

Module Catalogue

»Courses in English«



Last updated: October 9, 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.

Contents

1	International Information Systems Bachelor SPO2024 - Bachelor's Degree	4
1.1	Orientation Phase	4
1.1.1	Programming 1	4
1.1.2	1st Foreign Language	6
1.1.3	Mathematics 1	8
1.1.4	Introduction to Business Administration, Financial Accounting	10
1.1.5	2nd Foreign Language 1 of 4	14
1.1.6	Mathematics 2	18
1.1.7	Programming 2 & Software Engineering	20
1.1.8	Introduction to Information Systems	22
1.1.9	Intercultural Management & Law	24
1.1.10	2nd Foreign Language 2 of 4	28
1.2	Intensification Phase	32
1.2.1	Statistics	32
1.2.2	Implementation of Enterprise Systems	36
1.2.3	Database Systems	38
1.2.4	Programming of Enterprise Systems	42
1.2.5	2nd Foreign Language 3 of 4	46
1.2.6	Data Analytics	50
1.2.7	E-Business	52
1.2.8	International IT Project and Service Management	54
1.2.9	Project Work	58
1.2.10	2nd Foreign Language 4 of 4	60
1.2.11	Internship	64
1.2.12	Practical Seminar	66
1.2.13	Cost Accounting, Controlling & Financial Management	68
1.2.14	Applied Artificial Intelligence	72
1.2.15	Production and Logistics	74
1.2.16	Business Modelling	78
1.2.17	Seminar New Technologies	82
1.2.18	Compulsory Elective Subjects	84
1.2.19	General Science Elective Subjects	86
1.2.20	Bachelor Thesis	88
1.2.21	Bachelor Seminar	90
2	Computer Science - Bachelor's Degree	92
2.1	Project Work 1	92
2.2	Project Work 2	94
3	Business Information Systems - Bachelor's Degree	96
3.1	Customizing	96
3.2	IT Applications Seminar	98

3.3	Project 1	100
3.4	Project 2	102
4	Computer Science - Master's Degree	104
4.1	Master's Seminar	104
5	Business Information Systems - Master's Degree	106
5.1	Master's Seminar	106
5.2	Project Work	108
6	Required Electives–Bachelor's Degree	110
6.1	Computer Games Development	110
6.2	Digital Transformation in Organizations	112
6.3	Interaction Engineering	116
6.4	IT Sourcing and Cloud Transformation	120
6.5	Lean IT & Enterprise Architecture	122
6.6	Visual Thinking for Business	126
7	Required Electives–Master's Degree	128
7.1	Computer Games Development	128
7.2	Data Science	130
7.3	Digital Transformation in Organizations	134
7.4	Embedded Security	138
7.5	Interaction Engineering	142
7.6	IT Sourcing and Cloud Transformation	146
7.7	Lean IT & Enterprise Architecture	148
7.8	Secure implementations on microcontrollers (Secure Concepts and Protocols)	152
7.9	Smart Sustainability Simulation Game (S3G)	156

1 International Information Systems Bachelor SPO2024 - Bachelor's Degree

1.1 Orientation Phase

1.1.1 Programming 1

Information about the module

engl. Name	Programming 1
Code	PRG1
Coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	Programming 1 (4 Credit hours) Practical work Programming 1 (2 Credit hours)
Modul area	Orientation Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 6, CP credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h

Exam

Admission requirement for the examination	Practical work Programming 1
Type of exam / required course achievements	Written examination, 60 minutes, carried out as electronic examination Auxiliaries: Development environment, authorized lecture and exercise materials, Java API documentation, Moodle
Examination number (according to SPO no. 1.1)	

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.

1.1.2 1st Foreign Language

Information about the module

engl. Name	1st Foreign Language
Code	FL1
Coordinator	Prof. Dr. Svea Schauffler
Faculty	Faculty of Liberal Arts and Sciences
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	1st Foreign Language (4 Credit hours)
Modul area	Orientation Phase
Teaching language	The module is usually taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Oral examination A, 10-20 minutes, 20%• Oral examination B, 10-20 minutes, 20%• Written examination, 90 minutes, none auxiliaries, 60%
Examination number (according to SPO no. 1.2)	
Grading	According to § 20 of the APO in the currently valid version.

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.

1.1.3 Mathematics 1

Information about the module

engl. Name	Mathematics 1
Code	MAT1
Coordinator	Prof. Dr. Caroline Justen
Faculty	Faculty of Liberal Arts and Sciences
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	Mathematics 1 (4 Credit hours)
Modul area	Orientation Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Usage possibilities	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

Exam

Type of exam / required course achievements	Written examination, 60 minutes, auxiliaries: 2 DIN A4 pages handwritten formulary; a calculator that can't calculate 70! (70 Factorial)
Examination number (according to SPO no. 1.3)	
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.

1.1.4 Introduction to Business Administration, Financial Accounting

Information about the module

engl. Name	Introduction to Business Administration, Financial Accounting
Code	IBA
Coordinator	Prof. Dr. Stephan Zimmermann
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	Introduction to Business Administration, Financial Accounting (6 Credit hours)
Modul area	Orientation Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 6, CP credits: 7, Contact hours: 90h, Independent study: 120h, Total workload: 210h

Exam

Type of exam / required course achievements	Written examination, 90 minutes, auxiliary: calculator, 1 DIN A4 sheet (front and back) with handwritten, personal lecture summary
Examination number (according to SPO no. 1.4)	
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

engl. Name	2nd Foreign Language 1 of 4
Code	II2.FS
Coordinator	Lecturers at the Faculty of Liberal Arts and Sciences
Faculty	Faculty of Liberal Arts and Sciences
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	2nd Foreign Language 1 of 4 (4 Credit hours)
Modul area	Orientation Phase
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	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	<p>Oral and written parts according to the module specifications of the chosen language of the faculty of Liberal Arts and Sciences</p> <p>In the foreign language German Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, 30-90 minutes, 60% • Oral examination, 10-40 minutes, 40% <p>In the foreign languages French, Italian and Spanish Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, max. 60 minutes, 20% • Oral examination, max. 20 minutes, 20% • Written assignment, 2000 words, max. 9 pages, 30% • project work (workload: max. 15 h, in the form of a simulation), 30% <p>In the foreign language Chinese Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, max. 60 minutes, 50% • Oral examination, max. 20 minutes, 20% • Written assignment, 2000 words, max. 9 pages, 30%
Examination number (according to SPO no. 1.5)	
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.

