry bookkeeping and cost accounting in exercises and business games.

Literature
Bornhofen, M. et al.: Buchführung 1: Grundlagen der Buchführung für Industrie- und Handelsbetriebe, 24th edition, Wiesbaden, 2012.
Further literature will be announced in the lecture and in the business game

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Module: 6101600
Software Engineering

Module profile

Exam number
6101600

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. Isabel John

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

Applicability	BEC
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
Basic knowledge of object-orientated programming

Content
The discipline of software engineering is part of practical computer science and deals with all activities of software development from the user's idea to the tested, delivered system

Basic concepts
- Objectives and principles of software engineering
- Presentation of the result types of software development phases with method allocation
- Fundamentals of object-oriented function and data modelling with UML
- Object-oriented analysis based on UML (use case modelling, creation of static models, creation of dynamic models)

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

- Modelling
- Costs and benefits
- Software quality, quality assurance and testing (overview)
- Dynamic and static testing
- Configuration management (rudimentary)
- Fundamentals of data protection, privacy and ethics

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 acquire the following competences:

- Students understand special features of software that distinguish software from other products.
- Students remember the principles of software engineering and understand their application.
- Students analyse requirements in discussions with customers in order to record, model and specify them in a structured manner.
- Students apply UML diagram types (e.g. use case diagrams, class diagrams, activity diagrams, sequence diagrams) to model requirements.
- Students use UML diagrams to create designs.
- Students evaluate the role of quality assurance in the software development process and explain corresponding objectives and skills.
- Students understand the principles of analytical quality assurance and create test cases for various black-box and white-box methods
- Students remember basic data protection regulations and evaluate their application in software projects with regard to data protection and digital sovereignty.

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
- McLaughlin: Object-oriented analysis and design from head to toe, OReilly, 2017
- Kecher, Christoph; Hoffmann-Elbern, Ralf; Will, Torsten T.: UML 2.5: Das umfassende Handbuch, Rheinwerk Computing, 2021
- Spillner, A., & Linz, T.: Basiswissen Softwaretest: Education and Training for Certified Testers - Foundation Level according to ISTQB® Standard. dpunkt.verlag, 7th edition. 2024

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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.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6100230
Web Programming III

Module profile

Exam number
6100230

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. Tristan Wimmer

Lecturer(s)
Prof. Dr. Tristan Wimmer

Applicability	BEC
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
In this course, students consolidate their previous knowledge from Web Programming I and II and apply it to the Django web framework. Students will develop a web project during the semester and learn about the basic functionality of web frameworks, among other things.

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 course, students will know the basics of programming with regard to data types, control structures and exception handling and will be able to apply them confidently in the Python programming language. Furthermore, participants will have basic experience of working with the Python web framework and will be able to, among other things

- Understand the use of web frameworks
- Design REST interfaces independently
- Set up a new project with Django
- Safely apply the basics of Django

Literature
Will be announced in the course.

4. semester

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

Module: 6102110
Content Engineering

Module profile

Exam number
6102110

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. Tobias Aubele

Lecturer(s)
Prof. Dr. Tobias Aubele, Nils Stotz

Applicability	BEC
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
Knowledge of website creation and UX

Content
The Content Engineering module combines strategic content planning with technical implementation expertise and data-driven optimisation. It enables students not only to create digital content, but also to model it as structured data and empirically prove its effectiveness. Based on the content lifecycle, methods of information retrieval and semantic analysis are deepened. A central focus is on content modelling for multichannel architectures and the use of structured data (e.g. Schema.org) to maximise findability.
The validation of content strategies through web analysis, A/B testing and experimentation is a key focus. Students learn to formulate hypotheses on user guidance, set up experiments in a statistically sound manner and interpret results using web analysis tools. The establishment of a culture of experimentation in organisations is also addressed in order to transform decision-making processes from subjective opinions to data-based facts.
The module is rounded off by the design of accessible content and the considered use of generative AI tools. The aim is to understand content as a measurable product that is technically managed and continuously optimised through testing.

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 ...

- understand the technical principles of information retrieval and semantic analysis in order to understand the indexing of content by search engines.
- create media-neutral content models and taxonomies in order to structure content for complex multichannel architectures in a scalable way.
- apply standards for structured data (e.g. Schema.org) to ensure the machine readability and technical SEO performance of web content.
- create hypothesis-based A/B test scenarios to empirically test the effectiveness of content variants.
- analyse user behaviour and test results using web analytics tools to derive data-based recommendations for content optimisation.
- create digital content in strict compliance with digital accessibility guidelines to ensure accessibility for all user groups.
- critically evaluate the organisational requirements for a successful culture of experimentation and the use of AI tools in order to establish sustainable processes in companies.

Literature
Aubele, T.; Girke, D.: Barrier-free websites, Rheinwerk Verlag, 2025
Erlhofer, S.: Search engine optimisation: The comprehensive handbook, Rheinwerk Verlag, 2023
Hassler, M.: Digital Analytics with Google Analytics 4 and Co.: Analysing metrics, understanding visitors, using Google Analytics, mitp Business, 2023
Kohavi, R.: Trustworthy Online Controlled Experiments: A Practical Guide to A/B Testing, Cambridge University Press, 2020
Löffler, M.: Think Content!: Content strategy, content marketing, copywriting for the web, Rheinwerk Verlag, 2014
Manning, C.; Raghavan, P.; Schütze, H.: Introduction to Information Retrieval, Cambridge University Press, 2008
Rorig, D.: Being able to write texts, Rheinwerk Verlag, 2020

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

Module: 6101710
Senior Seminar

Module profile

Exam number
6101710

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. Mario Fischer

Lecturer(s)
Prof. Dr. Mario Fischer,
Prof. Dr. Christina Völkl-Wolf,
Prof. Dr. Rolf Schillinger

Applicability	BEC
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
Develop an understanding of current requirements, solutions, tools and trends in e-commerce.
Ability to analyse, develop and evaluate a completed and more complex topic in a problem-oriented manner, structure and deliver a presentation and prepare a written elaboration, discuss and defend the content in front of the plenum.

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, 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
Acquiring the ability to process and evaluate complex specialised topics in the broadest sense and to compile a comprehensible presentation and documentation of the results obtained.
Students present and document their results in the seminar.

Ability to expand existing knowledge independently:
Students learn to familiarise themselves with new content independently, to understand and, if necessary, apply it and to deepen and/or expand it on their own responsibility.

Ability to recognise significant technical developments:
Through the detailed discussions of the topics presented and the joint sorting into a larger professional environment, participants learn to differentiate and assess the potential that new technologies, methodologies or tools hold for their future field of work. This includes taking a critical look at data, surveys, statistics, etc. and jointly checking whether they meet the requirements of scientific quality.

The seminar topics deal with current and future-oriented technologies and methods and are issued anew for each event.

Literature
Issued on a case-by-case basis depending on the seminar topic

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

Module: 6100830
English Communication

Module profile

Exam number
6100830

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. Graeme Dunphy

Lecturer(s)
Prof. Dr. Graeme Dunphy

Applicability	BEC
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
Socialising and small talk;
Presentations;
Telephone conversations;
discussions and meetings;
Negotiations;
projects

This seminar is at level B2 of the CEFR.

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
This course focuses on improving oral language skills with regard to topics and situations relevant to the profession.

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: 6101510,6910200
IT Project Management

Module profile

Exam number
6101510,6910200

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/English

Organisation

Responsible lecturer
Prof. Dr.-Ing. Anne Heß

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

Applicability	BEC, BDGD
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

- 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

E-Commerce degree programme: In the non-dual degree programme, the lecturer determines the topics of the practical examples for seminar lessons and examinations. In the dual study programme, students can work on practical examples from the company in seminar lessons and examinations.

