

Module Catalogue

»Courses in English«



Last updated: April 11, 2024

The purpose of the module descriptions is to provide a content-related overview of your degree course.

Only the current version of the university catalogue and examination regulations shall be deemed legally binding.

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1 International Information Systems Bachelor - Bachelor's Degree

1.1 1. Semester

1.1.1 1st Foreign Language

Information about the module

Title in English	1st Foreign Language
Examination number	9770010
Module code	FL1
Modul area	Programming
Module coordinator	Prof. Dr. Svea Schauffler
Faculty	Faculty of Liberal Arts and Sciences
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	1st Foreign Language (4 Credit hours)
Teaching language	The module is usually taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Presentation, 10-20 minutes, 20%• Oral examination, 10-20 minutes, 20%• Written examination, 90 minutes, none auxiliaries, 60%

Grading	According to § 20 of the APO in the currently valid version.
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Content of the module

The course is a combination of teacher input, independent self study, and language teaching based on a communicative methodology which includes the interaction of all participants. Groups usually comprise 20-25 participants.

Qualification aims for the module learning objectives/skills

The aim of this mandatory language course is for participants to use English confidently as part of their studies but also in the workplace.

This is achieved using an interactive and application-based methodology for language teaching. The focus is on useful skills such as text comprehension, technical vocabulary, written correspondence, oral communication, presenting, and negotiating in English.

Reading list

Will be provided in class.

1.1.2 Mathematics 1

Information about the module

Title in English	Mathematics 1
Examination number	9770020
Module code	MAT1
Modul area	Mathematics
Module coordinator	Prof. Dr. Caroline Justen
Faculty	Faculty of Liberal Arts and Sciences
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Mathematics 1 (4 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	None
Possibility to use module within student's own study programme or other programmes	The topics are relevant for the mathematics 2 module
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written examination, 60 minutes, auxiliaries: 2 DIN A4 pages handwritten formulary; a calculator that can't calculate 70! (70 Factorial)
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

- Propositional logic
- Infinite sequences and series
- Real-valued functions
- Financial mathematics
- Derivatives
- Complex numbers

Qualification aims for the module learning objectives/skills

Students passing the course successfully will be able to:

- develop new mathematical knowledge from calculus and linear algebra which are not part of the mathematics 2 modul:
 - understanding problems in mathematical language
 - solving mathematical problems of low and medium complexity
 - transferring mathematical knowledge taught in the course to new simple problems
- train logical reasoning
- model simple practical problems in mathematical language
- use mathematical textbooks to extend the mathematical topics of the lectures

Reading list

J. Stewart, S. Watson, D.K. Clegg: Calculus: Early Transcendentals, *Metric Edition Cengage Learning, Inc, 9th edition*, 2020.

K. Sydsaeter, P. Hammond, A. Strom, A. Carvajal: Essential Mathematics for Economic Analysis, *Pearson Education, 6th edition*, 2021.

G. Strang: Calculus, *Wellesley-Cambridge Press, 3rd edition*, 2017.

Opitz, O.; Etschberger, S.; Burkart, W.R.; Klein R. : Mathematik, Lehrbuch für das Studium der Wirtschaftswissenschaften. *De Gruyter Oldenbourg, 12. Auflage*, 2017.

1.1.3 Programming 1

Information about the module

Title in English	Programming 1
Examination number	9770030
Module code	PRG1
Modul area	Programming
Module coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Programming 1 (4 Credit hours) Practical work Programming 1 (2 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	None
Total workload and its constituent parts	Credit hours: 6, CP credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h
Type of examination / required course achievements	Electronic examination, 60 minutes, Auxiliaries: Development environment, authorized lecture and exercise materials, Java API documentation, Moodle
Admission requirement for the examination	Practical work Programming 1
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

This lecture introduces students to the core concepts of programming based on the programming language JAVA. JAVA is one of the important languages of our time and it is widely used in business.

The focus of the lecture lies on the concepts and methods of programming. These concepts and methods will be introduced and explained with examples in JAVA.

The first part of the lecture provides the context with key terminology of business informatics and software engineering. It then introduces to the fundamentals of programming with basic JAVA language elements, simple data types, variables, expressions and operators. Then control structures, complex data types and methods will be introduced. The second part of the lecture provides an introduction to object-orientation and its application in JAVA.

The lecture will provide the concepts and methods that will then be practiced in hands-on exercises with a state-of-the art integrated development environment (IDE, e. g., Eclipse). Students will develop and implement algorithms in JAVA and will be evaluated based on their ability to apply the knowledge from the lecture in practice.

Qualification aims for the module learning objectives/skills

Students will get an introduction to the core concepts of programming using JAVA. After successful participation, students will be able to:

- Understand and describe key elements of the programming language JAVA
- Know the key concepts of OO programming languages
- Understand JAVA source code of low to medium complexity
- Independently implement algorithms in JAVA
- Independently develop own algorithms
- Quickly familiarize themselves with other programming languages

Reading list

Literature recommendations will be provided in the lecture.

1.1.4 Introduction to Business Administration, Financial Accounting

Information about the module

Title in English	Introduction to Business Administration, Financial Accounting
Examination number	9770040
Module code	IBA
Module coordinator	Prof. Dr. Stephan Zimmermann
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Introduction to Business Administration, Financial Accounting (6 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	None
Total workload and its constituent parts	Credit hours: 6, CP credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h
Type of examination / required course achievements	Written examination, 90 minutes, auxiliary: calculator
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Business Administration:

- Fundamentals of economics
- Scientific approach of business administration
- Entrepreneurship and constitutive management decisions (business model, choice of legal form and location, corporate constitution)
- Value Chain (marketing and sales, production, materials management)
- Organization and human resources management
- Operational taxes

Financial accounting:

- Terms and rules of external accounting
- Technique of double-entry bookkeeping
- Balance sheet: structure, content, transactions
- Profit and loss account: structure, content, business transactions
- Basics of balance sheet analysis

Qualification aims for the module learning objectives/skills

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

- Understand elementary theories of economics
- Recognize challenges, tasks and methods of business administration
- Explain constitutive decisions of companies
- Outline basic value chain and leadership processes in a company
- Explain the tasks and rules of financial accounting
- Apply the system of double-entry bookkeeping.

Reading list

Business Administration:

Thommen, Jean-Paul; Grösser, Stefan (2014): Economy, Company, Management. Introduction to Business Administration. Zürich

Eichhorn, Peter; Towers, Ian (2018): Principles of Management. Efficiency and Effectiveness in the Private and Public Sector. Cham: Springer International Publishing

Kolmar, Martin (2017): Principles of Microeconomics. An Integrative Approach. Cham: Springer International Publishing

Pride, William M.; Hughes, Robert J.; Kapoor, Jack R. (2019): Foundations of business. 6E. Boston: Cengage.

Mazzarol, Tim (2020): Entrepreneurship and Innovation. Fourth edition. Singapore: Springer (Springer Texts in Business and Economics).

Financial Accounting:

Nothhelfer, Robert: Financial Accounting. Introduction to German GAAP with exercises (2017). München, Wien: De Gruyter Oldenbourg (De Gruyter Textbook).

Epstein, Lita; Tracy, John A. (2015): Bookkeeping all-in-one for dummies. Hoboken, NJ: John Wiley & Sons (For dummies). 2nd Edition

1.1.5 2nd Foreign Language 1 of 4

Information about the module

Title in English	2nd Foreign Language 1 of 4
Examination number	9771098- 9771504
Module code	II2.FS
Modul area	Foreign Language
Module coordinator	Lecturers at the Faculty of Liberal Arts and Sciences
Faculty	Faculty of Liberal Arts and Sciences
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	2nd Foreign Language 1 of 4 (4 Credit hours)
Teaching language	The module is taught in German for non-native students. Depending on the selection, the module will be taught in Spanish, French, Italian or Chinese language
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: Oral and written parts according to the module specifications of the chosen language of the faculty of Liberal Arts and Sciences
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The course is a combination of linguistic input by the teacher, independent self-study and communicative and application-oriented language teaching in which all participants are involved. The course takes place in groups of 20-25 participants.

Qualification aims for the module learning objectives/skills

The goal of this compulsory curriculum is to achieve confidence with the terminology of this subject and its professional environment. This is achieved through task-based and interactive teaching in the foreign language. The course puts emphasis on crucial and practical skills such as reading comprehension, technical vocabulary, written correspondence, confident verbal communication, presentation and negotiation.

Reading list

Literature recommendations will be provided in the lecture.