1.1.6 Mathematics 2

Information about the module

engl. Name	Mathematics 2
Code	MAT2
Coordinator	Prof. Dr. Caroline Justen
Faculty	Faculty of Liberal Arts and Sciences
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Mathematics 2 (4 Credit hours)
Modul area	Orientation Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	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

Exam

Type of exam / required course achievements	Written examination, 60 minutes, auxiliaries: 2 DIN A4 pages handwritten formulary; a calculator that can't calculate 70! (70 Factorial)
Examination number (according to SPO no. 2.1)	
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.

1.1.7 Programming 2 & Software Engineering

Information about the module

engl. Name	Programming 2 & Software Engineering
Code	PRG2
Coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Programming 2 & Software Engineering (4 Credit hours) Practical work Programming 2 & Software Engineering (2 Credit hours)
Modul area	Orientation Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	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

Exam

Admission requirement for the examination	Practical work Programming 2 & Software Engineering
Type of exam / required course achievements	Written examination, 60 minutes, carried out as electronic examination Auxiliaries: Development environment, authorized lecture and exercise materials, Java API documentation, Moodle
Examination number	(according to SPO no. 2.2)
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.

1.1.8 Introduction to Information Systems

Information about the module

engl. Name	Introduction to Information Systems
Code	ISY
Coordinator	Prof. Dr. Arne Mayer
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Introduction to Information Systems (3 Credit hours) Practical work Introduction to Information Systems (1 Credit hour)
Modul area	Orientation Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Admission requirement for the examination	Practical work Introduction to Information Systems
Type of exam / required course achievements	Written examination, 60 minutes, auxiliary: non-programmable calculator
Examination number (according to SPO no. 2.3)	
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

1.1.9 Intercultural Management & Law

Information about the module

engl. Name	Intercultural Management & Law
Code	IML
Coordinator	Prof. Dr. Svea Schauffler Frank Falker, LL.M.
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Intercultural Management & Law (4 Credit hours)
Modul area	Orientation Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Written examination, 120 minutes, Intercultural Management: none auxiliaries; Law: auxiliary Collection of laws
Examination number (according to SPO no. 2.4)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Intercultural barriers and the resulting misunderstandings can strongly influence any business decision and the possible results. Due to this, the development of intercultural competence is of utmost importance for both executives and managers to be successful in an international and dynamic business environment. International project management through global information systems is therefore of great importance. This course examines the relationship between culture and management and highlights the complexities of managing in international business. Basic psychological and sociological constructs underlying the creation and maintenance of international cooperation are analyzed. Special attention is given to the impact of globalization and the various forms of international alliances, as well as diversity and change management in this context. In this context, legal issues are also relevant, especially for the management, development and operation of information systems. The module creates a basic understanding of the relevant legal concepts based on the topics:

Private Law

- legal transactions
- General and special law of obligations
- Property law

Internet law

- Protection of domains
- Electronic Commerce
- Liability for damages and limitation of liability Copyright law

Competition Law

- Basic concepts
- Protection and liability
- Claims for damages

Data protection

- Characteristics and basic terms
- Applicable legal provisions
- Telecommunications data protection

Qualification aims for the module learning objectives/skills

After successful participation in the module, students will be able to:

- reproduce a basic psychological and sociological understanding of culture formation
- classify the basics of the most important culture researchers and measurement models
- specify risks and precautions in international business
- identify the impact of globalization on culture and management
- identify the basic features of private law and basic features of data processing law, including the importance of data protection, as well as their practical significance.
- interpret basic knowledge of legal casework in contract law.
- apply acquired knowledge in professional and everyday life.

Reading list

Literature will be announced in the seminar.

1.1.10 2nd Foreign Language 2 of 4

Information about the module

engl. Name	2nd Foreign Language 2 of 4
Code	II2.FS
Coordinator	Lecturers at the Faculty of Liberal Arts and Sciences
Faculty	Faculty of Liberal Arts and Sciences
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	2nd Foreign Language 2 of 4 (4 Credit hours)
Modul area	Orientation Phase
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	Seminar format, practical work
Prerequisites	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

Exam

Type of exam / required course achievements	<p>Oral and written parts according to the module specifications of the chosen language of the faculty of Liberal Arts and Sciences</p> <p>In the foreign language German Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, 30-90 minutes, 60% • Oral examination, 10-40 minutes, 40% <p>In the foreign languages French, Italian and Spanish Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, max. 60 minutes, 20% • Oral examination, max. 20 minutes, 20% • Written assignment, 2000 words, max. 9 pages, 30% • project work (workload: max. 15 h, in the form of a simulation), 30% <p>In the foreign language Chinese Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, max. 60 minutes, 50% • Oral examination, max. 20 minutes, 20% • Written assignment, 2000 words, max. 9 pages, 30%
Examination number (according to SPO no. 2.5)	
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 Intensification Phase

1.2.1 Statistics

Information about the module

engl. Name	Statistics
Code	STAT
Coordinator	Prof. Dr. Phil. Alessandra Zarccone
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	Statistics (4 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Written examination, 90 minutes, 2 DIN A4 page handwritten list of R functions, statistics software (R) on own laptop
Examination number (according to SPO no. 3.1)	
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/>

1.2.2 Implementation of Enterprise Systems

Information about the module

engl. Name	Implementation of Enterprise Systems
Code	CUST
Coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	Customizing of Information Systems (4 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Written examination, 60 minutes, auxiliaries: authorized lecture notes, 50%• Practical examination (10-30 pages) and oral examination (10-30 minutes), 50%
Examination number (according to SPO no. 3.2)	
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 (structures, master data, transaction data)
- 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 and ES management. Here among other topics, the necessary steps to configure/customize an ERP system such as SAP S/4 HANA and concepts such as master data management and lifecycle management 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 ES Implementations and of ES Management
- Configure/customize core features of the SAP S/4 HANA System

Reading list

Literature recommendations will be provided in the first lecture.