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

Module: 6100930,6810190
Innovation Management and Entrepreneurship

Module profile

Exam number
6100930,6810190

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. Michael Müßig

Lecturer(s)
Prof. Dr. Michael Müßig

Applicability	BEC, BISD
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
Intro: Motivation, innovation, company, founding a company, startup and a look at economic history
Definitions: Management, ... and all terms relating to innovation and types of innovation
Processes and correlations: Adoption and diffusion, acceptance
Prediction: Gartner's hypecycle and the three horizons
Innovation in the company, Schumpeter and the innovator's dilemma, disruption
Startup ecosystems
End-to-end: design thinking, personas and value proposition, business model canvas, lean startup and customer development, MVP and prototyping
The business plan, founding team
Growth and change, growth hacking
Founding, financing, designing and evaluating companies
Open and crowd innovation, Jugaad, frugal and sustainability in founding and innovation

CASE studies (alternating): Tesla, Kodak and digital photography, Fashion and TEC, Scoutbee, Vogel Communications

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

- Present and explain the terminology in the field of innovation management as well as business creation and management
- assess statements on regional and company-internal ecosystems for innovation and intra- and entrepreneurship
- Understand the importance of teams and team processes in the field of innovation development and business creation and be able to apply team-building methods
- Students learn the basics of a business plan in terms of its structure and creation and are able to develop and create one independently
- Identify the key tax, legal and economic building blocks of a successful business start-up and analyse their significance
- They will be able to present and design their own business model ideas using the methodical approaches of design thinking, value proposition and business modelling

Literature
Mandatory:
Hess, Thomas: Strategically managing digital transformation. Springer Fachmedien Wiesbaden GmbH, 2019
Osterwalder, Alexander; Pigneur, Yves et al: Business Model Generation, campus Verlag, 2013 (and more recent editions)
Ries, Eric: Lean Startup, 4th ed. Reline-Verlag Munich 2015
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: 6101400
Web Application and Development Systems

Module profile

Exam number
6101400

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. Rolf Schillinger

Lecturer(s)
Prof. Dr. Rolf Schillinger

Applicability	BEC
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
WebProg I - III
Databases
Introduction to web technologies

Content
- MVC architectures
- Convention over configuration, don't repeat yourself paradigms
- Object-relational mapping
- Modern web development toolchain (composer, npm, grunt, ...)
- Implementation of models, views and controllers, active record pattern, asset chain, dependency injection in Laravel or Flask
- JS frameworks and their connection to an API

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 MVC architectures and recognise and classify variants and modifications thereof
- recognise types of implementation of object-relational mapping
- Use modern toolchains
- analyse and structure project requirements
- plan and implement websites with the help of MVC frameworks such as Laravel and JS frameworks such as Vue.js

Literature
Will be announced in the course.

5. semester

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

Module: 6102410
Supervised Internship

Module profile

Exam number
6102410

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
Prof. Dr. Mario Fischer

Lecturer(s)
Prof. Dr. Mario Fischer

Applicability	BEC
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 points. 55 ECTS from 1st year of study

Recommended prerequisites for the participation in the module
None

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 Tobias Aubele

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

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

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. Gabriele Saueressig,
Prof. Dr. Christina Völkl-Wolf,
Aylin Heilsberg,
Katja Hollerbach,
Kerstin Betzel,
Julia Holleber,
Christian Genheimer

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.

Fundamentals of soft and professional skills, in particular
o Importance and fields of application of soft and professional skills in studies and work,
o methodical and reflective behaviour in a professional context.

Moderation and communication techniques, in particular
o Basics of moderation,
o Moderation techniques according to the Metaplan method,
o Structuring and visualisation of group processes.

Negotiation techniques, in particular
o Basics of conducting negotiations,
o Negotiation techniques according to the Harvard method,
o Interest- and solution-orientated communication.

Basics of body language, in particular
o Facial expressions, gestures and posture,
o Effect of demeanour and external appearance,
o conscious use of non-verbal communication.

Team and conflict management, in particular
o phases of team development,
o basic methods of team management,
o causes and forms of conflict,
o simple communication and solution strategies in conflict situations.

Fundamentals of scientific work, in particular
o Developing simple scientific questions,
o basics of literature research,
o Citation rules and avoiding plagiarism,
o organisation and structure of short scientific papers.

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: 5003859
Agentic AI: Enabling Autonomous and Goal-Driven Intelligence

Module profile

Exam number
5003859

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-Michael Schleif

Lecturer(s)
Manikanda Kumar

Applicability	BIN, BWI, BEC, BISD
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 programming, Fundamentals of AI/ML.

Content
This course is designed to introduce next-generation AI systems capable of autonomous decision-making, planning, reasoning, and self-improvement to students. Unlike traditional reactive AI models, Agentic AI systems can initiate actions, perform multi-step tasks, collaborate with other agents, and adapt to dynamic environments. This course equips learners with both theoretical foundations and hands-on experience in building autonomous AI agents.
The learners will explore agent architectures, cognitive models, memory systems, tool-use capabilities, multi-agent collaboration frameworks, and practical agent deployment workflows. Through lab exercises using modern frameworks such as Flowise, LangChain, AutoGen Studio, CrewAI, and AgentOps, students will build goal-driven agents, evaluators, planners, and multi-agent systems. Real-world applications from business automation, sustainability, smart systems, and software engineering will be emphasised throughout.
The course ends with a practical assessment where participants design, implement, and demonstrate a functional autonomous agent. By integrating theory, hands-on experimentation, and evaluation, this course provides a strong foundation for applying Agentic AI in academic, industrial, and research environments aligned with the green digital transformation.

1 Foundations of Agentic AI
Agentic AI - Autonomous AI vs Traditional AI - Agent lifecycle and capabilities - Types of autonomy in AI systems - Rule-based agents vs LLM-driven agents - Real-world examples of agents - maturity levels of autonomous systems - Application domains aligned to sustainability & green digital transition.
Interactive brainstorming: Where can agents be used in business?
2. agent architectures, memory, and planning
Cognitive architecture: perception, reasoning, memory, action - Memory systems in agents: short-term memory, episodic memory, vector-store memory, long-term memory - Planning systems: task decomposition, tree of thought, planner-executor architecture - Tool-calling & API integration - Evaluator-planner loops - Safety layers & guardrails.
3. building autonomous agents and tool-using systems

Agent capabilities: tool-use, retrieval augmentation, action loops - Safety, guardrails, and constraints, Using frameworks: LangChain Agents, AutoGen Studio, CrewAI worker-manager roles - Hands-on use cases: Research automation agents - Business workflow agents.

4. multi-agent systems, collaborations, and workflows

Multi-agent systems: roles & communication, Manager-worker architecture, Planner-agent-reviewer loops, Collaboration strategies: parallel, sequential, cooperative, Real-world MAS applications (smart grids, supply chain, robotics)

5. deployment, monitoring, ethics

Deployment workflows (local, cloud) - Logging, monitoring, and evaluation of agents - Safety, ethical issues & governance of autonomous systems - Responsible AI principles for autonomous systems - Real-world challenges: hallucination, error handling, misuse.

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
1. understand and explain the principles, architecture, and lifecycle of Agentic AI systems and compare them with traditional AI models.
2. design and implement autonomous agents using modern frameworks with capabilities such as planning, memory, tool-use, and reasoning.
3. evaluate and deploy single-agent and multi-agent systems for real-world applications related to sustainability, automation, and intelligent digital ecosystems.

Literature
Text Books:
Martin Ford "Architects of Intelligence: The truth about AI from the people building it" 2018.
Stuart J. Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall Series in Artificial Intelligence, 2009
Reference Books:
Kence Anderson, "Designing Autonomous AI: A Guide for Machine Teaching", O'Reilly Media, Inc., 2022

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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
Stefan Sauer

Lecturer(s)
Stefan Sauer

Applicability	BEC, BIN, BWI, BISD, BDGD
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/)

For scheduling see: https://geo.thws.de/studium/aktuelle-lehrveranstaltungsplaene/

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
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. Alexander Schinner

Lecturer(s)
Liane Kiesewalter,
Tobias Kasch

Applicability	BIN, BWI, BEC, BISD, BDGD
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, BISD, BDGD
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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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003856
CANVA – Branding with AI

Module profile

Exam number
5003856

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	BWI, BEC, BISD, BDGD
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
Own laptop, installation of the Pro version/test access to the CANVA programme.

Content
1. corporate identity - strategic
Understanding the terms
CI, CD, brand
Best practice examples from different industries, analysis of international brands
Positioning, brand values
Mission & vision
Identity models (e.g. Golden Circle)
Target group profile (e.g. persona)
Brand personality (mood board, archetype)
Tonality and language style

2.corporate design - visual
Derive a design system
From brand essence to visual system (design with Canva)
Logo
Colour scheme
Typography
Visual language
Layout principles (grid, white space, composition)

3. branding of a brand
Creation of social media content for the brand
Colour management and colour effect
Fonts and font design
Photo editing, graphics
Video, reels, stories

Development of a brand cosmos:
Creation of digital media and print media such as website, social media content, audio-visual content, business cards, etc.

Usage scenarios / application:
Self-employment/freelancing: A consistent CD helps with professional external image and differentiation.
Application folder/portfolio: Your own branding as a "common thread" creates recognition and demonstrates strategic thinking.