1.2 2. Semester

1.2.1 Database Systems

Information about the module

Title in English	Database Systems
Examination number	9770050
Module code	DBS
Module coordinator	Prof. Matthias Kolonko, Ph.D. (ONPU)
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Database Systems (4 Credit hours) Practical work Database Systems (2 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	None
Total workload and its constituent parts	Credit hours: 6, CP credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h
Type of examination / required course achievements	Written examination, 90 minutes, none auxiliaries As an alternative to the written exam, 3 interim tests can be handed in that will be summarized as one final grade. After having chosen to hand in the 3 interim tests, it is not possible to switch back to the written exam at the end of the particular semester.
Admission requirement for the examination	Practical work Database Systems
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The course focuses on three central points in the area of database systems. The first key point is the semantic data modeling and the system-independent database design. It is followed by the implementation using relational database systems with SQL. Subsequently, the normal form theory is addressed into more depth. During the course, both practical and theoretical aspects are examined. The architecture of a database management system (RDBMS) and suitable physical data structures are illustrated using a common RDBMS.

An instance of a relational database system will be provided for SQL exercises. During the practical training, the design and realization of an appropriate database structure is requested from the students by means of a self-imposed topic.

Qualification aims for the module learning objectives/skills

After having successfully accomplished the course, participants shall be able to

- describe the fundamental architecture and operational principles of a database system.
- perform analysis and data modeling (both conceptual and logical database design).
- name and utilize the fundamental SQL operations.
- implement data structures and queries using SQL (DDL & DML).
- perform an analysis and normalization of a logical data model with regard to the theory of normal forms.

Weighting of individual performance in the final grade

Written exam (100%) or 3 interim tests (each with the same weighting)

Reading list

- R. Elmasri, S. B. Navathe: *Fundamentals of Database Systems* (Pearson 2020, ISBN: 1-292-09761-2)
- S. Müllenbach, L. Kern-Bausch, M. Kolonko: Conceptual Modeling Language AGILA MOD
in Herald of Advanced Information Technology, vol. 2, no. 4, pp. 246-258, Dez. 2019
(ISSN: 2663-0176 – DOI: 10.15276/hait.04.2019.1)
- M. Kolonko, S. Müllenbach, E. Arsirii, B. Trofymov: *Extensions to the Conceptual Modeling Language AGILA MOD*
in Proceedings of the VI. Ukrainian-German conference „Informatics. Culture. Technology“, Odessa, Sept. 2018, pp. 38-39
- L. Kern-Bausch, M. Jeckle: Informationsmodellierung und logischer Datenbankentwurf, Kapitel 14.2
in Taschenbuch der Informatik (U. Schneider und D. Werner), 4. Auflage, Fachbuchverlag Leipzig im Carl Hanser Verlag, 2001,
ISBN: 3-446-21753-3
- P. Sauer: Informationsmodellierung, Kapitel 2
in Taschenbuch Datenbanken (T. Kudraß), 2. Auflage, Fachbuchverlag Leipzig im Carl Hanser Verlag, 2015,
ISBN: 978-3-446-43508-7
- Vorlesungsunterlagen von Prof. Dr. Sabine Müllenbach unter <https://ohs.informatik.hs-augsburg.de:4443/web/bine>
(Anmeldung mit RZ-Login)

1.2.2 2nd Foreign Language 2 of 4

Information about the module

Title in English	2nd Foreign Language 2 of 4
Examination number	9771098- 9771504
Module code	II2.FS
Modul area	Foreign Language
Module coordinator	Lecturers at the Faculty of Liberal Arts and Sciences
Faculty	Faculty of Liberal Arts and Sciences
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	2nd Foreign Language 2 of 4 (4 Credit hours)
Teaching language	The module is taught in German for non-native students. Depending on the selection, the module will be taught in Spanish, French, Italian or Chinese language
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	The module 2nd Foreign Language 2 of 4 builds on the 2nd Foreign Language 1 from 4 and is assumed. (recommended)
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: Oral and written parts according to the module specifications of the chosen language of the faculty of Liberal Arts and Sciences
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The course is a combination of linguistic input by the teacher, independent self-study and communicative and application-oriented language teaching in which all participants are involved. The course takes place in groups of 20-25 participants.

Qualification aims for the module learning objectives/skills

The goal of this compulsory curriculum is to achieve confidence with the terminology of this subject and its professional environment. This is achieved through task-based and interactive teaching in the foreign language. The course puts emphasis on crucial and practical skills such as reading comprehension, technical vocabulary, written correspondence, confident verbal communication, presentation and negotiation.

Reading list

Literature recommendations will be provided in the lecture.

1.2.3 Introduction to Information Systems

Information about the module

Title in English	Introduction to Information Systems
Examination number	9770060
Module code	ISY
Module coordinator	Prof. Dr. Arne Mayer
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Introduction to Information Systems (3 Credit hours) Practical work Introduction to Information Systems (1 Credit hour)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written examination, 60 minutes, auxiliary: non-programmable calculator
Admission requirement for the examination	Practical work Introduction to Information Systems
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

- Fundamentals and Definitions of Information Systems
- Business Process Management and Modeling
- Information systems, esp. Key System Applications
- IT strategies, Enterprise Architecture Management, Information management
- Case studies on complex integrated business processes and information systems

Qualification aims for the module learning objectives/skills

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

- To describe the subject areas assigned to information systems discipline. You will be able to explain the four layer principle and how it differs from business administration and computer science.
- Understand the challenges and tools used to describe IT systems and are able to independently document business processes using common methods
- Master basic terms, methods, concepts and applications of operational information processing and integrated systems.
- Students understand IT strategies and their necessity; They are familiar with IT organizational structures and relevant working methods/methods for the design of IT systems and are able to analyze IT landscapes with the help common methods such as Enterprise Architecture Management methods

Reading list

Laudon, K. C., Laudon J. P.: Management Information Systems: Managing the Digital Firm, current edition, Pearson

Annual update in the lecture due to the innovative nature

1.2.4 Programming 2 & Software Engineering

Information about the module

Title in English	Programming 2 & Software Engineering
Examination number	9770070
Module code	PRG2
Modul area	Programming
Module coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Programming 2 & Software Engineering (4 Credit hours) Practical work Programming 2 & Software Engineering (2 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	Module Programming 1 (recommended)
Total workload and its constituent parts	Credit hours: 6, CP credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h
Type of examination / required course achievements	Electronic examination, 60 minutes, Auxiliaries: Development environment, authorized lecture and exercise materials, Java API documentation, Moodle
Admission requirement for the examination	Practical work Programming 2 & Software Engineering
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Larger software applications are developed in practice in teams using a methodical approach. As a basis for this, the concepts, methods and tasks of software engineering (SE), which go beyond pure programming, are presented in this course:

- Agile and classic SE process models (e.g. Scrum)
- Requirements engineering (e.g. with user stories)
- Design and architecture (e.g. with UML)
- Validation (e.g. unit tests and test management)
- Versioning and deployment (e.g. with Git)
- Operation (e.g. DevOps)

Based on foundations of the lecture Programming 1, further concepts and constructs of modern programming languages are taught using JAVA. The module deals with the following content:

- Repetition and deepening of the foundations and understanding of object-oriented programming
- Introduction of other important concepts, such as e. g. helper classes and frameworks for working with JAVA
- Introduction and deepening of input/output concepts such as streams and parallel programming with threads
- Introduction to distributed applications
- Introduction to functional programming

Qualification aims for the module learning objectives/skills

After successful participation in the module, students are able to:

- describe basic knowledge of programming including the concepts of object-oriented programming
- grasp requirements and tasks, to abstract them and to solve them using programming language tools
- familiarize themselves with further concepts or other programming languages
- understand and apply the tasks and methods of (agile) software engineering.

Reading list

Literature recommendations will be provided in the lecture.

1.2.5 Mathematics 2

Information about the module

Title in English	Mathematics 2
Examination number	9770080
Module code	MAT2
Modul area	Mathematics
Module coordinator	Prof. Dr. Caroline Justen
Faculty	Faculty of Liberal Arts and Sciences
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Mathematics 2 (4 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	Module Mathematics 1 (recommended)
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written examination, 60 minutes, auxiliaries: 2 DIN A4 pages handwritten formulary; a calculator that can't calculate 70! (70 Factorial)
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

- Integration
- Systems of linear equations
- Linear Algebra
- Multivariable functions
- Linear Optimization

Qualification aims for the module learning objectives/skills

Students passing the course successfully will be able to:

- develop new mathematical knowledge from calculus and linear algebra which are not part of the mathematics 1 modul:
 - understanding problems in mathematical language
 - solving mathematical problems of low and medium complexity
 - transferring mathematical knowledge taught in the course to new simple problems
- train logical reasoning
- model simple practical problems in mathematical language
- use mathematical textbooks to extend the mathematical topics of the lectures

Reading list

J. Stewart, S. Watson, D.K. Clegg: Calculus: Early Transcendentals, *Metric Edition Cengage Learning, Inc, 9th edition*, 2020.