1.2.3 Database Systems

Information about the module

engl. Name	Database Systems
Code	DBS
Coordinator	Prof. Matthias Kolonko, Ph.D. (ONPU)
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Database Systems (4 Credit hours) Practical work Database Systems (2 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 6, CP credits: 7, Contact hours: 90h, Independent study: 120h, Total workload: 210h

Exam

Admission requirement for the examination	Practical work Database Systems
Type of exam / required course achievements	Written examination, 90 minutes, none auxiliaries Alternative Portfolio exam with equally weighted parts: <ul style="list-style-type: none">• written examination 1, 30 min• written examination 2, 30 min• written examination 3, 30 min
Examination number (according to SPO no. 3.3)	

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) is 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 Portfolio with 3 written exams (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)

1.2.4 Programming of Enterprise Systems

Information about the module

engl. Name	Programming of Enterprise Systems
Code	PRG3
Coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	Programming 3 (4 Credit hours) Practical work Programming 3 (2 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	Programming 1 (recommended)
Total workload and its constituent parts	Credit hours: 6, CP credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h

Exam

Admission requirement for the examination	Practical work Programming of Enterprise Systems
Type of exam / required course achievements	Written examination, 60 minutes, carried out as electronic examination Auxiliaries: SAP, authorized lecture and exercise materials, Moodle
Examination number (according to SPO no. 3.4)	
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.

1.2.5 2nd Foreign Language 3 of 4

Information about the module

engl. Name	2nd Foreign Language 3 of 4
Code	II2.FS
Coordinator	Lecturers at the Faculty of Liberal Arts and Sciences
Faculty	Faculty of Liberal Arts and Sciences
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	2nd Foreign Language 3 of 4 (4 Credit hours)
Modul area	Intensification Phase
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	Seminar format, practical work
Prerequisites	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

Exam

Type of exam / required course achievements	<p>Oral and written parts according to the module specifications of the chosen language of the faculty of Liberal Arts and Sciences</p> <p>In the foreign language German Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, 30-90 minutes, 60% • Oral examination, 10-40 minutes, 40% <p>In the foreign languages French, Italian and Spanish Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, max. 60 minutes, 20% • Oral examination, max. 20 minutes, 20% • Written assignment, 2000 words, max. 9 pages, 30% • project work (workload: max. 15 h, in the form of a simulation), 30% <p>In the foreign language Chinese Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, max. 60 minutes, 50% • Oral examination, max. 20 minutes, 20% • Written assignment, 2000 words, max. 9 pages, 30%
Examination number (according to SPO no. 3.5)	
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.

1.2.6 Data Analytics

Information about the module

engl. Name	Data Analytics
Code	DAT
Coordinator	Prof. Dr. Wolfgang Kratsch
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Data Analytics (4 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Written examination, 60 minutes, none auxiliaries
Examination number (according to SPO no. 4.1)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Due to the advancing digitalization, data plays an increasingly important role in decision-making in companies. Today, companies no longer rely solely on traditional business intelligence tools to analyze their data. Under the term advanced analytics, they also use methods of statistics and machine learning to make forecasts about future events today and derive recommendations for action.

The resulting analytical information systems support decision-makers in companies by providing them with decision-relevant information, models and simulation results for different scenarios. Technologies such as online analytical processing (OLAP), data warehousing and data mining are used for this purpose. In companies, the focus is particularly on business analytics. This describes the process of so-called data refinement and visualization. It is a strategic tool for company managers. The focus is not only on the question "What was?", but also: "What will be?".

Qualification aims for the module learning objectives/skills

After successful participation in the module, students will be able to:

- Explain data and how to use it in a business context to develop new or improve existing business models and processes.
- Execute the data analysis process from data preparation to algorithms for analysis to visualization of analysis results.
- Examine issues and scenarios based on company data.
- Classify the quality as well as the linkage of data analysis results.

Reading list

Chamoni, P.; Gluchowski, P Analytische Informationssysteme: Business Intelligence-Technologien und –Anwendungen. 3. Auflage. Springer-Verlag: Berlin, Heidelberg 2006.

Laudon, K. C.; Laudon, J. P.; Schoder, Detlef Wirtschaftsinformatik – Eine Einführung. 2. Auflage. Pearson Studium: München et al. 2009.

Laursen, G. H. N.; Thorlund, J. Business Analytics for Managers: Taking Business Intelligence Beyond Reporting. 2. Auflage. Wiley: Hoboken 2016.

Ware, C. Information Visualization. 3. Auflage. Morgan Kaufmann: Waltham 2012.

1.2.7 E-Business

Information about the module

engl. Name	E-Business
Code	EBUS
Coordinator	Prof. Dr. Arne Mayer
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	E-Business (4 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical work
Prerequisites	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

Exam

Type of exam / required course achievements	Written examination, 60 minutes, none auxiliaries
Examination number (according to SPO no. 4.2)	
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-Companies
- E-Communities
- E-Entertainment

Qualification aims for the module learning objectives/skills

- An understanding of e-business and its areas and their impact 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

1.2.8 International IT Project and Service Management

Information about the module

engl. Name	International IT Project and Service Management
Code	IPSM
Coordinator	Prof. Dr. Clemens Espe, MBA
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	(4 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English or in German.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Written examination, 60 minutes, none auxiliaries
Examination number (according to SPO no. 4.3)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

IT Project Management:

- Methods for initiating projects/international projects and for stakeholder management
- Classical organizational forms of projects and international projects
- Teaching the necessary tools for planning time, costs and content of a project/international project
- Computer-aided tools for project management
- Methods for monitoring and controlling project progress
- Closing of projects/international projects

IT Service Management:

- Processes according to the industry standard ITIL of the phases
 - Service Strategy,
 - Service Design,
 - Service Transition,
 - Service Operation and
 - Continual Service Improvement

Qualification aims for the module learning objectives/skills

After successful participation in the module, students will be able to:

- independently carry out the definition and structuring of projects.
- plan, execute and successfully complete projects independently and on their own responsibility with regard to time, costs and content
- use the instruments and statistical methods of project management in a manner appropriate to the situation
- plan projects using current computer-aided project management tools by independently recording and optimizing time, cost, budget and resource plans
- explain the ITIL framework with its five lifecycle phases and its 26 processes
- evaluate current service processes in the work environment and transfer the ideas, structures and best practices of the ITIL framework to improve these processes

Reading list

PMI (2013): „A Guide to the Project Management Body of Knowledge“, Project Management Institute, 5th edition, 2013

Tiemeyer (2018): „Handbuch IT-Projektmanagement: Vorgehensmodelle, Managementinstrumente, Good Practices“, Hanser, 2018

Burghardt (2012): „Projektmanagement: Leitfaden zur Planung, Überwachung und Steuerung von Projekten“, Publicis Publishing, Erlangen 2012