Start-ups & student initiatives: A clear brand identity simplifies communication, fundraising and community building.
Agency work: CI/CD expertise is a key qualification for strategic design processes on behalf of clients.
Research & science: Scientific projects also benefit from a coherent, comprehensible image.

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 students develop a complete corporate identity and corporate design
Concept for a real own project or a fictitious project / start-up including visual realisation with the help of Canva and AI applications. The aim is to design a consistent, professional brand image for a later real application. Confident use of CANVA as design software is a prerequisite.

Students will recognise key concepts of corporate identity and corporate design.
Students understand the importance of strategic brand management for digital communication media.
Students analyse CI/CD systems with regard to target groups, differentiation and use of media.
Students evaluate design solutions in the context of user experience, media formats and communication goals.
Students apply the content they have learnt and create a complete corporate identity concept including a cross-media design system for their own or a fictitious project.

Literature
https://www.canva.com/de_de/

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

Module: 5003861
Computer Networks for Practical Engineers

Module profile

Exam number
5003861

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. Rolf Schillinger

Lecturer(s)
Bishnu Prasad Gautam

Applicability	BIN, BWI, BEC, BISD, BDGD
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 course provides students with practical knowledge and skills in computer networks, focusing on how networks are constructed, configured, and operated by computer network engineers. The course begins at the physical layer with hands-on construction of LAN (Ethernet) cables, and then introduces fundamental concepts such as classful and classless IP addressing, switching, and routing.
Students will learn static routing as a foundation, followed by dynamic routing protocols including RIP, OSPF, and BGP through practical laboratory exercises. The course also introduces essential network security concepts, with particular attention to firewalls and basic network protection mechanisms required in real network environments.
In the final part of the course, students are introduced to next-generation networking paradigms, such as IoT, Software-Defined Networking (SDN), and Quantum Networks, providing insight into future network evolution. In addition to delivering a broad foundation in computer networking for IT and engineering careers, this course also supports self-study towards the 200-301 Cisco Certified Network Associate (CCNA) exam by developing relevant conceptual understanding and practical skills.

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 fundamentals of computer networking, including LAN construction, network components, and basic communication principles used in modern information systems.
- The students apply IP addressing, VLAN configuration, and routing concepts to design and configure small- to medium-scale networks using both static and dynamic routing methods.
- The students analyse and compare dynamic routing protocols such as RIP, OSPF, and BGP, and explain their operational principles, use cases, and performance characteristics.
- The students design and implement practical network topologies by integrating routers, switches, and end devices, and verify connectivity through hands-on configuration and testing.
- The students understand emerging and future network systems, including IoT, Software-Defined Networking (SDN), and quantum networks, and evaluate their potential impact on security, scalability, and next-generation communication infrastructures.

Literature
Will be provided at start of module.

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

Module: 5003862
Data Analytics

Module profile

Exam number
5003862

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)
Dr. Jaani Väisänen

Applicability	BIN, BWI, BEC, BISD, BDGD
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
No coding required. Install Altair AI Studio before the course; a university student licence is available via https://web.altair.com/altair-student-edition.

Content
This course gives business students a practical, no coding introduction to data analytics using Altair AI Studio. You'll learn to build an end to end analytics workflow-from importing and preparing data to selecting variables, building models, evaluating performance, and interpreting results for business decisions.

- Course kickoff, AI Studio workflow basics, and practical data preparation for modelling
- Regression

o Concept: what regression explains
o Hands on workflow: build a regression model in AI Studio
o Validation and model goodness: simple train/validation/test incorporating key fit metrics

- Clustering

o Concept: grouping similar cases
o Hands on workflow: prepare data and create clusters in AI Studio
o Validation and model goodness: choosing a useful number of clusters for the business question

- Tree models

o Concept: classification and interpretable drivers
o Hands on workflow: build and read a decision tree in AI Studio
o Validation and model goodness: cross validation and practical classification metrics

- Association analysis:

o Concept: co-occurrence and recommendations
o Hands on workflow: create association rulesets in AI Studio
o Validation and model goodness: support, confidence, and lift

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 course, students will be able to:
1. construct end-to-end analytics workflows (Apply/Create): Independently design and execute complete data mining processes within Altair AI Studio-from data import and cleansing to model generation-without relying on programming code.
2. analyse and select Appropriate Methodologies (Analyze): Diagnose specific business problems to determine the most suitable analytical technique (Regression, Clustering, Decision Trees, or Association Analysis) based on the structure of the data and the desired business outcome.
3. evaluate model performance and robustness (Evaluate): Critically assess the quality of analytical models by interpreting quantitative validation metrics (such as R^2, Lift, Confidence, and Cross-Validation scores) to distinguish between statistical noise and reliable patterns.
4. synthesise data into business strategy (Create): Translate technical model outputs into actionable business insights and formulate data-driven strategic recommendations for management.

Literature
will be specified in the lecture.

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

Module: 5003852
Digital Sovereignty - Operational Concepts and Technologies

Module profile

Exam number
5003852

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.-Ing. Tobias Fertig

Lecturer(s)
Prof. Dr. Michael Müßig,
Prof. Dr.-Ing. Tobias Fertig,
Andreas Schütz

Applicability	BIN, BWI, BEC, BISD, BDGD
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 module teaches basic concepts of digital sovereignty with a focus on the operational and technical implementation level.
After an introduction to key terms (e.g. dependencies on platform providers, data sovereignty, vendor lock-in, open source, open standards), specific technical alternatives and tools are considered.

Topics covered include
- Open source software vs. proprietary solutions
- Full stack open source (OS): in e-commerce, IT security, knowledge management, ERPs, ...
- Digital sovereignty at all levels: From hardware to payment flows (PayPal, ApplePay, GooglePay vs. digital euro, GNU Taler, Wero, etc.)
- Cloud alternatives (self-hosting, European cloud providers)
- Open standards and interoperability
- Data protection, encryption and data storage
- Practical examples from administration, education and companies

In the project-oriented part, students work in teams on specific application scenarios (e.g. digital infrastructure of a university, an SME or a municipality).
The aim is to develop realistic technical concepts to improve digital sovereignty.
The results are presented and reflected upon at the end of the semester as part of a transfer conference with a public audience and jury.

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 can name key terms, players and motivations of digital sovereignty.
- Students can explain how technical dependencies arise through software, cloud services and platforms.
- Students can select suitable open source and open alternative solutions for specific application scenarios.
- Students can analyse existing digital infrastructures with regard to dependencies, risks and sovereignty deficits.
- Students can compare technical solutions in terms of costs, maintainability, security and sustainability.
- Students can design and present an operational concept for improving digital sovereignty for a defined scenario.

Literature

- https://link.springer.com/book/10.1007/978-3-031-69994-8
- https://direct.mit.edu/books/monograph/3504/The-StackOn-Software-and-Sovereignty
- https://link.springer.com/article/10.1007/s44206-024-00146-7

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Faculty of Computer Science and Business Information Systems
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
This module focuses on the design and development of an e-commerce website over the course of one intensive week, with a primary emphasis on emotional and persuasive design. The module combines theoretical foundations with hands-on, iterative practice, enabling students to apply design principles directly to real e-commerce contexts. The work is grounded in user experience design and extends to ethical design in relation to dark patterns, as well as growth hacking as a means of improving and optimising digital commerce solutions.
Throughout the week, students work in teams to design, build, and iteratively refine an e-commerce website. All student teams are provided with access to a shared web hosting environment supplied by the course teacher, which is used throughout the week for building and testing the e-commerce sites. Theoretical concepts are continuously applied through practical implementation, user testing, and reflection. Applying theoretical concepts in practice, combined with iterative testing and refinement of the students' e-commerce websites, provides valuable insights. This process helps students recognise and understand different user groups, learn how to engage them emotionally, and ethically apply emotional and persuasive strategies in an e-commerce context.

- Introduction to basic operations and UX principles.

Students set up the e-commerce website using WordPress and WooCommerce on the provided web hosting environment, define target groups, and create user personas.

- Emotional Design.

Students design and implement emotional design strategies tailored to their selected target groups and personas.

- Persuasive Design and Ethical Design.

Students conduct user testing, apply persuasive design strategies, and develop the next iteration of the website while identifying and avoiding dark patterns.

- Growth Hacking for e-commerce.

Students conduct further user testing, finalize the website, and develop a plan for growth and optimisation.

- Presentation and Reflection.

Students present their completed websites and key findings, followed by reflection on the design and development process.
Mornings are dedicated to theoretical sessions, while afternoons focus primarily on hands-on activities, such as e-commerce site building, user testing, and interviews.