K. Sydsaeter, P. Hammond, A. Strom, A. Carvajal: Essential Mathematics for Economic Analysis, *Pearson Education, 6th edition*, 2021.

G. Strang: Calculus, *Wellesley-Cambridge Press, 3rd edition*, 2017.

Opitz, O.; Etschberger, S.; Burkart, W.R.; Klein R. : Mathematik, Lehrbuch für das Studium der Wirtschaftswissenschaften. *De Gruyter Oldenbourg, 12. Auflage*, 2017.

1.3 3. Semester

1.3.1 Customizing of Information Systems

Information about the module

Title in English	Customizing of Information Systems
Examination number	9772030
Module code	CUST
Module coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Customizing of Information Systems (4 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Written examination, 60 minutes, with authorized lecture material, 50%• Project work, 10-30 pages and 10-30 minutes presentation, 50%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

This lecture introduces to Enterprise Systems (ES), that represent a specific category of information systems. They build on pre-packaged industry best practices embedded in standardized product software and target large-scale integration of data and business processes across all company's functional areas and beyond company borderlines.

In the first part of the lecture, after an introduction to the key terms and definitions for ES, process-centric ES and in particular Enterprise Resource Planning (ERP) Systems will be discussed in detail. ERP Systems such as SAP S/4 HANA are the core business applications for many organizations. The lecture will examine

- Fundamentals of ERP Systems
- Basic Functionalities of ERP Systems with the example SAP S/4 HANA
- Core processes such as "Order to Cash" and "Procure to Cash"

The second part of the lecture presents the core concepts of ES implementations. With these concepts the necessary steps to configure/customize an ERP system such as SAP S/4 HANA are elaborated.

Qualification aims for the module learning objectives/skills

Students will get an introduction to the core concepts of Enterprise Systems as specific category of Information Systems. After successful participation, students will be able to:

- Understand and describe the different types and concepts of Enterprise Systems
- Understand and describe the functions and processes covered by ERP Systems
- Use the SAP S/4 HANA System for important core processes
- Understand and describe the core concepts of Enterprise System Implementations
- Configure/customize core features of the SAP S/4 HANA System

Reading list

Literature recommendations will be provided in the first lecture.

1.3.2 E-Business

Information about the module

Title in English	E-Business
Examination number	9772040
Module code	EBUS
Module coordinator	Prof. Dr. Arne Mayer
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	E-Business (4 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	None; recommended: Introduction to business administration
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written examination, 60 minutes, none auxiliaries
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

- Areas of e-business
- Technical and technological foundations of the internet economy as driver for e-business
- Functional view on e-Business information systems
- Economics of e-Business, especially electronic commerce
- E-Compancies
- E-Communities
- E-Entertainment

Qualification aims for the module learning objectives/skills

- An understanding of e-business and its areas and their impace on business as well as economy
- Abilities for analyzing relevant information systems and their underlying processes and workflows
- Practical relevant functional skills for upcoming employments in the industry
- Increased their soft skills due to case studies, discussions, and ability to present self-elaborated content

Reading list

Kollmann, Tobias.: E-Business, Springer Gabler, 7. Auflage, 2019 (in German)

Laudon, Kenneth C.; **E-commerce:** business, technology, society, Pearson (Boston, MA), 2012.

Peitz, Martin; Waldfogel, Joel: The Oxford handbook of the digital economy, Oxford Univ. Press, 2012

Reynolds, Jonathan: **E-Business:** a management perspective, Oxford Univ. Press, 2010

1.3.3 2nd Foreign Language 3 of 4

Information about the module

Title in English	2nd Foreign Language 3 of 4
Examination number	9771098- 9771504
Module code	II2.FS
Modul area	Foreign Language
Module coordinator	Lecturers at the Faculty of Liberal Arts and Sciences
Faculty	Faculty of Liberal Arts and Sciences
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	2nd Foreign Language 3 of 4 (4 Credit hours)
Teaching language	The module is taught in German for non-native students. Depending on the selection, the module will be taught in Spanish, French, Italian or Chinese language
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	The module 2nd Foreign Language 3 of 4 builds on the 2nd Foreign Language 2 and 1 from 4 and is assumed. (recommended)
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: Oral and written parts according to the module specifications of the chosen language of the faculty of Liberal Arts and Sciences
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The course is a combination of linguistic input by the teacher, independent self-study and communicative and application-oriented language teaching in which all participants are involved. The course takes place in groups of 20-25 participants.

Qualification aims for the module learning objectives/skills

The goal of this compulsory curriculum is to achieve confidence with the terminology of this subject and its professional environment. This is achieved through task-based and interactive teaching in the foreign language. The course puts emphasis on crucial and practical skills such as reading comprehension, technical vocabulary, written correspondence, confident verbal communication, presentation and negotiation.

Reading list

Literature recommendations will be provided in the lecture.

1.3.4 Programming of Information Systems

Information about the module

Title in English	Programming of Information Systems
Examination number	9772020
Module code	PRG3
Modul area	Programming
Module coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Programming 3 (4 Credit hours) Practical work Programming 3 (2 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	Programming 1 (recommended)
Total workload and its constituent parts	Credit hours: 6, CP credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h
Type of examination / required course achievements	Electronic examination, 60 minutes, Auxiliaries: SAP, authorized lecture and exercise materials, Moodle
Admission requirement for the examination	Practical work Programming of Information Systems
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

This lecture introduces concepts of programming that are required when organizations want to change or extend their Enterprise Systems (ES). This can for example be required in ES implementations, when the organization introduces a new system and the system needs to be adapted to meet business requirements. As technology platform SAP S/4 HANA will be used and the programming language ABAP.

The first part of lecture presents the fundamentals of programming for Enterprise Systems such as:

- Technical fundamentals and architecture
- Basic ABAP language elements
- ABAP reporting
- Simple data types, variables
- Expressions and operators
- Control structures
- Functions
- Complex data types

The second part of the lecture introduces advanced programming concepts

- Object Oriented Reporting with Abap Objects
- Events
- Interfaces
- Inheritance
- Exceptions
- Advanced programming techniques

Qualification aims for the module learning objectives/skills

Students will get an introduction to the programming of Enterprise Systems using SAP S/4 HANA and ABAP.

After successful participation, students will be able to:

- Understand and describe key elements of the programming language ABAP
- Understand ABAP source code
- Independently implement algorithms in ABAP
- Independently develop simple algorithms

Reading list

Literature recommendations will be provided in the first lecture.

1.3.5 Statistics

Information about the module

Title in English	Statistics
Examination number	9772010
Module code	STAT
Module coordinator	Prof. Dr. Phil. Alessandra Zarcone
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Statistics (4 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format with practical exercises
Prerequisites for participation in the module	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written examination, 90 minutes, auxiliaries: 2 DIN A4 pages handwritten, statistics software (R) on own laptop
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

- Introduction to statistics and to R
- Descriptive statistics: measures of central tendency, measures of dispersion, distributions
- Visualization with R
- Basic Probability Theory
- Looking at relationships: Correlation
- Prediction: Regression, Multiple Regression and Logistic regression
- Elements of Inferential statistics: hypothesis testing, comparing means, confidence intervals, significance testing, model evaluation
- Reporting of statistical models and results

Qualification aims for the module learning objectives/skills

After successfully completing this module, the students are able to:

- know and understand the most important statistical properties such as mean, median, percentile, quantile, variance, co-variance, correlation, auto correlation, variation coefficient and confidence intervals
- understand descriptive statistics methods and employ them for exploratory data analysis
- perform exploratory data analysis with R
- understand data visualization and create simple plots using R
- understand basic probability theory methods and solve simple problems using them
- formulate the assumptions behind different models and understand how to choose an appropriate model
- apply inferential statistics methods to evaluate statistical models
- apply the methods learned using the statistical software R and interpret the output coming from the software

Reading list

Field, Andy; Miles, Jeremy; Field, Zoe: Discovering Statistics Using R, SAGE Publications, 1. Aufl. 2012

Bruce, Peter; Bruce, Andrew; Gedeck, Peter: Practical Statistics for Data Scientists, O'Reilly, 2. Aufl. 2020

Winter, Bodo: Statistics for Linguists: An Introduction Using R, Routledge. 1. Aufl. 2019

Software:

- R: <https://www.r-project.org/>

2 Computer Science - Bachelor's Degree

2.1 Project Work 1

Information about the module

Title in English	Project Work 1
Examination number	3975450
Module code	PA1
Module coordinator	Director of studies
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Project Work 1 (6 credit hours)
Teaching language	German/English
Teaching and learning methods of the module	Project Work
Prerequisites for participation in the module	
Total workload and its constituent parts	Credit hours: 6, CP credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 10-30 Seiten, 80%• Presentation, 20-40 minutes, 20%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Over the course of one semester, the project work is made up of the following items of work (attendance at each event is compulsory):

- Project management event (kick-off seminar at the beginning of the semester)
- Participation in the project meetings (usually on a weekly basis)
- Project presentation event (e.g. project day including colloquium at the end of the semester)
- Project implementation

Qualification aims for the module learning objectives/skills

The students acquire the skills required to carry out an IT project. The students acquire knowledge of project organisation and implementation, other presentation, teamwork, scientific writing and debate culture skills as well as experience with project management tools.