E. M. Goldratt (2002): „Die Kritische Kette – Das neue Konzept im Projektmanagement“, Campus Verlag, Frankfurt, New York, 2002

Hofstede (2010): „Cultures and Organizations - SW of the Mind“, Mc Graw-Hill, 2010

Axelos (2014): „ITIL Lifecycle Suite“ (5 Bände), The Stationary Office, 2014

Beims, Ziegenbein (2015): „IT-Service Management in der Praxis mit ITIL“, Hanser, 2015

1.2.9 Project Work

Information about the module

engl. Name	Project Work
Code	PROJ
Coordinator	Prof. Dr. Stephan Zimmermann (Director of Studies)
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Project Work (2 SWS)
Modul area	Intensification Phase
Teaching language	The module is taught in English and in German.
Teaching and learning methods	Project work, Seminar
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 8, Contact hours: 60h, Independent study: 180h, Total workload: 240h

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Written assignment, 5-15 pages, 80%• Oral examination, 5-30 minutes, 20%
Examination number (according to SPO no. 4.4)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The students carry out IT projects in small teams. The tasks of the students include project management, as well as project implementation depending on the task as well as documentation and presentation of the results.

Qualification aims for the module learning objectives/skills

After successful participation in the module, students will be able to:

- understand team processes and resolve typical team conflicts.
- plan and execute IT projects in a team with regard to time, effort and resources.
- apply agile or classic project management methods in practice.
- select suitable methods and learn new techniques independently.
- document project results in a comprehensible and appealing manner.

Reading list

Project specific Literature recommendations will be provided in the lecture.

1.2.10 2nd Foreign Language 4 of 4

Information about the module

engl. Name	2nd Foreign Language 4 of 4
Code	II2.FS
Coordinator	Lecturers at the Faculty of Liberal Arts and Sciences
Faculty	Faculty of Liberal Arts and Sciences
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	2nd Foreign Language 4 of 4 (4 Credit hours)
Modul area	Intensification Phase
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	Seminar format, practical work
Prerequisites	The module 2nd Foreign Language 4 of 4 builds on the 2nd Foreign Language 3, 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

Exam

Type of exam / required course achievements	<p>Oral and written parts according to the module specifications of the chosen language of the faculty of Liberal Arts and Sciences</p> <p>In the foreign language German Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, 30-90 minutes, 60% • Oral examination, 10-40 minutes, 40% <p>In the foreign languages French, Italian and Spanish Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, max. 60 minutes, 20% • Oral examination, max. 20 minutes, 20% • Written assignment, 2000 words, max. 9 pages, 30% • project work (workload: max. 15 h, in the form of a simulation), 30% <p>In the foreign language Chinese Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, max. 60 minutes, 50% • Oral examination, max. 20 minutes, 20% • Written assignment, 2000 words, max. 9 pages, 30%
Examination number (according to SPO no. 4.5)	
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.

1.2.11 Internship

Information about the module

engl. Name	Internship
Code	PRAC
Coordinator	Advisor for Internship
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	Internship (20 weeks)
Modul area	Intensification Phase
Teaching language	The module is taught in English or in German.
Teaching and learning methods	Practical work
Prerequisites	The start of the internship and participation in the practical seminar is permitted if at least 80 ECTS have been proven.
Total workload and its constituent parts	ECTS: 20, Total workload: 20 weeks

Exam

Type of exam / required course achievements	Written assignment, 20 pages
Examination number (according to SPO no. P.1)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Special feature:

As a special feature of studies at Bavarian universities, we offer you a legally required practical study semester integrated into your studies, in which the focus of knowledge transfer is shifted out into practice. During the practical semester, you retain your status as a student; the practical training is supplemented and deepened by accompanying teaching events at the university.

The Internship Office is responsible for the formal handling of the internship. Therefore, please also read the guidelines for the practical study semesters of the Internship Office.

In addition to the Internship Office, you will also have a professional supervisor. Please contact him or her as early as possible, especially if you have any problems with your internship.

Qualification aims for the module learning objectives/skills

- Instruction to work independently and on one's own responsibility
- Introduction to the professional field by working as independently as possible and on your own responsibility
- Extension and deepening of knowledge about organizational problem solving in the company
- Knowledge of issues relating to the exercise of the profession, such as job opportunities, forms of employment law and workplaces
- Insight into relevant tax regulations and social security.

Weighting of individual performance in the final grade

passed with success / passed without success

Reading list

Literature recommendations will be provided during the practical work, if needed.

1.2.12 Practical Seminar

Information about the module

engl. Name	Practical Seminar
Code	PSEM
Coordinator	Professors of the Faculty of Computer Science
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	Practical Seminar (2 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English or in German.
Teaching and learning methods	Seminar
Prerequisites	The start of the internship and participation in the practical seminar is permitted if at least 80 ECTS have been proven.
Total workload and its constituent parts	Credit hours: 2, CP credits: 2, Contact hours: 30h, Independent study: 30h, Total workload: 60h

Exam

Type of exam / required course achievements	Oral examination, 15-30 minutes
Examination number (according to SPO no. P.2)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Students can

- present their own work correctly and comprehensibly according to scientific standards and answer questions.
- understand presentations on other work and participate in professional discussions.

Qualification aims for the module learning objectives/skills

The students expand their competence for presentations.

Weighting of individual performance in the final grade

passed with success / passed without success

Reading list

Literature recommendations will be provided in the lecture.

1.2.13 Cost Accounting, Controlling & Financial Management

Information about the module

engl. Name	Cost Accounting, Controlling & Financial Management
Code	COF
Coordinator	Prof. Dr. Jana Görmer-Redding
Faculty	Faculty of Computer Science
Type	Compulsory Module
Duration / Frequency	1 semester, winter semester
Courses	Cost Accounting, Controlling & Financial Management (6 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English or in German.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 6, CP credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h

Exam

Type of exam / required course achievements	Written examination, 90 minutes, auxiliary: non-programmable calculator, 1 DIN A4 sheet (front and back) with handwritten, personal lecture summary
Examination number	(according to SPO no. 5.1)
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The module deals with questions of internal accounting and corporate management. For this purpose, methods of cost and performance accounting, controlling and financial management are deepened.