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 module, students will be able to:

- apply emotional and persuasive design principles in e-commerce website design
- design and evaluate user experiences for different target groups
- recognise ethical challenges in persuasive design in relation to dark patterns
- iteratively improve an e-commerce website based on user testing and feedback
- reflect on the role of emotional and persuasive strategies in digital commerce

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. Benjamin Weggenmann

Lecturer(s)
Paulius Baltrušaitis

Applicability	BIN, BWI, BEC, BISD, BDGD
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 learning 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 during lessons

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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
Seminar

Language of instruction
English

Organisation

Responsible lecturer
Prof. Dr. Andreas Lehrmann

Lecturer(s)
Prof. Dr. Andreas Lehrmann

Applicability	BIN, BWI, BEC, BISD, BDGD
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
[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: 5003853
Artificial Intelligence in Marketing and E-Commerce

Module profile

Exam number
5003853

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. Ivan Yamshchikov

Lecturer(s)
Prof. Dr. Ivan Yamshchikov

Applicability	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 use of artificial intelligence is fundamentally changing business models and processes in digital commerce. Companies are using AI to personalise customer experiences, use marketing budgets more efficiently and make data-based decisions along the customer journey. In this module, students learn about key methods of artificial intelligence and apply them to typical problems in marketing and e-commerce. The focus is not only on technical understanding, but also on business evaluation and ethical reflection.

I. Typical problems from marketing and e-commerce:
- Introduction to artificial intelligence and machine learning in e-commerce
- Personalisation and recommendation engines
- Customer classification and segmentation using clustering and decision trees
- Predictive models for purchasing behaviour, churn prediction and dynamic pricing
- Chatbots and language models in customer service (basics of natural language processing)
- Automation of online advertising and campaign management using AI
- Data protection, algorithmic fairness and ethical issues in the use of AI

II Technical scope.

Introduction to artificial intelligence (AI)
Overview: The development of AI in recent decades.
Concepts: Difference between symbolic AI (logic-based) and sub-symbolic AI (data-based).
Classical methods: Early models such as Adatron, Boltzmann machines, Hopfield networks and cellular automata.
Knowledge representation: Introduction to semantic networks, ontologies and (fuzzy) logic.

Main concepts and principles of machine learning (ML)
Types of learning: Supervised, unsupervised and reinforcement learning.

Learning objectives: Prediction (regression/classification) and knowledge discovery (clustering/density estimation).
Formalisation: The mathematical description of the learning problem.
Ethics: Social implications and ethical issues of ML.

Basics of learning from data
Objective function: The loss function
Risk: Expected and empirical risk in learning.
Model complexity: Overfitting and underfitting.
Process: Training, validation and testing of models.
Evaluation: How to evaluate models and select the best one.

Selected machine learning algorithms
Linear models: For the prediction of values or categories.
Regularisation: Methods such as ridge regression to avoid errors.
Variable selection: Sparse models (e.g. Lasso) to identify important data features.
Mixed models: K-Means clustering and Gaussian mixed models (GMM).
Non-parametric methods: Kernel methods, decision trees and random forests.

Programming for machine learning
Languages: Practical work with Python.
Tools: Use of important libraries such as NumPy, Pandas, Scikit-learn and Jupyter Notebooks.

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 have the following competences:
1. students understand basic methods of artificial intelligence and their application in digital marketing and online commerce. They analyse business-related data and develop AI-supported solutions for personalisation, customer loyalty and increased efficiency in digital business models.
2. students work together purposefully in project groups and take on roles in technical and business problem solving. They communicate their results appropriately and reflect critically on team processes.
3. students apply basic methods of machine learning, segmentation, recommendation and prediction models in practice. They use commercially available tools (e.g. Google AI, Python) to analyse and develop data-based solutions.
4. develop their ability for self-organised knowledge acquisition and critically reflect on the contribution of AI to digital business strategies.

Literature
1 Bishop, Christopher M. Pattern Recognition and Machine Learning. Information Science and Statistics. New York: Springer, 2006.
2 Murphy, Kevin P. Machine Learning: A Probabilistic Perspective. Adaptive Computation and Machine Learning Series. Cambridge, MA: MIT Press, 2012.
3 Hastie, Trevor, Robert Tibshirani, and JeromeFriedman. The Elements of Statistical Learning. Springer Series in Statistics. New York, NY, USA: Springer New York Inc, 2001.
4 Russel, S, Norwig, P. Artificial Intelligence: A Modern Approach, Pearson, 2022

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003133
Logistics Management in E-Commerce

Module profile

Exam number
5003133

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. Tobias Aubele

Lecturer(s)
Oliver Dahms

Applicability	BEC, BDGD
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 logistical contexts, analytical skills, networked and interdisciplinary thinking

Content
The module provides a holistic understanding of the logistics value chain in e-commerce, from the strategic selection of fulfilment models to the technical implementation of intralogistics systems. Students deal intensively with the CEP sector (courier, express and parcel services) and its networks, as these form the critical interface to the end customer.

A technical focus is placed on the planning and dimensioning of intralogistics systems. Based on real order and article structure analyses, students learn to plan material flows and select suitable storage and picking techniques. Operational management aspects such as personnel deployment planning, performance management using SLAs and KPIs and returns management are also covered. The module is rounded off with modern approaches to re-commerce in order to sustainably close ecological and economic cycles.

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
The students ...

- evaluate different fulfilment strategies (make-or-buy) taking into account costs, flexibility and service quality in order to make well-founded sourcing decisions.
- analyse the structures and trends in the CEP industry and its networks in order to understand the dependencies of the "last mile" in e-commerce.
- analyse complex article and order data (e.g. using ABC analyses) in order to derive quantitative requirements for logistics systems.
- create rough concepts for intralogistics systems by selecting and combining suitable subsystems (storage, conveyor, picking technology) based on the requirements data.
- apply methods of personnel deployment planning to develop flexible working time models that efficiently cushion fluctuations in order volumes.
- create a system of key performance indicators (KPIs) and define service level agreements (SLAs) to manage the performance of internal or external logistics processes.
- develop concepts for efficient returns management and re-commerce in order to manage returns rates economically and return products to the material cycle.

Literature
Aggtelekey, B. - Factory Planning , Volume 1-3
Jünemann, R. - Material Flow and Logistics
Pfohl H.-C. - Logistics Systems
Gudehus, T. - Logistics: Fundamentals Strategies Applications
Arnold, D.; Isermann, H. - Handbook of Logistics
Fischer, M.; Dittrich, L. - Material Flow and Logistics
Goldratt, E. M.; Cox, J. - The goal
Packard, D. - The Hewlett Packard Story
Peters, T. - In search of excellence
Womack, J. P. - The second revolution in the automotive industry
Masaaki, I. - Kaizen
Michael Pulverich, Jörg Schietinger - Manual Order Picking
Jay R. Galbraith - Disigning Oganisations
Helmut Baumgarten - The best of logistics
Willibald A. Günthner - Technical Innovations for Logistics
Detlef Spee - Successfully implementing lean warehousing
Detlef Spee - Designing efficient warehouse processes

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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, BISD
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: 6102800
Project Work

Module profile

Exam number
6102800

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. Tobias Aubele

Lecturer(s)
Prof. Dr. Tobias Aubele,
Prof. Dr. Mario Fischer,
Prof. Dr. Christina Völkl-Wolf,
Prof. Dr. Rolf Schillinger,
Prof. Dr. Tristan Wimmer

Applicability	BEC
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 selection, software introduction). Each project is supervised by a professor from the Faculty of Computer Science and Business Informatics. In the course of the project work, the techniques and methods learned in business informatics are practised in a practical professional context (teamwork; project organisation; practical tasks).
Minimum content of the written project work:

- For software development
- Requirements specification in which the requirements for the project work are summarised (with milestones/schedule)
- Technical design using appropriate methods
- IT design
- Listing
- User manual
- Appendix (literature used; list of abbreviations, glossary, etc.)
- For other tasks:
- Project description in which the requirements for the project work are summarised (with milestones/schedule)
- Further contents to be specified by the supervising professor, which result from the individual character of the respective assignment
- Appendix (literature used; list of abbreviations, glossary, etc.)

The topics of the practical examples for the examination are provided by or agreed with the lecturer in the traditional degree programme. In the dual study programme variant, a practical assignment is worked on in consultation with the lecturer.

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 can methodically process and solve comprehensive tasks. Students can develop and implement suitable solution strategies in a team. They know how team processes work and how they can contribute their own personality.