Reading list

2.2 Project Work 2

Information about the module

Title in English	Project Work 2
Examination number	3975450
Module code	PA2
Module coordinator	Director of studies
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Project Work 2 (8 credit hours)
Teaching language	German/English
Teaching and learning methods of the module	Project Work
Prerequisites for participation in the module	
Total workload and its constituent parts	Credit hours: 8, CP credits: 10, Contact hours: 120h, Independent study: 180h, Total workload: 300h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 10-30 Seiten, 80%• Presentation, 20-40 minutes, 20%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Over the course of one semester, the project work is made up of the following items of work (attendance at each event is compulsory):

- Project management event (kick-off seminar at the beginning of the semester)
- Participation in the project meetings (usually on a weekly basis)
- Project presentation event (e.g. project day including colloquium at the end of the semester)
- Project implementation

Qualification aims for the module learning objectives/skills

The students acquire the skills required to carry out an IT project. The students acquire knowledge of project organisation and implementation, other presentation, teamwork, scientific writing and debate culture skills as well as experience with project management tools.

Reading list

3 Business Information Systems - Bachelor's Degree

3.1 Customizing

Information about the module

Title in English	Customizing
Examination number	3975460
Module code	CUST
Module coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Customizing of Information Systems (4 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical class and workshop, practical work
Prerequisites for participation in the module	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Written examination, 60 minutes, with authorized lecture material, 50%• Project work, 10-30 pages and 10-30 minutes presentation, 50%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

This lecture introduces to Enterprise Systems (ES), that represent a specific category of information systems. They build on pre-packaged industry best practices embedded in standardized product software and target large-scale integration of data and business processes across all company's functional areas and beyond company borderlines.

In the first part of the lecture, after an introduction to the key terms and definitions for ES, process-centric ES and in particular Enterprise Resource Planning (ERP) Systems will be discussed in detail. ERP Systems such as SAP S/4 HANA are the core business applications for many organizations. The lecture will examine

- Fundamentals of ERP Systems
- Basic Functionalities of ERP Systems with the example SAP S/4 HANA
- Core processes such as "Order to Cash" and "Procure to Cash"

The second part of the lecture presents the core concepts of ES implementations. With these concepts the necessary steps to configure/customize an ERP system such as SAP S/4 HANA are elaborated.

Qualification aims for the module learning objectives/skills

Students will get an introduction to the core concepts of Enterprise Systems as specific category of Information Systems. After successful participation, students will be able to:

- Understand and describe the different types and concepts of Enterprise Systems
- Understand and describe the functions and processes covered by ERP Systems
- Use the SAP S/4 HANA System for important core processes
- Understand and describe the core concepts of Enterprise System Implementations
- Configure/customize core features of the SAP S/4 HANA System

Reading list

Literature recommendations will be provided in the first lecture.

3.2 IT Applications Seminar

Information about the module

Title in English	IT Applications Seminar
Examination number	3975610
Module code	DVASEM
Module coordinator	Director of studies
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	IT Applications Seminar (2 credit hours)
Teaching language	German/English
Teaching and learning methods of the module	In this course, you choose one specific topic from the numerous subject areas offered by various lecturers. This usually takes place at the end of the previous semester although in some cases this may take place during a brief introductory session. Registration takes place online and is binding. Attendance is compulsory and active participation (discussion, colloquium) is expected
Prerequisites for participation in the module	
Total workload and its constituent parts	Credit hours: 2, CP credits: 3, Contact hours: 30h, Independent study: 60h, Total workload: 90h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Written assignment, 5-15 pages, 70%• Presentation, 15-30 minutes, 30%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The aim of this seminar is to promote the autonomous development of in-depth knowledge of a topic that has been studied as part of the subject area on offer, as well as active participation in the form of individual presentations and other related contributions. Each participant summarises the findings of the seminar and makes a presentation on them.

Qualification aims for the module learning objectives/skills

The students acquire detailed knowledge of the chosen subject area as well as advanced skills in the fields of academic work, presentation techniques and elocution.

Reading list

3.3 Project 1

Information about the module

Title in English	Project 1
Examination number	3975450
Module code	PRO1
Module coordinator	Director of studies
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Project Work 1 (4 credit hours)
Teaching language	German/English
Teaching and learning methods of the module	Project Work
Prerequisites for participation in the module	
Total workload and its constituent parts	Credit hours: 4, CP credits: 8, Contact hours: 60h, Independent study: 180h, Total workload: 240h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 10-30 Seiten, 80%• Presentation, 20-40 minutes, 20%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Over the course of one semester, the project work is made up of the following items of work (attendance at each event is compulsory):

- Project management event (kick-off seminar at the beginning of the semester)
- Participation in the project meetings (usually on a weekly basis)
- Project presentation event (e.g. project day including colloquium at the end of the semester)
- Project implementation

Qualification aims for the module learning objectives/skills

The students acquire the skills required to carry out an IT project. The students acquire knowledge of project organisation and implementation, other presentation, teamwork, scientific writing and debate culture skills as well as experience with project management tools.

Reading list

3.4 Project 2

Information about the module

Title in English	Project 2
Examination number	3975450
Module code	PRO2
Module coordinator	Director of studies
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Project Work 2 (4 credit hours)
Teaching language	German/English
Teaching and learning methods of the module	Project Work
Prerequisites for participation in the module	
Total workload and its constituent parts	Credit hours: 4, CP credits: 8, Contact hours: 60h, Independent study: 180h, Total workload: 240h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 10-30 Seiten, 80%• Presentation, 20-40 minutes, 20%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Over the course of one semester, the project work is made up of the following items of work (attendance at each event is compulsory):

- Project management event (kick-off seminar at the beginning of the semester)
- Participation in the project meetings (usually on a weekly basis)
- Project presentation event (e.g. project day including colloquium at the end of the semester)
- Project implementation

Qualification aims for the module learning objectives/skills

The students acquire the skills required to carry out an IT project. The students acquire knowledge of project organisation and implementation, other presentation, teamwork, scientific writing and debate culture skills as well as experience with project management tools.

Reading list

4 Computer Science - Master's Degree

4.1 Master's Seminar

Information about the module

Title in English	Master's Seminar
Examination number	8900110
Module code	MASEM
Modul area	Academic work
Module coordinator	Prof. Dr. Phil. Alessandra Zarcone
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester, summer semester
Courses that make up the module	Master's seminar (2 credit hours)
Teaching language	English
Teaching and learning methods of the module	<p>The topics are announced in advance so that every student who is interested in the module can sign up online, select a topic and do their own research.</p> <p>The students are required to submit an abstract 1 week before their presentation. Each presentation is followed by a discussion where the students discuss possible open questions. A critical but productive approach towards one's own work and the peers' work is encouraged.</p> <p>The students submit an article summarizing their results at the end of the course.</p>
Prerequisites for participation in the module	Module Workshop (WSH)
Possibility to use module within student's own study programme or other programmes	Master's degree Computer Science
Total workload and its constituent parts	Credit hours: 2, CP credits: 5, Contact hours: 30h, Independent study: 120h, Total workload: 150h

Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation and discussion, 20-30 minutes, 30% • Written assignment, 11-15 pages, 70%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The aim of the master's seminar is to promote autonomous research work on a particular topic.

The students expand their knowledge and understanding of the chosen topic and investigate the methodology, potential critical points and open questions. They summarise the results in a long abstract and then present the results to the class. The students review their peers's abstracts and presentations and adopt a critical approach towards their own work. The content of all presentations is thematically related to encourage discussion. Each student submits a paper on the chosen topic.

We strongly recommend attending the Workshop "Introduction to Scientific Research" before the Masterseminar.

Qualification aims for the module learning objectives/skills

The students have refined their critical insights and have developed their scientific writing and presentation skills.