The contents of the sub-topics are:

Cost and performance accounting:

- Cost accounting methods
- Contribution margin accounting
- Planned costing

Controlling:

- Basics of controlling
- Strategic controlling
- Operational controlling

Financial management:

- Views of investment and financing problems
- Investment appraisal: Static & dynamic methods
- Financing decisions: Capital structure, equity financing, debt financing

Qualification aims for the module learning objectives/skills

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

- structure decisions on the basis of methods of cost and activity accounting in the company.
- transfer the procedures of cost and performance accounting to different questions in the company.
- explain the role and significance of controlling for companies.
- describe the tasks and instruments of operative and strategic controlling and apply them to operational decision-making situations.
- characterise operational decision-making situations and to select and apply suitable investment and financing methods for this purpose.
- critically assess the strengths and weaknesses of different investment calculation methods.
- economically analyse different types and concepts of equity and debt financing.

Reading list

Becker, Wolfgang; Holzmann, Robert (2016): Kosten-, Erlös- und Ergebnisrechnung. Wiesbaden: Springer Fachmedien Wiesbaden.

Becker, Wolfgang; Holzmann, Robert; Hilmer, Christian (2016): Übungen zur Kosten-, Erlös- und Ergebnisrechnung. Wiesbaden: Springer Fachmedien Wiesbaden.

Wöltje, Jörg (2016): Kosten- und Leistungsrechnung. Alle Verfahren und Systeme auf einen Blick. 2. Auflage. Freiburg: Haufe-Lexware GmbH & Co. KG.

Weber, Jürgen; Schäffer, Utz: Einführung in das Controlling, 14. Aufl. (oder älter), Stuttgart, Schäffer-Poeschel, 2014.

Peemöller, Volker: Controlling: Grundlagen und Einsatzgebiete, 5. Auflage (oder älter), Herne, nwb, 2005.

Brealey R., Myers S.; Allen F. (2008): Principles of Corporate Finance, Ninth Edition, New York.

Breuer W. (2007): Investition I, 3. Auflage, Wiesbaden.

Copeland T., Weston J., Shastri K. (2008): Finanzierungstheorie und Unternehmenspolitik, 4. Auflage, München.

1.2.14 Applied Artificial Intelligence

Information about the module

engl. Name	Applied Artificial Intelligence
Code	AAI
Coordinator	Prof. Dr. Wolfgang Kratsch Prof. Dr. Björn Häckel
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Applied Artificial Intelligence (4 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English or in German.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Written examination, 60 minutes, none auxiliaries
Examination number (according to SPO no. 6.1)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

In the module, selected current research work and fields of application in information systems of companies from the field of artificial intelligence are dealt with. Artificial intelligence is gaining importance in companies. Admittedly, we are still at the very beginning in the use of AI systems despite all the progress. Thanks to developments in the area of big data and algorithmic advances such as deep learning, the field of machine learning has developed rapidly in recent years and thus also provided the basis for ever greater support through artificial intelligence methods. The aim of this module is to understand these methods in an application-oriented corporate environment and in the context of information systems and to carry out use cases on this basis.

Qualification aims for the module learning objectives/skills

After successful participation in the module, students will be able to:

- reproduce basic theoretical and practical knowledge about the application areas of artificial intelligence and robotics in the context of information systems
- assess potentials and limits in the field of artificial intelligence
- describe current developments in the field of artificial intelligence
- carry out selected, company-specific use cases with the help of artificial intelligence

Reading list

Kersting, K., Lambert, C., & Rothkopf, C. (2020): Wie Maschinen lernen - Künstliche Intelligenz verständlich erklärt. Springer, Wiesbaden

Kreutzer, R.T.; Sirrenberg, M. (2019): Künstliche Intelligenz verstehen, Springer Gabler, Wiesbaden

1.2.15 Production and Logistics

Information about the module

engl. Name	Production and Logistics
Code	PROLO
Coordinator	Prof. Dr. Arne Mayer
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Production and Logistics (4 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English or in German.
Teaching and learning methods	Seminar format, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Written examination, 60 minutes, auxiliary: calculator
Examination number (according to SPO no. 6.2)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

- Introduction to production and logistics
- Business objects and processes
- Inventory management
- Procurement and procurement policy
- Production and production logistics
- Distribution logistics
- Disposal logistics
- Supply Chain Management (SCM)
- Overview of information and communication systems in production and logistics
- Approaches to using artificial intelligence in production and logistics
- Further methods, techniques and applications

Qualification aims for the module learning objectives/skills

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

- Recognize and classify the importance of logistics for the successful management of manufacturing companies
- To capture, understand, analyze and optimize companies and value chains in production and logistics methodically and comprehensively
- Be familiar with essential information and communication systems in production and logistics and understand their purposes
- Understand important functions of information and communication systems in production and logistics

Reading list

Kummer, Sebastian, Werner Jammerneegg und Oskar Grün. 2013. Grundzüge der Beschaffung, Produktion und Logistik. 3., aktualisierte Auflage. München: Pearson Studium.

Schönsleben, Paul. 2016. Integrales Logistikmanagement: Operations und Supply Chain Management innerhalb des Unternehmens und unternehmensübergreifend. 7. Aufl. Berlin, Heidelberg: Springer-Verlag.

Wannenwetsch, Helmut. 2010. Integrierte Materialwirtschaft und Logistik: Beschaffung, Logistik, Materialwirtschaft und Produktion. 4. Aufl. Springer-Lehrbuch. Berlin Heidelberg: Springer-Verlag.

Available on the WWW for members of the Augsburg University of Applied Sciences
(from the university network, also via VPN)
<http://www.springer.com/de/book/9783662483336>

Interactive examples and exercises for the book at
<http://www.intlogman.lim.ethz.ch/>

1.2.16 Business Modelling

Information about the module

engl. Name	Business Modelling
Code	BMO
Coordinator	Prof. Dr. Claudia Reuter
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Business Modelling (4 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English or in German.
Teaching and learning methods	Seminar format, practical work
Prerequisites	Introduction to Information Systems and Programming 1 of Semester 1 and 2 (recommended)
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Written examination, 60 minutes, carried out as electronic examination auxiliary: lecture notes, literature cited
Examination number (according to SPO no. 6.3)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The module provides participants with basic knowledge in the areas of business and software modelling.