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: 5003865
Quantum Computing

Module profile

Exam number
5003865

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-Michael Schleif

Lecturer(s)
Divya Rani

Applicability	BIN, BWI, BEC, BISD, BDGD
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 Linear Algebra and Python Programming

Content
This course provides a comprehensive introduction to the principles, mathematical foundations, hardware concepts, and programming tools of quantum computing. Students will explore qubits, superposition, entanglement, quantum gates, algorithms, noise models, error correction, and real-world applications. Hands-on sessions using Qiskit enable learners to construct and simulate quantum circuits and run programs on IBM Quantum devices.

1. foundations of quantum computing
Classical vs Quantum computation, Qubits and quantum states, Superposition and entanglement, Dirac notation (bras & kets),Bloch sphere representation, Quantum measurement and collapse, Physical implementations of qubits: Superconducting, Ion traps, Photonic systems.
2. quantum gates and quantum circuits
Single-qubit gates: Pauli-X, Y, Z, Hadamard (H), Phase, S, T, Multi-qubit gates: CNOT, Swap, Controlled phase, Building quantum circuits, Reversible computing principles, Quantum circuit simulation tools, IBM Qiskit basics, Circuit construction & visualisation, Noise, error sources & decoherence.
3. quantum algorithms
Quantum parallelism, Deutsch-Jozsa algorithm, Grover's search algorithm, Shor's factoring algorithm Quantum Fourier Transform (QFT), Phase estimation, Variational Quantum Algorithms (VQA): VQE, QAOA
4. quantum hardware, noise & error correction
NISQ (Noisy Intermediate-Scale Quantum) era systems, Quantum noise models: Bit flip, Phase flip, Depolarising noise, Quantum error correction basics: Shor code, Steane code, Surface code (overview), Fault-tolerant quantum computation, Quantum supremacy claims (Google, IBM).
5. applications, future trends & quantum programming
Quantum cryptography (BB84, QKD), Post-Quantum Cryptography (PQC), Quantum Machine Learning (QML) basics, Quantum optimization (QAOA use cases), Quantum simulation in chemistry & physics Hands-on Qiskit programming: Creating circuits, executing on simulators, Running on IBM Quantum 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
English

Condition for the award of credit points
None

Learning outcomes
On successful completion of the course the students shall be able to
1. explain the fundamental concepts of qubits, superposition, entanglement, and quantum measurement.
2. construct and simulate quantum circuits using quantum gates and operators.
3. analyse the working of major quantum algorithms and identify their computational advantages.
4. understand hardware constraints, quantum noise, and basic quantum error correction techniques.
5. implement quantum programs using Qiskit and evaluate applications of quantum computing across domains.

Literature
Textbook(s):
1 Nielsen, M., & Chuang, I. Quantum Computation and Quantum Information, Cambridge University Press, 2010.
2. Yanofsky, N., & Mannucci, M. Quantum Computing for Computer Scientists, Cambridge University Press, 2008.
References:
1. IBM Quantum Documentation - https://quantum-computing.ibm.com
2. Qiskit Textbook - https://qiskit.org/learn
3 Preskill, J. Quantum Computing in the NISQ Era.
4. Arun P. Quantum Computing: An Applied Approach, Springe
Online Resources (e-books, notes, ppts, video lectures etc.):
1. Qiskit Tutorials: https://qiskit.org/tutorials
2. Quantum Algorithms Zoo: https://quantumalgorithmzoo.org
3. MIT OCW - Quantum Computation
4. IBM Quantum Lab (free cloud access).

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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, BISD, BDGD
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
The students remember fundamental RE models, methods, and their relevance in the software development process.
The students understand the importance of requirements engineering, including stakeholder analysis, in diverse project contexts, including international and AI-driven projects.
The students apply requirements elicitation techniques and modelling methods, such as UML, use cases, user stories, and non-functional requirements, to real-world scenarios.
The students analyze requirements through negotiation, prioritisation, and validation against quality criteria to ensure completeness and clarity.
The students evaluate different RE approaches and adapt techniques suited for specific domains like machine learning and generative AI systems.
The students create comprehensive requirements specifications and models that address the needs of complex, modern software systems, including AI applications.
The students are able to adapt requirements engineering techniques for generative artificial intelligence based systems

Literature
Cockburn, Writing Effective Use Cases, Addison Wesley, 2016
Hull, Requirements engineering, Springer Verlag, 2019
Berenbach, Software & Systems Requirements Engineering: In Practice, McGraw Hill, 2017
Chris Rupp & the SOPHISTs , Requirements Engineering (in German), Hanser, 2022
Huyen, Chip. Designing machine learning systems. " O'Reilly Media, Inc.", 2022.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003857
Seminar Smart Systems

Module profile

Exam number
5003857

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. Arndt Balzer

Lecturer(s)
Prof. Dr. Arndt Balzer

Applicability	BIN, BWI, BEC, BISD, BDGD
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
Courses in the field of computer engineering

Content
Contents: In the specialisation module, students work independently on topics from the field of smart systems. Solutions (hardware and software) are developed and presented.
Topics from previous years (selection): AI based checkout, Braille Reader, Inverse Pendulum, Kalman Filtering, Pathfinding with Turtlebot, Quadrocopter, Radar + Lidar, ROS (Robot Operating System), SDR (Software Defined Radio), SLAM (Mapping, Localisation, Navigation), Supervised Learning, Reinforcement Learning, Rock-Paper-Scissors on Pepper, WIFI Indoor Localisation, ...
The seminar is organised under a regularly updated umbrella topic, for which individual topics are assigned. The topics are determined at the beginning of the seminar and are based on current developments. Actuators and sensors, low performance systems through to smartphones, their programming and evaluation of prototype implementations are always of interest.

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
Learning objectives: By dealing with a selected topic, the ability to deal with challenging topics is deepened.

- The students acquire mathematical and technical basics
- Derive the specialised knowledge required for their specific topic or area of application
- Implement this knowledge using the methods they have learnt and acquire additional confidence in their application

The findings are documented and the results are presented at the end of the seminar

- Students acquire the skills to document and present results in a comprehensible manner.
- Students apply methods of scientific work including (literature) research.
- Students generalise their ability to independently expand existing knowledge and quickly familiarise themselves with the topics of others (fellow students)

Literature

- Will be announced in each case.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003854
Smart Agriculture

Module profile

Exam number
5003854

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. Peter Braun

Lecturer(s)
Prof. Dr. Peter Braun,
Prof. Dr. Isabel John

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 module deals with typical problems of smart agriculture using a concrete example: systematic data acquisition in the field with drones, structured processing and analysis of image data and the derivation of comprehensible key figures and maps as a basis for an initial inspection. Building on this, methods for image-based detection and quantification of anomalies are developed and integrated into simple data management with visualisation. A further focus is on the validation of image-based findings using independent measured values and on the statistical testing and interpretation of relationships using correlations. The implementation is carried out prototypically in the form of software artefacts and presentations of results.

The module is carried out in cooperation with the partner university Suwa University of Technology in Japan and is supported by teaching contributions from professors at the partner university. An important part of the module is an excursion to Suwa University, during which the prototype results are further developed, validated and jointly presented together with Japanese students. Intercultural content includes manners, communication styles in emails and video conferences, joint laboratory work, projects and presentations as well as behaviour and everyday rules on site in Japan.

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 describe central data sources and outputs (drone images/ logs, AI results, measured values) and organise them into a consistent data flow.
- Students implement a traceable data pipeline in Python including simple quality controls and reproducible exports (e.g. GeoTIFF/PNG, reports).
- A group of students calculate ExG/VARI/NDVI and interpret index maps critically under field conditions (light changes, shadows, missing bands).
- A group of students explain basic AI tasks (classification, detection, segmentation) and assess limitations due to domain shift and uncertainty in the field.
- A group of students correlate physiological measurements (Fv/Fm, chlorophyll index) with image/KI metrics (Pearson/Spearman) and derive an evidence-based assessment.
- Students explain basic forms of behaviour and politeness in the Japanese university environment and derive an appropriate appearance in meetings and on site.
- Students formulate professional emails and prepare video conferences with Japanese contacts in a structured manner.
- Students lead their project using appropriate project management methods and pay attention to intercultural project management aspects during the excursion and interaction with Japanese students

Literature
Will be announced later in the seminar.