They are able to

- research a chosen topic
- structure a scientific publication
- apply common-practice scientific methodologies
- analyze and discuss research results
- identify weak points and strength of scientific publications and provide feedback to their peers

Reading list

5 Business Information Systems - Master's Degree

5.1 Master's Seminar

Information about the module

Title in English	Master's Seminar
Examination number	8004091
Module code	MSEM
Modul area	Module F: Academic Work
Module coordinator	Prof. Dr. Phil. Alessandra Zarcone
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester, summer semester
Courses that make up the module	Master's seminar (2 credit hours)
Teaching language	English
Teaching and learning methods of the module	<p>The topics are announced in advance so that every student who is interested in the module can sign up online, select a topic and do their own research.</p> <p>The students are required to submit an abstract 1 week before their presentation. Each presentation is followed by a discussion where the students discuss possible open questions. A critical but productive approach towards one's own work and the peers' work is encouraged.</p> <p>The students submit an article summarizing their results at the end of the course.</p>
Prerequisites for participation in the module	Module Workshop (WSH)
Possibility to use module within student's own study programme or other programmes	Master's degree Business Information Systems
Total workload and its constituent parts	Credit hours: 2, CP credits: 5, Contact hours: 30h, Independent study: 120h, Total workload: 150h

Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation and discussion, 20-30 minutes, 30% • Written assignment, 11-15 pages, 70%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The aim of the master's seminar is to promote autonomous research work on a particular topic.

The students expand their knowledge and understanding of the chosen topic and investigate the methodology, potential critical points and open questions. They summarise the results in a long abstract and then present the results to the class. The students review their peers's abstracts and presentations and adopt a critical approach towards their own work. The content of all presentations is thematically related to encourage discussion. Each student submits a paper on the chosen topic.

We strongly recommend attending the Workshop "Introduction to Scientific Research" before the Masterseminar.

Qualification aims for the module learning objectives/skills

The students have refined their critical insights and have developed their scientific writing and presentation skills.

They are able to

- research a chosen topic
- structure a scientific publication
- apply common-practice scientific methodologies
- analyze and discuss research results
- identify weak points and strength of scientific publications and provide feedback to their peers

Reading list

5.2 Project Work

Information about the module

Title in English	Project Work
Examination number	8004092
Module code	PROAR
Modul area	Academic work
Module coordinator	Director of studies
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Project Work (2 credit hours)
Teaching language	English
Teaching and learning methods of the module	Project work, regular project status meetings, project-related tuition in blocks of seminars, coaching.
Prerequisites for participation in the module	No specific master's modules.
Total workload and its constituent parts	Credit hours: 2, CP credits: 5, Contact hours: 30h, Independent study: 120h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 20-40 Seiten, 80%• Presentation, 20-40 minutes, 20%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The project tasks covered in this module derive from specific, practical implementation projects that are carried out by the companies of today. The intention here is to establish practical collaboration with companies. The students organise themselves into project teams, analyse the commercial issues, draft potential alternative solutions and make the decision as to which approach to take. Once the framework is in place, the implementation stage begins based on this decision.

Qualification aims for the module learning objectives/skills

The students master the planning and execution of a system implementation project by selecting and applying appropriate project management techniques.

Reading list

6 Required Electives–Bachelor's Degree

6.1 Computer Games Development

Information about the module

Title in English	Computer Games Development
Examination number	IN 3970322, 2970788 TI 3976563, 2976562 WI 3975708 IIS 9775108
Module code	CGDEV4.WP
Module coordinator	Philip McClenaghan
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	The module is regularly offered as a block course during the semester break. (February/March) and (August/September)
Courses that make up the module	Computer Games Development (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical classes and workshops
Prerequisites for participation in the module	None
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation, 10-30 minutes, 40% • Written assignment, 8-25 pages, 60%

Grading	According to § 20 of the APO in the currently valid version.
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Content of the module

The aim of this course is to provide students with an understanding of computer game theory and design. This is not a technical course. Conceptual design and critical analysis exercises allow students to explore a range of relevant topics in order to gain the ability to look at computer games objectively and from an informed standpoint. Students present their work (in English) both verbally and in written form through presentations and analysis documents.

Qualification aims for the module learning objectives/skills

On completion of this module, the student will be able to demonstrate:

- An appreciation of the computer games industry
- An understanding of computer games design and the ability to critically evaluate computer games
- An understanding of design implementation
- The ability to create a pre-production games proposal document
- The ability to articulate course related ideas and concepts in English, both verbally and in written form

Reading list

Sylvester, T. (2013) Designing Games: A Guide to Engineering Experiences. O'Reilly
Gamasutra Website (<http://www.gamasutra.com/>)

6.2 Digital Transformation in Organizations

Information about the module

Title in English	Digital Transformation in Organizations
Examination number	IN 3970377, 2970875 TI 3976579, 2976686 WI 3975795 IIS 9775115
Module code	DTO4.WP
Module coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Digital Transformation in Organizations (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical group work and case studies, industry talks
Prerequisites for participation in the module	Students should have acquired basic skills in informatics or business information systems to understand core concepts/fundamentals behind business organizations and digital technologies. Bachelor (5th semester) or master in business information systems or computer science is recommended.
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Project work, 50% • Written assignment, 10-15 pages, 50%

Content of the module

Digitalization is one of the megatrends of our time. We live in a time where digital technologies and their applications make astonishing progress. Cars become driverless, computers beat humans in chess and Jeopardy and 3D-printers create houses. In the first part of this course the terms digitalization and digital transformation will be defined and the foundations are laid. Specifically, the following topics will be covered:

- Digital transformation – why it is one of the biggest buzzwords but also megatrends of our time
- Digitalization and digital transformation: Definition and delimitation
- A framework for organizations, individuals, and digital technology
- Historical evolution of industry and (digital) technologies
- Key digital technologies of our time
- Influence of digital technologies on organizations

Many organizations are confronting the question of how to design and manage the digital transformation. Based on phase-models of innovation adoption, the generic transformation process will be explained. Along this process, specific tasks and challenges that an organization needs to design and manage will be introduced. Specifically, the following topics will be covered:

- Stage models for digital transformation in organizations
- Key design aspects for digital transformations
- Methods and instruments to design, manage and facilitate digital transformations

Overall, this course is aimed at giving students the opportunity to learn and practice important aspects of digital transformations in organizations, one of the most pressing topics of our time for businesses around the globe. Group work with (research) papers and case studies will be used to complement the concepts and examples from the lecture. In industry talks, practitioners will share their own experiences from digital transformation management.

Qualification aims for the module learning objectives/skills

Students that aim at learning the design and management aspects of digitalization in organizations will create and deepen their knowledge. Students will be prepared for working in digital transformation projects in business organizations. After successful participation, students particularly will:

- Understand the term and the reasons for accelerated digital transformation in organizations
- Understand the technological and conceptual foundations of digital transformation
- Remember the historical evolution of industries and (digital) technologies
- Understand the influence of digital technologies on organizations
- Understand the typical phases and tasks in digital transformations
- Analyze and evaluate design and management problems in digital transformations
- Apply methods and instruments to create solutions for real world problems in the context of digital transformation projects

Reading list

Literature recommendations will be provided in the lecture

6.3 Interaction Engineering

Information about the module

Title in English	Interaction Engineering
Examination number	IN 3970326, 2970796 TI 3976567, 2976571
Module code	INTENG4.WP
Module coordinator	Prof. Dr. Michael Kipp
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Interaction Engineering (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	The course includes a series of lectures by the lecturer. Students will give oral presentations and work on assignments at home, both individually and in teams. Students will also work on a final team project which engages them in scientific thinking, practical implementation and critical reflection.
Prerequisites for participation in the module	The requirements for this course are solid programming skills, prior experience with working scientifically, a good command of the English language (reading, writing and speaking) and an interest in working both analytically and creatively to develop novel interaction methods.
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs: Computer Science and Computer Engineering
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation, 15 minutes, 25% • Project work, 50% • Written assignment, 15-20 pages, 25%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

In the course students will learn about fundamental concepts of human-computer interaction and various research areas that try to improve traditional ways of human-computer interaction by including touch, gesture, facial and bodily actions to make the interaction more intuitive, natural and efficient.

Students will also get to know and apply methods to evaluate interactive systems objectively (measurable aspects) and subjectively (user feedback).

Qualification aims for the module learning objectives/skills

Knowledge

- Fundamentals of human-computer interaction
- Touch interaction
- Gestural interaction
- Tangible interaction
- Proxemic, spatial, full-body interaction
- Cross-device interaction

Skills

- Understanding and presenting a research publication
- Implementing a running prototype of an interactive system
- Applying evaluation methods for an interactive system
- Critically discussing research publications
- Working in a team

Competencies

- Understanding and further developing a research topic
- Informally evaluating a prototype

Reading list

B. Buxton, S. Greenberg, S. Carpendale, N. Marquardt (2012) Sketching User Experiences: The Workbook, Morgan Kaufmann, 262 pages.