Introduction to business and software modelling

- Properties of models
- Expectations of models
- Types of models and forms of documentation

Target modelling

- Hierarchical decomposition
- Impact mapping

Process modelling with BPMN

- BPMN process diagrams
- BPMN Collaborations
- BPMN event handling

Requirements engineering and system design

- Basics of Requirements Engineering
- System delimitation
- Eliciting requirements
- Documenting requirements textually
- Model-based documentation with UML (use case diagrams, activity diagrams, class diagrams, state diagrams, sequence diagrams)

Qualification aims for the module learning objectives/skills

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

- select and apply established modelling concepts
- develop business process models according to BPMN
- apply requirements engineering techniques
- design simple SW systems with UML
- assess the quality of models
- know a tool for creating models

Reading list

- Bisset, M., Adzic, G.:** Impact Mapping: Making a Big Impact with Software Products and Projects, Provoking Thoughts, 2012
- Silver, B.:** BPMN Method and Style, 2. Auflage, Cody-Cassidy Press, 2011
- Pohl, K., Rupp, C.:** Basiswissen Requirements Engineering, 3. Auflage, dpunkt.verlag GmbH, 2011
- Cohn, M.:** User Stories Applied: For Agile Software Development, Addison-Wesley Professional, 2004
- Patton, J.:** User Story Mapping: Discover the Whole Story, Build the Right Product, O'Reilly and Associates, 2014
- Kecher, C., Salvanos, A.:** UML 2.5: Das umfassende Handbuch, 6. Auflage, Rheinwerk Computing, 2017
- Grässle, P., Baumann, H., Baumann, P.:** UML projektorientiert. Geschäftsprozessmodellierung, IT-System-Spezifikation und Systemintegration mit UML, Galileo Press, 2003

1.2.17 Seminar New Technologies

Information about the module

engl. Name	Seminar New Technologies
Code	
Coordinator	Professors of the Faculty of Computer Science
Faculty	Faculty of Computer Science
Type	Compulsory Module
Duration / Frequency	1 semester, winter semester
Courses	Seminar New Technologies (2 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English or in German.
Teaching and learning methods	Seminar
Prerequisites	None
Total workload and its constituent parts	Credit hours: 2, CP credits: 5, Contact hours: 30h, Independent study: 120h, Total workload: 150h

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Written assignment, 10-20 pages, 50%• Oral examination, 20-40 minutes, 50%
Examination number (according to SPO no. 6.4)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Students carry out research on a topic relating to currently relevant technologies in the field of information systems and computer science. They document, present and discuss their results in plenary sessions.

Qualification aims for the module learning objectives/skills

Students are familiar with the principles of scientific research, scientific writing and writing and presentation and are able to summarise information on subject-specific topics

- to collect,
- quote correctly and
- in their own words in writing and orally,

and to debate on specific topics.

Reading list

Literature recommendations will be provided in the lecture.

1.2.18 Compulsory Elective Subjects

Information about the module

engl. Name	Compulsory Elective Subjects
Code	PEE
Coordinator	Professors of the Faculty of Computer Science
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, winter or summer semester
Courses	The required elective modules can be chosen from the offer of the Faculty of Computer Science.
Modul area	Intensification Phase
Teaching language	See details of the respective required elective module.
Teaching and learning methods	Seminar, Seminar format, practical work
Prerequisites	Information on participation in required elective modules can be found under §§ 3, 4, 5 of the study and examination regulations.
Total workload and its constituent parts	CP: 28, Please take the credit hours for the subjects from the catalogue for the profile education elective modules (FWP catalogue).

Exam

Type of exam / required course achievements	For more information on the subject-related required elective modules please visit the program's websites under Downloads and links.
Examination number (according to SPO no. W.1)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Specific expertise in each module.

Qualification aims for the module learning objectives/skills

Further information on the subject-related compulsory elective subjects can be found on the website of the degree programme under Downloads relevant to studies.

Reading list

Literature will be announced in the respective courses.

1.2.19 General Science Elective Subjects

Information about the module

engl. Name	General Science Elective Subjects
Code	AWP
Coordinator	Professors of the Faculty of Liberal Arts and Sciences
Faculty	Faculty of Liberal Arts and Sciences
Type	Required elective module
Duration / Frequency	1 semester, winter or summer semester
Courses	All courses offered at the Technical University of Applied Sciences Augsburg can be chosen as general science electives, provided they are not compulsory or elective subjects of this degree programme or are included in the exclusion list of the degree program.
Modul area	Intensification Phase
Teaching language	The module is taught in German and English.
Teaching and learning methods	The teaching and learning methods, as well as the teaching media used, vary depending on the course.
Prerequisites	Information on participation in compulsory elective subjects can be found under §§ 6 and 7 of the study and examination regulations.
Total workload and its constituent parts	CP: 2, Please look at the module catalogue of the Faculty of Liberal Arts and Sciences.

Exam

Type of exam / required course achievements	The type and duration of the examination varies depending on the course and can be found in the module catalogue of the Faculty of Liberal Arts and Sciences.
Examination number	(according to SPO no. W.2)
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

The general science program at the Technical University of Applied Sciences Augsburg includes a wide range of subjects in the humanities, social sciences and natural sciences subjects. Students learn about areas of knowledge that go beyond their subject-specific studies.

Qualification aims for the module learning objectives/skills

To a certain extent, the general science electives represent a "Studium generale". Students are able to apply the theoretical knowledge they have acquired in their studies and profession.

Weighting of individual performance in the final grade

The type and duration of the examination varies depending on the course and can be found in the module catalogue of the Faculty of Liberal Arts and Sciences.

Reading list

The literature list can be found in the module catalogue of the Faculty of Liberal Arts and Sciences.

1.2.20 Bachelor Thesis

Information about the module

engl. Name	Bachelor Thesis
Code	BA
Coordinator	Professors of the Faculty of Computer Science
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter or/and summer semester
Courses	
Modul area	Intensification Phase
Teaching language	The module is taught in English or in German.
Teaching and learning methods	Bachelor Thesis
Prerequisites	Information on the Bachelor thesis can be found under § 12 of the study and examination regulations.
Total workload and its constituent parts	ECTS: 12, Working hours: 360 h Processing time: 4 months

Exam

Type of exam / required course achievements	Bachelor Thesis, 20-80 pages
Examination number (according to SPO no. 7.1)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

For the Bachelor's thesis, an individual topic is assigned to each student by the examination board in accordance with §10 of the SPO.

Qualification aims for the module learning objectives/skills

See §10 of the study examination regulations.

Reading list

Technical literature on the chosen topic.