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

Module: 5003098
Social Media in the business world

Module profile

Exam number
5003098

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. Christina Völkl-Wolf

Lecturer(s)
Tobias Tellers,
Philipp Oberkalkofen

Applicability	BEC, BDGD, BISD
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 social media, use of internet applications
- Interest in corporate communications

Content
The module focuses on the professional development and implementation of social media strategies. Students learn to define strategic goals and analyse target groups in a differentiated manner. They receive a comprehensive overview of relevant social media channels and their targeted use, in particular blogs, Facebook, X (formerly Twitter), YouTube, Instagram and professional networks such as XING and LinkedIn. Another focus is on the sensible combination and linking of these platforms and their integration into overarching marketing strategies.

In addition, methods of monitoring, measuring success and social media controlling are taught. Particular attention is paid to community management as a key factor for successful communication in social networks. This includes the development of a community strategy, the basics of online dialogue, dealing with challenges such as trolls or shitstorms and the basic principles of crisis communication. Students also learn how community engagement can be specifically promoted and positively influenced by psychological factors. The range of topics is supplemented by the development of a content strategy, the use of social customer service and suitable methods for monitoring the success of community 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
After successfully completing the module, students will be able to:
Students identify key terms, building blocks and technical foundations of social media strategies in a corporate context.
Students categorise social media platforms, target groups and communication formats and explain their respective application possibilities.
Students use the principles of community management in practical situations to activate, moderate and maintain online communities.
Students differentiate between typical dialogue situations and challenges in social media dialogue and structure corresponding interaction and reaction patterns.
Students assess the success of social media measures using basic monitoring and analysis tools and derive well-founded recommendations for action.
Students develop a complete social media strategy including objectives, channel selection, content planning and integration into overarching marketing goals.

Literature
Appel, G., Grewal, L., Hadi, R., & Stephen, A. T. (2020). The future of social media in marketing. Journal of the Academy of Marketing Science, 48(1), 79-95.
Rana, N. P., Slade, E. L., Dwivedi, Y. K., & Tajvidi, M. (Eds.). (2020). Digital and Social Media Marketing: Emerging Applications and Theoretical Development. Springer.
Wolff, C. (2024). Social media strategies for B2B companies. Springer Gabler.
Tajvidi, M., Wang, Y., Hajli, N., & Love, P. E. D. (2021). Brand value co-creation in social commerce: The role of interactivity, social support, and relationship quality. International Journal of Information Management, 57.
Kapoor, K. K., Tamilmani, K., Rana, N. P., Patil, P., Dwivedi, Y. K., & Nerur, S. (2018). Advances in social media research: Past, present and future. Information Systems Frontiers, 20, 531-558.
Opresnik, M. O., & Hollensen, S. (2023). Social Media Marketing: A Practitioner Guide. Springer.

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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, BISD
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 or backend programming or programming in Python or basic programming; object-orientated programming in Java
Participants will receive a virtual machine, the functionality of which should be tested before the course begins.

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 define test objectives for software.
- Students analyse test objectives and define suitable test types.
- Students translate test types into automated tests.
- Students decide on the use of design patterns in testing and apply design patterns.
- Students explain Behaviour Driven Development.
- Students 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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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, 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
The Mobile and Ubiquitous Concepts and Development module offers students the opportunity to specialise either technically or conceptually. The focus is on the development of a digital product or service for mobile or ubiquitous usage contexts - either in the form of a functional prototype or a strategically sound marketing concept.

Students with a focus on technology and development create an executable, independently programmed application (e.g. with Flutter, web technologies or native tools), while concept-oriented participants develop a comprehensive business, marketing or interaction concept - including target group analysis, value proposition, customer journey and monetisation approach. Both variants are based on real challenges and conclude with a presentation of the solution. In this way, the module promotes both application-oriented programming skills and strategic-creative conceptualisation skills.

Specific contents are:
- Fields of application of mobile and ubiquitous systems
- Tools for rapid app/web development (e.g. Flutter, Firebase, web technologies)
- Conception and design of context-sensitive mobile services
- Customer experience and interaction strategy
- Market and user analysis, value proposition design
- Monetisation and scaling (e.g. freemium, subscription, platform models)
- Agile methods and iterative project development
- Testing, user feedback and optimisation
- Presentation and pitching of digital products

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 completing the module, students will be able to

- name technologies, business models and success factors in the field of mobile and ubiquitous applications (to remember)
- explain the requirements and special features of mobility, context sensitivity and user needs in digital systems (to understand)
- either use technical development tools (e.g. Flutter, web stacks),

or apply methods for ideation, market analysis and business modelling (to apply)

- analyse usage contexts and problems in order to derive functional or strategic solutions (to analyse)
- critically evaluate own and third-party concepts or applications in terms of utility, feasibility, innovative content and market suitability (to evaluate)
- either programme a functioning application

or create a viable, structured marketing or application concept (to create)

Literature
Ries, E. (2011). The Lean Startup. Crown Publishing
Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation. Wiley
Rogers, Y., Sharp, H., & Preece, J. (2023). Interaction Design. Wiley
Cook, D. (2021). Flutter for Beginners. Packt Publishing
Norman, D. A. (2013). The Design of Everyday Things. Basic Books

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6106201
Process and Landing Page Optimization

Module profile

Exam number
6106201

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)
André Morys,
Ina Reinhardt

Applicability	BEC
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 6102410

Recommended prerequisites for the participation in the module
None

Content
The module teaches a systematic, evidence-based approach to increasing the conversion rate and user experience in e-commerce. Students learn how to apply holistic conversion optimisation frameworks (e.g. 7-level model) in order to identify and leverage optimisation potential in a structured manner.
The process begins with the analysis phase: technical audits, heuristic analyses of websites and processes and quantitative web analysis data are combined. In addition, qualitative methods such as interview techniques and user testing (including eye tracking) are used to understand the "why" behind user behaviour. Based on this, target group-specific personas are developed.
In the conception and implementation phase, students translate psychological principles of behavioural economics into concrete designs. One focus is on the design and technical realisation of high-converting landing pages that are precisely tailored to online marketing campaigns.
Finally, the module deals with the validation of optimisation measures. Students learn how to design, carry out and analyse statistically valid A/B and multivariate tests in order to replace subjective design decisions with objective 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
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 students ...

- apply established conversion optimisation frameworks to design the optimisation process in organisations in a structured and iterative way.
- analyse websites and checkout processes both technically and heuristically in order to identify usability barriers and conversion killers.
- apply quantitative web analysis methods and qualitative methods (interviews, eye tracking) to gain in-depth user insights and formulate data-based optimisation hypotheses.
- create data-supported personas to make user needs tangible and personalise the approach in marketing campaigns.
- apply the principles of behavioural economics (e.g. scarcity, social proof, loss aversion) in a targeted manner to guide the decision-making behaviour of users in an ethically justifiable way (nudging).
- create high-conversion landing pages whose design and content are precisely tailored to the upstream marketing campaigns (ad-scent).
- create concepts for A/B and multivariate tests and evaluate their results statistically in order to provide valid proof of the effectiveness of changes.

Literature
Ariely, Dan: Predictably Irrational
Kahneman, Daniel: Think fast, think slow
Morys, André: Conversion Optimisation
Vollmert, Markus; Lück,Heike: Google Analytics 4

Various current (online) specialist articles, which are distributed by the lecturer according to topic

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6108201
Shop Systems

Module profile

Exam number
6108201

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. Rolf Schillinger

Lecturer(s)
Prof. Dr. Rolf Schillinger,
Oliver Dahms,
Prof. Dr. Tristan Wimmer

Applicability	BEC
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 6102410

Recommended prerequisites for the participation in the module
Web Programming I - III, Web Application and Development Systems, Introduction to Web Technologies

Content
In this course, students deal with the following topics:
Taxonomy of current shop system variants
- Cloud / on premise systems
- Open source / proprietary systems
- Standalone systems / part of (ERP) platforms

Data and data management
- ERP
- PIM

Hands-on deployments
- On premise shop system
- Cloud-only shop system
- Connection of a shop system to an ERP system using connectors

Connection of marketplaces and external services
- Amazon
- eBay
- Price search engines

Multichannel platforms
- General functionality
- Example project on a multichannel platform

Logistics / fulfilment

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

- differentiate between the most important types of shop systems
- plan an optimal shop platform based on project requirements
- set up, book and configure shop systems themselves
- plan and implement the connection of shop systems to price search engines
- connect shop systems to several sales channels via multichannel platforms
- differentiate between operator concepts for logistics and fulfilment solutions and select them based on project requirements

Literature
Will be announced in the course.

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 6106100
Seminar Conversion Optimization

Module profile

Exam number
6106100

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)
Prof. Dr. Tobias Aubele,
Prof. Dr. Rolf Schillinger

Applicability	BEC
Semester according to SPO	6. semester
Type of module	Concentration 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 is dedicated to the scientific and practice-oriented examination of current trends, methods and technologies of optimisation / experimentation. Students leave the level of "best practices" and analyse evidence-based approaches at the interface of data analysis, behavioural psychology and user experience design.