B. Albert, T. Tullis (2013) Measuring the User Experience, 2. Edition, Morgan Kaufmann, 301 pages.

J. Butler, K. Holden, W. Lidwell (2010) Universal Principles of Design, Rockport Publishers, 272 pages.

6.4 IT Sourcing and Cloud Transformation

Information about the module

Title in English	IT Sourcing and Cloud Transformation
Examination number	IN 3970380, 2970878 TI 3976596, 2976689 WI 3975798 IIS 9775133
Module code	ITSCT4.WP
Module coordinator	Prof. Dr. Arne Mayer
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	IT Sourcing and Cloud Transformation (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar-based instruction at the beginning - Supported by case studies, group discussions and guest lectures. In the further course, work in small groups, in which the students work out the practice-relevant content themselves.
Prerequisites for participation in the module	None
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written examination, 60 minutes, auxiliary: non-programmable calculator
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Offshoring and outsourcing as well as the change from classic IT models to the cloud are a 'must have' for organizations in high-wage countries like Germany. This stems not only from an economic point of view, but also against the background of the permanent shortage of IT specialists. As a result, complexity and demands on the IT of organizations increase significantly. In this module - with a strong focus on relevant, current problems - students are prepared for opportunities and challenges in their future professional life.

The following blocks are covered:

- Off- and nearshoring (regional IT sourcing)
- Outsourcing (external IT sourcing)
- Transformation to the Cloud / Everything as a Service
- Low code platforms as game changers in software development

Qualification aims for the module learning objectives/skills

With successful participation in the module, students can:

- Understand the challenges in today's information management
- Be familiar with and discuss the IT measures and technologies mentioned
- Generate solution proposals for current problems and create implementation approaches

Reading list

Will be announced in the first lecture

6.5 Lean IT & Enterprise Architecture

Information about the module

Title in English	Lean IT & Enterprise Architecture
Examination number	IN 3970394, 2970892 TI 3976600, 2976714, WI 3975812, IIS 9775171
Module code	LEANIT4.WP
Module coordinator	Prof. Dr. Stephan Zimmermann
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Lean IT & Enterprise Architecture (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Lecture and seminar lessons with laboratory exercises and case studies to apply the knowledge acquired. In addition, the exercises support self-study.
Prerequisites for participation in the module	The requirements for this course are a basic command of the English language, and an interest in better managing IT organizations and enterprise architectures.
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Project work, 15-30 pages
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

IT in companies is becoming more and more important and complex. A numerous and increasing number of applications, systems and IT services used in business processes and delivered by IT organizations substantiates this development.

Lean IT and Enterprise Architecture Management (EAM) help companies to address related challenges. While Lean IT uses lean principles to develop and manage IT products and services with the central concern to eliminate waste in the context of IT that adds no value for the customer or user, EAM describes the management practice to transform the IT landscape by defining, communicating, and using a coherent set of strategies and guidelines.

In this course students will learn about the fundamental concepts of lean IT and enterprise architectures, and how these two topics connect. They also get to know techniques to develop strategies, analyze waste and work in value streams, and build business, information system and technology architectures.

Students will play several lean games to increase their lean mindset and solve several case studies regarding enterprise architecture challenges in practice. Supported by the novel “The Phoenix Project” they will have an additional touchpoint to practical challenges.

Knowledge focus:

- Lean IT concepts (value, waste, value streams, pull, flow)
 - Value stream mapping
 - The Four Types of Work
 - Kanban-Boards
- Enterprise Architecture concepts: Business, Information System and Technology Architecture
 - Business Capability Management
 - IT Portfolio Management
 - The Open Group Architecture Framework (TOGAF)
 - Visualization of IT landscapes

Qualification aims for the module learning objectives/skills

After successful participation in the module, the students can:

- illustrate waste, work, and Kanban in a lean IT context
- apply value stream mapping for IT services & products
- demonstrate competencies with the application of EA methods and IT landscape modelling
- apply business capability management and IT portfolio techniques
- illustrate enterprise architecture frameworks
- solving practical case studies and scenarios
- articulate course related ideas and concepts in English.

Reading list

Ahlemann, F., Stettiner, E., Messerschmidt, M., Legner, C. (2012): Strategic Enterprise Architecture Management Challenges, Best Practices, and Future Developments, Springer-Verlag Berlin Heidelberg.

Kim, Gene; Behr, Kevin; Spafford, George (2013) : The Phoenix Project – A novel about IT, DevOps and helping your business win, IT Revolution Press.

Lankhorst M. (2013) : Enterprise architecture at work: Modelling, communication, and analysis. Springer, Berlin.

Peppard J., Ward J. (2016) : The strategic management of information systems: Building a digital strategy. Wiley, Chichester, West Sussex.

The Open Group (2018), The Open Group Architectural Framework (TOGAF) Version 9.2. The Open Group, Reading, UK.

6.6 Visual Thinking for Business

Information about the module

Title in English	Visual Thinking for Business
Examination number	IN 3970353, 2970849 TI 3976558, 2976659 WI 3975767 IIS 9775160
Module code	VISTH.WP
Module coordinator	Philip McClenaghan
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	The module is regularly offered as a block course during the semester break. (February/March) and (August/September)
Courses that make up the module	Visual Thinking for Business (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical classes and workshops
Prerequisites for participation in the module	None
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation, 10-25 minutes, 40% • Written assignment, 10-15 pages, 60%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Companies in the modern business world are turning to new ways of working such as Design Thinking and Lean Start-Up to keep pace with constantly evolving marketplaces and technological advancements. The visual tools and methods of Visual Thinking support these new working practices by making information, ideas, concepts and processes visible and thus accessible to all.

Visual Thinking extends the verbal and written language using visualization methods that enable the graphic representation of ideas and complex content. In the new world of design thinking, agile innovation, lean start-up, etc., this is essential.

This course is suitable for all students who want to think through new ideas, complex content and procedures in a structured manner and communicate effectively in their professional life.

Qualification aims for the module learning objectives/skills

The students should develop the following skills during the course:

- Basic understanding of the theoretical aspects of visual thinking and visual communication.
- Application and further development of visual storytelling methods.
- The ability to communicate ideas and complex content visually.
- The ability to independently use visual thinking in a business environment.

Reading list

Will be announced in the first lecture.

7 Required Electives–Master’s Degree

7.1 Computer Games Development

Information about the module

Title in English	Computer Games Development
Examination number	BIS2019 8005036 MIN2017 8900730
Module code	COMGA.WP
Module coordinator	Philip McClenaghan
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	The module is regularly offered as a block course during the semester break. (February/March) and (August/September)
Courses that make up the module	Computer Games Development (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical classes and workshops
Prerequisites for participation in the module	None
Possibility to use module within student’s own study programme or other programmes	Required elective for master’s degree programs
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Presentation, 10-30 minutes, 40%• Written assignment, 8-25 pages, 60%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The aim of this course is to provide students with an understanding of computer game theory and design. This is not a technical course. Conceptual design and critical analysis exercises allow students to explore a range of relevant topics in order to gain the ability to look at computer games objectively and from an informed standpoint. Independent research projects enable students to gain indepth knowledge of specific aspects of computer games design. Students present their work (in English) both verbally and in written form through presentations, analysis documentation and research reports.

Qualification aims for the module learning objectives/skills

On completion of this module, the student will be able to demonstrate:

- An understanding of computer games design and the ability to critically evaluate computer games.
- An understanding of design implementation and the ability to critically reflect on design processes and decisions.
- The ability to create a pre-production games proposal document.
- The ability to articulate course related ideas and concepts in English, both verbally and in written form.
- The ability to independently research computer games design and critically interpret the results.

Reading list

Sylvester, T. (2013) *Designing Games: A Guide to Engineering Experiences*. O'Reilly

Gamasutra Website (<http://www.gamasutra.com/>)

7.2 Data Science

Information about the module

Title in English	Data Science
Examination number	BIS2019 8005026 MIN2017 8900650
Module code	DASC4.WP
Module coordinator	Prof. Dr.-Ing. Honorary Doctor of ONPU Thorsten Schöler
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Data Science (4 credit hours)
Teaching language	The module is taught in English, if necessary also in German
Teaching and learning methods of the module	<ul style="list-style-type: none"> • Seminar format • Scientific Seminar • Studies • Small projects
Prerequisites for participation in the module	<ul style="list-style-type: none"> • Good programming skills (Python, Java, etc.) • Interest in scientific challenges • Solid mathematical understanding
Possibility to use module within student's own study programme or other programmes	Required elective for master's degree programs
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written assignment, 8-20 pages

Grading	According to § 20 of the APO in the currently valid version.
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Content of the module

Introduction to Data Science:

Introduction, Data Science and the Internet of Things

Short introduction to Python

Extract Transform Load (ETL):

Setup, ETL and Hadoop, How Uber designed its big data platform, Accessing SQL databases, Airline delay data set, Unstructured/semi-structured data, Time series analysis of earth oscillation data, Further examples, Additional open data sources

Visualisation:

Introduction, Curve plotting, Using panels, Scatterplots, Histograms, Bar graphs, Image visualisation, Selected graphical examples with pandas, Advanced data learning representation, Feature importance, Further material

Statistics and classification:

Literature, Statistics, Linear regression, Correlation and covariance, Classification

Machine Learning:

Introduction, Unsupervised learning, Supervised learning, (Reinforcement learning)

Deep learning:

Introduction, Darknet, ConvNetJS MNIST demo, Lasagne MNIST, Another deep learning MNIST example in Lasagne and other toolkits, Introduction to TensorFlow, Introduction to Keras,

Datenkraken:

Examples, Workshop

Sensor data fusion:

Introduction, JDL data fusion model, Subsumption architecture, Literature

Qualification aims for the module learning objectives/skills

The participants understand the basic procedures and methods in the field of Big Data and Data Science. They can use various software libraries in the field of data science and machine learning. They are able to analyse, visualise and evaluate or classify large amounts of data. Within the framework of a small project, you will develop your own methods for data analysis in a self-imposed task.