1.2.21 Bachelor Seminar

Information about the module

engl. Name	Bachelor Seminar
Code	
Coordinator	Professors of the Faculty of Computer Science
Faculty	Faculty of Computer Science
Type	Compulsory Module
Duration / Frequency	The duration of the module is one semester. The module is regularly offered in both the summer and winter semesters.
Courses	Bachelor Seminar (2 Credit hours)
Modul area	Intensification Phase
Teaching language	The module is taught in English or in German.
Teaching and learning methods	Seminar
Prerequisites	None
Total workload and its constituent parts	Credit hours: 2, CP credits: 2, Contact hours: 30h, Independent study: 30h, Total workload: 60h

Exam

Type of exam / required course achievements	Oral examination, 30 minutes
Examination number (according to SPO no. 7.2)	
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Presentation of the Bachelor thesis

The lecturer supervising the Bachelor's thesis is also the lecturer for the Bachelor's seminar. The organisation and content of the Bachelor's seminar is determined by the respective lecturer. In terms of content, the Bachelor's seminar can cover both academic work and specialised topics from the Bachelor's thesis environment. Registration takes place automatically with the registration of the Bachelor's thesis.

Qualification aims for the module learning objectives/skills

The student is able to

- present his/her own work correctly and comprehensibly according to scientific standards and answer questions.
- understand presentations on other Bachelor's theses and participate in technical discussions.

Reading list

It is recommended to use the services of the university library at the beginning of the seminar, in particular for "research" and "citation". You can check the current seminar dates on the following website:

Seminare - Recherchieren, Wissenschaftliches Arbeiten, Zitieren und Literatur-/Wissensverwaltung: all das können Sie in unseren Bibliotheksseminaren an der Hochschule Augsburg lernen.

2 Computer Science - Bachelor's Degree

2.1 Project Work 1

Information about the module

engl. Name	Project Work 1
Code	PA1
Coordinator	Director of studies
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Project Work 1 (6 credit hours)
Teaching language	German/English
Teaching and learning methods	Project Work
Prerequisites	
Total workload and its constituent parts	Credit hours: 6, CP credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 10-30 Seiten, 80%• Presentation, 20-40 minutes, 20%
Examination number	3975450
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

engl. Name	Project Work 2
Code	PA2
Coordinator	Director of studies
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Project Work 2 (8 credit hours)
Teaching language	German/English
Teaching and learning methods	Project Work
Prerequisites	
Total workload and its constituent parts	Credit hours: 8, CP credits: 10, Contact hours: 120h, Independent study: 180h, Total workload: 300h

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 10-30 Seiten, 80%• Presentation, 20-40 minutes, 20%
Examination number	3975450
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

engl. Name	Customizing
Code	CUST
Coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	Customizing of Information Systems (4 Credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical class and workshop, practical work
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / 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%
Examination number	3975460
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 (structures, master data, transaction data)
- 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 and ES management. Here among other topics, the necessary steps to configure/customize an ERP system such as SAP S/4 HANA and concepts such as master data management and lifecycle management 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 ES Implementations and of ES Management
- 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

engl. Name	IT Applications Seminar
Code	DVASEM
Coordinator	Director of studies
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	IT Applications Seminar (2 credit hours)
Teaching language	German/English
Teaching and learning methods	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	
Total workload and its constituent parts	Credit hours: 2, CP credits: 3, Contact hours: 30h, Independent study: 60h, Total workload: 90h

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Written assignment, 5-15 pages, 70%• Presentation, 15-30 minutes, 30%
Examination number	3975610
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

engl. Name	Project 1
Code	PRO1
Coordinator	Director of studies
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Project Work 1 (4 credit hours)
Teaching language	German/English
Teaching and learning methods	Project Work
Prerequisites	
Total workload and its constituent parts	Credit hours: 4, CP credits: 8, Contact hours: 60h, Independent study: 180h, Total workload: 240h

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 10-30 Seiten, 80%• Presentation, 20-40 minutes, 20%
Examination number	3975450
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

engl. Name	Project 2
Code	PRO2
Coordinator	Director of studies
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, summer semester
Courses	Project Work 2 (4 credit hours)
Teaching language	German/English
Teaching and learning methods	Project Work
Prerequisites	
Total workload and its constituent parts	Credit hours: 4, CP credits: 8, Contact hours: 60h, Independent study: 180h, Total workload: 240h

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 10-30 Seiten, 80%• Presentation, 20-40 minutes, 20%
Examination number	3975450
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

engl. Name	Master's Seminar
Code	MASEM
Coordinator	Prof. Dr. Phil. Alessandra Zarcone
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester, summer semester
Courses	Master's seminar (2 credit hours)
Modul area	Academic work
Teaching language	English
Teaching and learning methods	<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	Module Workshop (WSH)
Usage possibilities	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

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation and discussion, 20-30 minutes, 30% • Written assignment, 11-15 pages, 70%
Examination number	8900110
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

engl. Name	Master's Seminar
Code	MSEM
Coordinator	Prof. Dr. Phil. Alessandra Zarcone
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester, summer semester
Courses	Master's seminar (2 credit hours)
Modul area	Module F: Academic Work
Teaching language	English
Teaching and learning methods	<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	Module Workshop (WSH)
Usage possibilities	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

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation and discussion, 20-30 minutes, 30% • Written assignment, 11-15 pages, 70%
Examination number	8004091
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

engl. Name	Project Work
Code	PROAR
Coordinator	Director of studies
Faculty	Faculty of Computer Science
Type	Compulsory module
Duration / Frequency	1 semester, winter semester
Courses	Project Work (2 credit hours)
Modul area	Academic work
Teaching language	English
Teaching and learning methods	Project work, regular project status meetings, project-related tuition in blocks of seminars, coaching.
Prerequisites	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

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 20-40 Seiten, 80%• Presentation, 20-40 minutes, 20%
Examination number	8004092
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

engl. Name	Computer Games Development
Code	CGDEV4.WP
Coordinator	Philip McClenaghan
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	The module is regularly offered as a block course during the semester break. (February/March) and (August/September)
Courses	Computer Games Development (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical classes and workshops
Prerequisites	None
Usage possibilities	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

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Presentation, 10-30 minutes, 40%• Written assignment, 8-25 pages, 60%
Examination number	IN 3970322, 2970788 TI 3976563, 2976562 WI 3975708 IIS 9775108
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. 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

engl. Name	Digital Transformation in Organizations
Code	DTO4.WP
Coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, summer semester
Courses	Digital Transformation in Organizations (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical group work and case studies, industry talks
Prerequisites	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.
Usage possibilities	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

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 50%• Written assignment, 10-15 pages, 50%
Examination number	IN 3970377, 2970875 TI 3976579, 2976686 WI 3975795 IIS 9775115
Grading	According to § 20 of the APO in the currently valid version.