The content covers the entire spectrum: from behavioural economics and cognitive biases to technical tracking challenges (e.g. server-side tracking, cookieless future) and emotion measurement (neuromarketing) in e-commerce. Particular attention is paid to the critical reflection of ethical aspects ("dark patterns") and the use of artificial intelligence for personalisation and test automation.

The examination consists of a written scientific paper on a specific specialist topic as well as a presentation and defence of the results in a plenary session. This promotes the ability to present complex issues concisely and discuss them in a technically 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
Term paper, 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
The students ...

- analyse current scientific studies and specialist publications on specific topics of conversion optimisation in order to record the current state of research in a structured manner.
- evaluate the applicability of behavioural economic principles (e.g. nudging, decoy effect) to specific e-commerce scenarios, taking ethical boundaries into account.
- evaluate various methods of data collection (e.g. eye-tracking, emotion measurement, A/B testing) with regard to their validity, reliability and suitability for specific optimisation issues.
- analyse the influence of technical and legal changes (e.g. GDPR, cookie restrictions) on the quality of web analytics data and tracking concepts.
- create a structured scientific paper that answers a complex conversion optimisation question in a theoretically sound and practical way.
- create a target group-oriented presentation of their research results and visualise complex relationships in an understandable way.
- critically evaluate the results of their fellow students' work in the context of the specialist discussion and defend their own theses against objections.

Literature
Students' own research based on the topic

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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, BWI
Semester according to SPO	6. semester
Type of module	Compulsory 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
The module combines the application-oriented perspective of mobile and ubiquitous systems with the requirements of scientific work. The focus is on dealing with current issues, concepts and technologies in the fields of mobile computing, context awareness, smart environments and human-centred design.

Students develop an initial scientific question on a topic they have chosen or proposed and work on it in a theory-led and structured manner within the framework of a scientific paper. In doing so, they analyse specialist literature, current research trends and methodological approaches. In addition to writing the paper, the focus is also on the academic presentation - including a discussion and feedback session. The module also serves as preparation for the Bachelor's thesis, both in terms of content and methodology.

Core contents are:
- Processing practical use cases of mobile systems against a scientific background
- First introduction to scientific working techniques and text types (paper, abstract, discussion)
- Development of viable research questions in the context of mobile/ ubiquitous systems
- Literature research, theorising, methodological approach
- Scientific writing and structuring
- Discussion of ethical, social or design implications
- Presentation techniques for scientific presentations
- Peer review procedures, feedback formats
- Linking application perspectives and research reflection

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 able to

- name central theories, concepts and current research approaches in the field of mobile and ubiquitous systems (to remember)
- distinguish scientific questions from practical project ideas and embed them in a theoretical framework (to understand)
- apply practical knowledge and scientific methods (e.g. systematic literature review, theoretical modelling, explorative analysis) to work on a topic (to apply)
- critically evaluate academic texts and develop their own argumentation structures (to analyse)
- assess the quality, stringency and relevance of scientific arguments in their own paper and those of fellow students (to evaluate)
- write a (first) independent scientific paper on a topic from the field of mobile and ubiquitous systems and present it professionally (to create)

Literature
Kornmeier, M. (2022). Scientific writing made easy. Springer
Flick, U. (2023). Social research: methods and applications. Rowohlt
Rogers, Y., Sharp, H., & Preece, J. (2023). Interaction Design. Wiley
Schmidt, A., & Kranz, M. (2017). Mobile interaction. Oldenbourg
Weiser, M. (1999). The Computer for the 21st Century. Scientific American

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

Module: 6108100
Seminar Shop Systems

Module profile

Exam number
6108100

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. Rolf Schillinger

Lecturer(s)
Prof. Dr. Rolf Schillinger,
Prof. Dr. Tristan Wimmer

Applicability	BEC
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 6102410

Recommended prerequisites for the participation in the module
none

Content
In this seminar, students work on current topics from all areas of the planning and implementation of online shop 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, 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 deepen their knowledge of shop systems and learn to categorise and process current topics.

The written elaboration and oral presentation of the topics prepare the students for the corresponding activities in their further professional or academic career.

Literature
Will be announced in the seminar

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Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003154
Video-Production & Video-Marketing

Module profile

Exam number
5003154

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. Christina Völkl-Wolf

Lecturer(s)
Alexander Gillich,
Christian Huller

Applicability	BEC, BDGD
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
Part 1: Video production
In the first part of the module, students are introduced to the individual steps of a video production. All levels of video production are covered, from mobile phone videos to cinema productions.

- Introduction and historical development of image & moving image
- Technology & technique - the tension between low-budget and high-end productions
- Definition of terms: data format & moving image format
- Content & Context
- Current developments in video marketing
- Production & post-production - from the idea to the finished film
- Transfer:

o Analysis & categorisation of current video formats (using a developed matrix)
o Derivation of a best-practice approach

- Practical part - video production

Part 2: Video marketing
The second part deals with the correct online marketing of videos with a focus on YouTube marketing.

- Video marketing - introduction & overview
- Video portals - status quo of YouTube, Vimeo, Facebook, Snapchat & Co.
- YouTube channel set-up: Account creation, administration levels and functions
- Video SEO:

o Ranking factors and optimisation options for YouTube videos
o Channel optimisation
o CTAs: strategic use of info cards, credits, watermarks and links as a call to action

- Community management: active & passive ways to increase channel subscribers and trust
- Video monetisation - possibilities, opportunities & risks
- Video advertising - advertising strategies and targeting options for video adverts
- YouTube analytics - measuring the success of video content
- Brand communication, PR, product communication with videos
- Practical part - video optimisation of the video produced in part 1

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 recall key terms, historical developments and basic technologies of image and video production and video marketing.
Students understand the relationship between content, context, technical realisation and marketing objectives of video formats in the e-commerce environment.
Students apply basic video production and post-production techniques to independently realise a target group-oriented video from the initial idea to the finished product.
Students analyse current video formats, platforms and YouTube channels based on defined criteria (e.g. format, target group, monetisation, SEO factors).
Students evaluate video marketing strategies, optimisation measures and monetisation approaches with regard to reach, community building and economic benefits.
Students use YouTube-specific tools (e.g. YouTube Studio, video SEO, analytics, CTAs) to optimise videos and channels based on data.
Students develop a video concept including production, optimisation and marketing strategy for a specific use case in e-commerce.

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
Stefan Sauer

Lecturer(s)
Stefan Sauer

Applicability	BEC, BIN, BWI, BISD, BDGD
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/)

For scheduling: https://geo.thws.de/studium/aktuelle-lehrveranstaltungsplaene/

- 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

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

Module: 5003855
Web Exploitation

Module profile

Exam number
5003855

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	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
Students learn the professional role and methodological workflow of web penetration testers, including legal and ethical frameworks. Techniques for identifying and exploiting common web vulnerabilities (e.g., OWASP Top Ten) in frontends, backends and APIs are taught. Web post-exploitation scenarios (e.g., web shells, session hijacking, API abuse) and related containment considerations are practised in isolated labs. Finally, students train structured reporting and target-audience appropriate presentation of findings.

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 completing the module, students can:

- describe the professional role of web penetration testers and their responsibilities within IT security.
- outline the typical workflow of a web penetration test (reconnaissance → enumeration → exploitation → post-exploitation → reporting).
- name legal constraints, scope boundaries and ethical considerations and incorporate them into test planning.
- identify common web vulnerabilities (e.g., injection, XSS, CSRF, authentication issues) in test applications and produce reproducible proofs of concept.
- perform web post-exploitation techniques (e.g., session takeover, web shells, API abuse) in a lab context and analyse their effects.
- assess discovered vulnerabilities in terms of exploitability and business impact (e.g., using CVSS criteria) and set remediation priorities.
- document the results of a web penetration test in a structured report and present key findings in a target-appropriate manner.