Reading list

- Y. Hofstetter**, Sie wissen alles: Wie intelligente Maschinen in unser Leben eindringen und warum wir für unsere Freiheit kämpfen müssen. München: C. Bertelsmann Verlag, 2014.
- W. McKinney**, Datenanalyse mit Python: Auswertung von Daten mit Pandas, NumPy und IPython, 1. Auflage, O'Reilly, 2015.
- J. Grus**, Einführung in Data Science: Grundprinzipien der Datenanalyse mit Python, 1. Auflage, O'Reilly, 2016.
- R. Bruns und J. Dunkel**, Event-Driven Architecture: Softwarearchitektur für ereignis-gesteuerte Geschäftsprozesse, 1. Auflage, Berlin u.a.: Springer, 2010.

7.3 Digital Transformation in Organizations

Information about the module

Title in English	Digital Transformation in Organizations
Examination number	BIS2019 8005083 MIN2017 8901240
Module code	DTO4.WP
Module coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Digital Transformation in Organizations (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format, practical group work and case studies, industry talks
Prerequisites for participation in the module	Students should have acquired basic skills in informatics or business information systems to understand core concepts/fundamentals behind business organizations and digital technologies. Bachelor (5th semester) or master in business information systems or computer science is recommended.
Possibility to use module within student's own study programme or other programmes	Required elective for master's degree programs
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Project work, 50% • Written assignment, 10-15 pages, 25% • Presentation, 15-25 minutes, 25%

Grading	According to § 20 of the APO in the currently valid version.
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Content of the module

Digitalization is one of the megatrends of our time. We live in a time where digital technologies and their applications make astonishing progress. Cars become driverless, computers beat humans in chess and Jeopardy and 3D-printers create houses. In the first part of this course the terms digitalization and digital transformation will be defined and the foundations are laid. Specifically, the following topics will be covered:

- Digital transformation – why it is one of the biggest buzzwords but also megatrends of our time
- Digitalization and digital transformation: Definition and delimitation
- A framework for organizations, individuals, and digital technology
- Historical evolution of industry and (digital) technologies
- Key digital technologies of our time
- Influence of digital technologies on organizations

Many organizations are confronting the question of how to design and manage the digital transformation. Based on phase-models of innovation adoption, the generic transformation process will be explained. Along this process, specific tasks and challenges that an organization needs to design and manage will be introduced. Specifically, the following topics will be covered:

- Stage models for digital transformation in organizations
- Key design aspects for digital transformations
- Methods and instruments to design, manage and facilitate digital transformations

Overall, this course is aimed at giving students the opportunity to learn and practice important aspects of digital transformations in organizations, one of the most pressing topics of our time for businesses around the globe. Group work with (research) papers and case studies will be used to complement the concepts and examples from the lecture. In industry talks, practitioners will share their own experiences from digital transformation management.

Qualification aims for the module learning objectives/skills

Students that aim at learning the design and management aspects of digitalization in organizations will create and deepen their knowledge. Students will be prepared for working in digital transformation projects in business organizations. After successful participation, students particularly will:

- Understand the term and the reasons for accelerated digital transformation in organizations
- Understand the technological and conceptual foundations of digital transformation
- Remember the historical evolution of industries and (digital) technologies
- Understand the influence of digital technologies on organizations
- Understand the typical phases and tasks in digital transformations
- Analyze and evaluate design and management problems in digital transformations
- Apply methods and instruments to create solutions for real world problems in the context of digital transformation projects

Reading list

Literature recommendations will be provided in the lecture

7.4 Embedded Security

Information about the module

Title in English	Embedded Security
Examination number	BIS2019 8005037 MIN2017 8900740
Module code	EMBSEC.WP
Module coordinator	Prof. Dr.-Ing. Dominik Merli
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Embedded Security (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar-like lectures and supporting practical exercises
Prerequisites for participation in the module	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written examination, 90 minutes, auxiliary: calculator, English-Dictionary
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

1. Introduction, Standards and Processes
 - Standards for Secure Components
 - Secure Development Process
2. Fundamental Embedded Security Building Blocks
 - Random Number Generators
 - Cryptographic Implementations
 - Secure Memory and Data Storage
 - Secure Device Identity
 - Secure Communication
3. Hardware and Firmware Level Security Measures
 - Secure Boot Process
 - Secure Firmware Update
 - Robust Device Architecture
4. Operating System Level Security Measures
 - Access Control and Management
 - System Monitoring

Qualification aims for the module learning objectives/skills

After successful participation, students are able to:

- derive security requirements for embedded systems and a secure development process
- explain fundamental embedded security building blocks
- name countermeasures for typical attacks on embedded systems
- describe advantages and disadvantages of different cryptographic implementations and protection measures
- explain device security concepts on hardware, firmware and operating system level and the reasoning behind them

Reading list

- D. Mukhopadhyay, R. S. Chakraborty:** "Hardware Security: Design, Threats, and Safeguards", Chapman and Hall/CRC, 2014
- S. Mangard, E. Oswald, T. Popp:** "Power Analysis Attacks: Revealing the Secrets of Smart Cards", Springer, 2007
- C. Paar, J. Pelzl:** "Understanding Cryptography: A Textbook for Students and Practitioners", Springer, 2010
- C. K. Koc (Ed.):** "Cryptographic Engineering", Springer, 2009

7.5 Interaction Engineering

Information about the module

Title in English	Interaction Engineering
Examination number	BIS2019 8005031 MIN2017 8900510
Module code	INTENG.WP
Module coordinator	Prof. Dr. Michael Kipp
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Interaction Engineering (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	The course includes a series of lectures by the lecturer. Students will give oral presentations and work on assignments at home, both individually and in teams. Students will also work on a final team project which engages them in scientific thinking, practical implementation and critical reflection.
Prerequisites for participation in the module	The requirements for this course are solid programming skills, prior experience with working scientifically, a good command of the English language (reading, writing and speaking) and an interest in working both analytically and creatively to develop novel interaction methods.
Possibility to use module within student's own study programme or other programmes	Required elective for master's degree programs: Interactive Media Systems, Computer Science and Business Information Systems
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation, 15 minutes, 25% • Project work, 50% • Written assignment, 15-20 pages, 25%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

In the course students will learn about fundamental concepts of human-computer interaction and various research areas that try to improve traditional ways of human-computer interaction by including touch, gesture, facial and bodily actions to make the interaction more intuitive, natural and efficient.

Students will also get to know and apply methods to evaluate interactive systems objectively (measurable aspects) and subjectively (user feedback).

Qualification aims for the module learning objectives/skills

Knowledge

- Fundamentals of human-computer interaction
- Touch interaction
- Gestural interaction
- Tangible interaction
- Proxemic, spatial, full-body interaction
- Cross-device interaction

Skills

- Understanding and presenting a research publication
- Implementing a running prototype of an interactive system
- Applying evaluation methods for an interactive system
- Critically discussing research publications
- Working in a team

Competencies

- Finding and formulating a research topic
- Formally evaluating a prototype

Reading list

B. Buxton, S. Greenberg, S. Carpendale, N. Marquardt (2012) Sketching User Experiences: The Workbook, Morgan Kaufmann, 262 pages.

B. Albert, T. Tullis (2013) Measuring the User Experience, 2. Edition, Morgan Kaufmann, 301 pages.

J. Butler, K. Holden, W. Lidwell (2010) Universal Principles of Design, Rockport Publishers, 272 pages.

7.6 IT Sourcing and Cloud Transformation

Information about the module

Title in English	IT Sourcing and Cloud Transformation
Examination number	BIS2019 8005086 MIN2017 8901270
Module code	ITSCT4.WP
Module coordinator	Prof. Dr. Arne Mayer
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	IT Sourcing and Cloud Transformation (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar-based instruction at the beginning - Supported by case studies, group discussions and guest lectures. In the further course, work in small groups, in which the students work out the practice-relevant content themselves.
Prerequisites for participation in the module	None
Possibility to use module within student's own study programme or other programmes	Required elective for master's degree programs
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Written examination, 60 minutes, auxiliary: non-programmable calculator, 70% • Presentation, 15 minutes, plus 10 minutes Discussion, 30%

Grading	According to § 20 of the APO in the currently valid version.
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Content of the module

Offshoring and outsourcing as well as the change from classic IT models to the cloud are a 'must have' for organizations in high-wage countries like Germany. This stems not only from an economic point of view, but also against the background of the permanent shortage of IT specialists. As a result, complexity and demands on the IT of organizations increase significantly. In this module - with a strong focus on relevant, current problems - students are prepared for opportunities and challenges in their future professional life.