Literature
The Web Application's Hackers Handbook (Dafydd Stuttart et al.), 2023
Penetration Testing - a Hands-On Introduction to Hacking (Georgia Weidman), 2014
Hacking, The Next Generation (Nitesh Dhanjani et al.), 2021

7. semester

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

Module: 6103700
Bachelor Thesis / Bachelor Seminar

Module profile

Exam number
6103700

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. Tobias Aubele

Lecturer(s)
Prof. Dr. Tobias Aubele,
Prof. Dr. Mario Fischer,
Prof. Dr. Christina Völkl-Wolf,
Prof. Dr. Rolf Schillinger,
Prof. Dr. Tristan Wimmer

Applicability	BEC
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 points from 1st - 2nd year, Soft and Professional Skills courses, project work
Compulsory participation in Bachelor's seminar

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 includes own studies and research on the state of the art in the respective subject area. In particular, the thesis must abstract from boundary conditions that are not technically based in nature, but result from the specific circumstances of the company/ operation. If software solutions are required as part of the assignment, this generally means that prototypes are implemented as part of the Bachelor's thesis, but does not include ensuring product features (incl. accompanying manuals, etc.).

The Bachelor's seminar includes, among other things, own studies and research on the state of the art in the respective subject area. In particular, the work must abstract from boundary conditions that are not technically based in nature, but result from the specific circumstances of the company/operation. If software solutions are required as part of the assignment, this generally means that prototypes are implemented as part of the Bachelor's thesis, but does not include ensuring product features (incl. accompanying manuals, etc.).

The topics of the practical examples for the examination are provided by or agreed with the lecturer in the traditional degree programme. In the dual study programme, a task from the practical company is worked on in consultation with the lecturer.

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, the student demonstrates that he/she is capable of independently solving a challenging problem in the field of computer science (possibly interdisciplinary), that he/she has mastered the methodological and scientific principles of the subject and can adequately present the result.

Literature
depending on the topic; the Bachelor's thesis should be written scientifically, i.e. literature must be intensively analysed, used and cited according to the topic.

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

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)
Prof. Dr. Rajesh Ramachandran

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 skills in Java

Content
The course 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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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 know 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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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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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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Faculty of Computer Science and Business Information Systems
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 in a targeted manner 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 effects 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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Faculty of Computer Science and Business Information Systems
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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Faculty of Computer Science and Business Information Systems
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 must 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: 6108202
Operating Shop Systems

Module profile

Exam number
6108202

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)
Prof. Dr. Rolf Schillinger,
Prof. Dr. Tristan Wimmer

Applicability	BEC
Semester according to SPO	7. semester
Type of module	Concentration module

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

Recommended prerequisites for the participation in the module
Web Programming I - III, Web Application and Development Systems, Introduction to Web Technologies

Content
In this course, students deal with the lifecycle of a typical e-commerce project by realising the typical tasks along this lifecycle in group projects. This includes in particular

- requirements engineering
- Design of data flows and system architecture
- project management
- Development of a strategy to measure the success of the developed solution

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

- Consistently capture and present the requirements of e-commerce projects
- Develop e-commerce projects within the framework of an agile methodology
- Develop and connect suitable logistics concepts
- analyse and assess the performance of existing websites from a business and technical perspective

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

Module: 6106202
Qualitative and Quantitative User Research

Module profile

Exam number
6106202

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. Tobias Aubele

Lecturer(s)
Prof. Dr. Tobias Aubele,
Cornelia Schnell

Applicability	BEC
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
Interface design and usability
online marketing
content engineering
Statistics

Content
Consumer behaviour
Basics of web analytics
Quantitative analysis
- Multivariate statistics, quality measures
- Test theory basics
- Creation of a test design (questionnaire)
- Testing reliability and validity
- Empirical testing of test concepts

Qualitative analysis
- Techniques of qualitative content analysis
- Quality criteria for content analysis
- Usability studies (think aloud; guided interviews)
- Conception and realisation of focus groups and interviews

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 will acquire theoretical knowledge of qualitative user research and will apply this in the form of designing, conducting and analysing interviews, surveys and moderated usability studies.
They will have understood how quantitative data is collected and analysed, particularly through web analysis and CRM systems.
Students know how these systems work and are able to set up a standard web analysis tool including website testing tools themselves, create customised reports and derive well-founded findings from them. The validity and reliability of data is tested for significance using statistical methods.

Quantitative and qualitative user research contributes to the overall learning objectives of e-commerce as follows:

Sound subject knowledge
- Subject-specific specialisations: Tailored to the needs of the degree programme, an idea of methods and technologies to adapt websites and processes to the needs of visitors.
- Interdisciplinary knowledge: Integration or refreshing of knowledge from the courses on online marketing, interface design and usability, content engineering and statistics.

Methodological expertise
- Ability to think logically, analytically and conceptually: The course covers a broad spectrum of both specialised and technical topics. The combination of both requires a high degree of analytical and conceptual thinking.
- Selection and safe application of suitable methods: Approaches and technologies are described for specific use cases in website design and the possible applications are discussed.

Practical experience and professional qualification
- Knowledge of practical tasks: The creation and optimisation of user-centred content and research into underlying consumer needs are core tasks in the field of e-commerce.

Literature
Kroeber-Riel, Werner; Gröppel-Klein, Andrea: Consumer Behaviour, Vahlen, 2013
Sauro, Jeff: Quantifying the User Experience: Practical Statistics for User Research, Morgan Kaufmann, 2012
Bühner, Markus: Introduction to test and questionnaire construction, Pearson, 2010
Sedlmeier, Peter: Research Methods and Statistics for Psychologists and Social Scientists, Pearson, 2013
Mayring, Philipp: Qualitative Content Analysis: Basics and Techniques, Beltz, 2015
Vollmert, Markus; Lück, Heike: Google Analytics: The comprehensive manual. Incl. Google AdWords integration and Google Webmaster Tools, Gallileo, 2014

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Faculty of Computer Science and Business Information Systems
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 session consists of approximately 50% lecture and 50% tutorial. The content of the course is taught in lectures and presentations. Students should be 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 course slides, sample solutions to 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 the 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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Faculty of Computer Science and Business Information Systems
Technical University of Applied Sciences Würzburg-Schweinfurt

Module: 5003145
Web-based UX-projects in finnish-german cooperation

Module profile

Exam number
5003145

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)
Prof. Dr. Tobias Aubele

Applicability	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
English courses

Content
Process:
10 students from Finland and 10 students from Germany (20 students, min. 4 students in one group, 5 groups, 5 topics)
5 days in Finland (Mon-Fri) 3x 8 hours in jan.
3 days in Germany (Mon-Fri) 3x 8 hours in oct.
During this time: (project work collaboration) in each project group
Expected optional involved businesses will be contacted beforhand in Germany and Finland and possible topics discussed. These topics will be eligible in the course starting in Finland.

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 should be able to collaborate in international interdisciplinary groups together. They use different tools for e-collaboration and work on one topic. Finally they present their results at the end of the course.

Literature
to be defined, depending on the topics

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

Module: 5102120,6102600
Business and IT Law

Module profile

Exam number
5102120,6102600

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. Oliver Ehret

Lecturer(s)
Prof. Dr. Oliver Ehret

Applicability	BEC, BIN
Semester according to SPO	7. 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 Basic principles of copyright law
Overview of relevant areas of intellectual 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
1. students know the basic terms and concepts of our legal system and its basic structures.
2. students understand the role of law for computer scientists and the relevance of legal knowledge in the IT sector.
3. students acquire the basic principles of general private and public law and their application in practice.
4. students explain IT legal terms and are able to categorise them in the context of relevant areas of law and contractual areas.
5. students recognise legal risks in the IT sector, are able to assess them and develop strategies to limit them.
6. students develop practical skills in dealing with IT-relevant legal problems, including knowledge of basic types of contracts in the IT sector.
7. students understand the principles of data protection, especially in the IT sector and their significance in an international context.
8. students reflect on the interlinking of computer science, architecture of IT systems, information security and data protection in order to gain a holistic understanding of these topics.

Literature
o Köhler, German Civil Code, dtv, 89th edition 2022
o Schneider: IT and Computer Law, 15th edition, Beck dtv, Munich 2022.
o Kallwass, Abels: Private Law, Verlag Franz Vahlen Munich, 24th edition, 2021
o Hoeren: IT Contract Law, 2nd edition, Verlag Otto Schmidt, Cologne 2012.
o Marly: Praxishandbuch Softwarerecht, 7th edition, C.H.Beck, Munich 2018.
o Härting: Internetrecht, 7th edition, Verlag Otto Schmidt, Cologne 2022.
o Hoeren: Skript Internetrecht Uni Münster, as of April 2020
o Haug: Basic knowledge of internet law, Verlag W. Kohlhammer, 3rd edition, 2016
o Redeker: IT law, C.H.Beck, 7th edition, 2020
o Schneider: Handbook, IT law, Otto Schmidt, 5th edition, 2017
o Kühling, Sack, Hartmann: Data protection law, 5th edition C.F.Müller, 2021