The following blocks are covered:

- Off- and nearshoring (regional IT sourcing)
- Outsourcing (external IT sourcing)
- Transformation to the Cloud / Everything as a Service
- Low code platforms as game changers in software development

Qualification aims for the module learning objectives/skills

With successful participation in the module, students can:

- Understand the challenges in today's information management
- Be familiar with and discuss the IT measures and technologies mentioned
- Generate solution proposals for current problems and create implementation approaches

Reading list

Will be announced in the first lecture

7.7 Lean IT & Enterprise Architecture

Information about the module

Title in English	Lean IT & Enterprise Architecture
Examination number	BIS2019 8005096 MIN2017 8901370
Module code	LEANIT4.WP
Module coordinator	Prof. Dr. Stephan Zimmermann
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Lean IT & Enterprise Architecture (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Lecture and seminar lessons with laboratory exercises and case studies to apply the knowledge acquired. In addition, the exercises support self-study.
Prerequisites for participation in the module	The requirements for this course are a basic command of the English language, and an interest in better managing IT organizations and enterprise architectures.
Possibility to use module within student's own study programme or other programmes	Required elective for master's degree programs
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 15-30 pages, 60%• Presentation A, 30-50 minutes, 40%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

IT in companies is becoming more and more important and complex. A numerous and increasing number of applications, systems and IT services used in business processes and delivered by IT organizations substantiates this development.

Lean IT and Enterprise Architecture Management (EAM) help companies to address related challenges. While Lean IT uses lean principles to develop and manage IT products and services with the central concern to eliminate waste in the context of IT that adds no value for the customer or user, EAM describes the management practice to transform the IT landscape by defining, communicating, and using a coherent set of strategies and guidelines.

In this course students will learn about the fundamental concepts of lean IT and enterprise architectures, and how these two topics connect. They also get to know techniques to develop strategies, analyze waste and work in value streams, and build business, information system and technology architectures.

Students will play several lean games to increase their lean mindset and solve several case studies regarding enterprise architecture challenges in practice. Supported by the novel “The Phoenix Project” they will have an additional touchpoint to practical challenges.

Knowledge focus:

- Lean IT concepts (value, waste, value streams, pull, flow)
 - Value stream mapping
 - The Four Types of Work
 - Kanban-Boards
 - Evaluating Lean IT concepts in an organizational context
- Enterprise Architecture concepts: Business, Information System and Technology Architecture
 - Business Capability Management
 - IT Portfolio Management
 - The Open Group Architecture Framework (TOGAF)
 - Visualization of IT landscapes
 - Evaluating IT Portfolios, Strategies & Capabilities
 - Strategic Dialogs

Qualification aims for the module learning objectives/skills

After successful participation in the module, the students can:

- illustrate waste, work, and Kanban in a lean IT context
- apply value stream mapping for IT services & products
- evaluate IT concepts in organizational structures
- demonstrate competencies with the application of EA methods and IT landscape modelling
- apply business capability management and IT portfolio techniques
- apply enterprise architecture frameworks
- solving practical case studies and scenarios
- articulate course related ideas and concepts in English
- connect Lean IT concepts and Enterprise Architecture.

Reading list

Ahlemann, F., Stettiner, E., Messerschmidt, M., Legner, C. (2012): Strategic Enterprise Architecture Management Challenges, Best Practices, and Future Developments, Springer-Verlag Berlin Heidelberg.

Kim, Gene; Behr, Kevin; Spafford, George (2013) : The Phoenix Project – A novel about IT, DevOps and helping your business win, IT Revolution Press.

Lankhorst M. (2013) : Enterprise architecture at work: Modelling, communication, and analysis. Springer, Berlin.

Peppard J., Ward J. (2016) : The strategic management of information systems: Building a digital strategy. Wiley, Chichester, West Sussex.

The Open Group (2018), The Open Group Architectural Framework (TOGAF) Version 9.2. The Open Group, Reading, UK.

7.8 Secure Concepts and Protocols

Information about the module

Title in English	Secure Concepts and Protocols
Examination number	BIS2019 8005054 MIN2017 8900960
Module code	SKUP.WP
Module coordinator	Prof. Dr. Alexander von Bodisco
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	The module is held in summer or winter term on an irregular basis depending on the demand.
Courses that make up the module	Secure Concepts and Protocols (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Lecture and practical exercises to deepen the gained knowledge.
Prerequisites for participation in the module	None
Possibility to use module within student's own study programme or other programmes	Required elective module for master's degree programs, Compulsory module for the master degree 'Industrial Safety and Security'.
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written examination, 90 minutes
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Methods and concepts for performance evaluation:

- Security concepts
 - Model classification
 - Access control
 - Flow of information
- Key Management
 - Key certification
 - Key generation
 - Key exchange
 - Key recovery
- Authentication
 - Authentication through knowledge, biometry or distributed systems
- Security in Computer Networks
Firewall technology, OSI-security architecture, secure communication, IPSec, SSL/TLS
- Security requirements in industrial networks
- Secure mobile wireless communication
 - GSM, UMTS, Long Term Evolution (LTE) and SAE, WLAN, Bluetooth

Qualification aims for the module learning objectives/skills

Student know and understand the basics of security concepts and communication protocols. Students are able to evaluate and compare security concepts with regard to security vulnerabilities.

Reading list

Eckert, C.; "IT-Sicherheit -Konzepte -Verfahren -Protokolle", 9te Auflage, De Gruyter Oldenbourg, ISBN-13:978-3486200003.

Kurose, J. und Ross, K.; "Computernetzwerke - Der Top-Down Ansatz", 6te Auflage, Pearson IT, ISBN-13:978-3-86894-237-8.

Tanenbaum, A. S.; "Computernetzwerke", 5te Auflage, Pearson Studium, ISBN-13:978-3-8689-4137-1.

Sauter, M.; "Grundkurs Mobile Kommunikationssysteme: UTMS, HSPA und LTE, GSM, GPRS, Wireless LAN und Bluetooth", 5te Auflage, Springer Vieweg, ISBN-13:978-3-6580-1460-5.

7.9 Workshop: Introduction to scientific research

Information about the module

Title in English	Workshop: Introduction to scientific research
Examination number	BIS2019 8005100
Module code	WSH2.WP
Modul area	Academic work
Module coordinator	Prof. Dr.-Phil. Alessandra Zarcone
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, winter semester, summer semester
Courses that make up the module	Workshop (2 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods of the module	Seminar format with practical exercises
Prerequisites for participation in the module	None
Possibility to use module within student's own study programme or other programmes	Master's degree Business Information Systems
Total workload and its constituent parts	Credit hours: 2, CP credits: 5, Contact hours: 30h, Independent study: 120h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Presentation and Discussion, 20-30 minutes, 40%• Written assignment (1 page review, 1 poster), 60%
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

We will cover different aspects and tools of a researcher's everyday work, in particular:

- Research methods and evaluation of statistical models
- Documentation of data collection
- Ethical aspects
- Scientific Writing
- Bibliographic search and citing the sources
- Presentation of scientific writing (talks and posters)
- Critical approach to one's own scientific work and to the literature and peer review
- Networking and promoting your work

At the beginning of the course the students are assigned one paper each. The papers are announced in advance so that every student who is interested in the module can sign up online and select a paper. The students are required to critically analyze the paper regarding the aspects covered by the course, to compile a review of the paper regarding these aspects and to prepare a poster presenting the content of the paper. They are required to submit the poster 2 weeks before the poster presentation and receive feedback the supervisor 1 week before the poster session.

At the end of the course the students present the papers in a poster session and are required to actively participate in the discussion of at least two more posters.

We strongly recommend attending the Workshop at the beginning of your Master (1st or 2nd semester).

Qualification aims for the module learning objectives/skills

After successfully completing this module, the students are able to:

- Critically review existing research work
- Plan their own research work
- Carry out their own research by adopting standard practice methods
- Present their own work in an accurate and effective way

Reading list

Booth, Wayne C, et al. The Craft of Research: University of Chicago Press, 4. edition, (2016)

More material (videos, papers) will be provided during the course.

Software:

- LaTeX: <https://www.latex-project.org>

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