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

engl. Name	Interaction Engineering
Code	INTENG4.WP
Coordinator	Prof. Dr. Michael Kipp
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, winter semester
Courses	Interaction Engineering (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	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	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.
Usage possibilities	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

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Presentation, 15 minutes, 25%• Project work, 50%• Written assignment, 15-20 pages, 25%
---	--

Examination number IN 3970326, 2970796
TI 3976567, 2976571

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

engl. Name	IT Sourcing and Cloud Transformation
Code	ITSCT4.WP
Coordinator	Prof. Dr. Arne Mayer
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, summer semester
Courses	IT Sourcing and Cloud Transformation (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	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	None
Usage possibilities	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

Exam

Type of exam / required course achievements	Written examination, 60 minutes, auxiliary: non-programmable calculator
Examination number	IN 3970380, 2970878 TI 3976596, 2976689 WI 3975798 IIS 9775133
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

engl. Name	Lean IT & Enterprise Architecture
Code	LEANIT4.WP
Coordinator	Prof. Dr. Stephan Zimmermann
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, summer semester
Courses	Lean IT & Enterprise Architecture (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Lecture and seminar lessons with laboratory exercises and case studies to apply the knowledge acquired. In addition, the exercises support self-study.
Prerequisites	The requirements for this course are a basic command of the English language, and an interest in better managing IT organizations and enterprise architectures.
Usage possibilities	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

Exam

Type of exam / required course achievements	Project work, 15-30 pages
Examination number	IN 3970394, 2970892 TI 3976600, 2976714, WI 3975812, IIS 9775171
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

engl. Name	Visual Thinking for Business
Code	VISTH.WP
Coordinator	Philip McClenaghan
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	The module is regularly offered as a block course during the semester break. (February/March) and (August/September)
Courses	Visual Thinking for Business (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical classes and workshops
Prerequisites	None
Usage possibilities	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

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Presentation, 10-25 minutes, 40%• Written assignment, 10-15 pages, 60%
Examination number	IN 3970353, 2970849 TI 3976558, 2976659 WI 3975767 IIS 9775160
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

engl. Name	Computer Games Development
Code	COMGA.WP
Coordinator	Philip McClenaghan
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	The module is regularly offered as a block course during the semester break. (February/March) and (August/September)
Courses	Computer Games Development (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical classes and workshops
Prerequisites	None
Usage possibilities	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

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Presentation, 10-30 minutes, 40%• Written assignment, 8-25 pages, 60%
Examination number	BIS2019 8005036 MIN2017 8900730
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

engl. Name	Data Science
Code	DASC4.WP
Coordinator	Prof. Dr.-Ing. Honorary Doctor of ONPU Thorsten Schöler
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, winter semester
Courses	Data Science (4 credit hours)
Teaching language	The module is taught in English, if necessary also in German
Teaching and learning methods	<ul style="list-style-type: none">• Seminar format• Scientific Seminar• Studies• Small projects
Prerequisites	<ul style="list-style-type: none">• Good programming skills (Python, Java, etc.)• Interest in scientific challenges• Solid mathematical understanding
Usage possibilities	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

Exam

Type of exam / required course achievements	Written assignment, 8-20 pages
Examination number	BIS2019 8005026 MIN2017 8900650
Grading	According to § 20 of the APO in the currently valid version.

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

engl. Name	Digital Transformation in Organizations
Code	DTO4.WP
Coordinator	Prof. Dr. Jens Lauterbach
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, summer semester
Courses	Digital Transformation in Organizations (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar format, practical group work and case studies, industry talks
Prerequisites	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.
Usage possibilities	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

Exam

Type of exam / 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%
Examination number	BIS2019 8005083 MIN2017 8901240
Grading	According to § 20 of the APO in the currently valid version.

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

engl. Name	Embedded Security
Code	EMBSEC.WP
Coordinator	Prof. Dr.-Ing. Dominik Merli
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, winter semester
Courses	Embedded Security (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Seminar-like lectures and supporting practical exercises
Prerequisites	None
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Written examination, 90 minutes, auxiliary: calculator, English-Dictionary
Examination number	BIS2019 8005037 MIN2017 8900740
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

engl. Name	Interaction Engineering
Code	INTENG.WP
Coordinator	Prof. Dr. Michael Kipp
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, winter semester
Courses	Interaction Engineering (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	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	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.
Usage possibilities	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

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Presentation, 15 minutes, 25%• Project work, 50%• Written assignment, 15-20 pages, 25%
---	--

Examination number	BIS2019 8005031 MIN2017 8900510
--------------------	------------------------------------

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

engl. Name	IT Sourcing and Cloud Transformation
Code	ITSCT4.WP
Coordinator	Prof. Dr. Arne Mayer
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, summer semester
Courses	IT Sourcing and Cloud Transformation (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	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	None
Usage possibilities	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

Exam

Type of exam / 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%
Examination number	BIS2019 8005086 MIN2017 8901270
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.

7.7 Lean IT & Enterprise Architecture

Information about the module

engl. Name	Lean IT & Enterprise Architecture
Code	LEANIT4.WP
Coordinator	Prof. Dr. Stephan Zimmermann
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, summer semester
Courses	Lean IT & Enterprise Architecture (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Lecture and seminar lessons with laboratory exercises and case studies to apply the knowledge acquired. In addition, the exercises support self-study.
Prerequisites	The requirements for this course are a basic command of the English language, and an interest in better managing IT organizations and enterprise architectures.
Usage possibilities	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

Exam

Type of exam / required course achievements	Portfolio exam: <ul style="list-style-type: none">• Project work, 15-30 pages, 60%• Presentation A, 30-50 minutes, 40%
Examination number	BIS2019 8005096 MIN2017 8901370
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 implementations on microcontrollers (Secure Concepts and Protocols)

Information about the module

engl. Name	Secure implementations on microcontrollers (Secure Concepts and Protocols)
Code	SKUP.WP
Coordinator	Prof. Dr. Alexander von Bodisco
Faculty	Faculty of Computer Science
Type	Wahlpflichtmodul
Duration / Frequency	Das Modul wird je nach Nachfrage unregelmäßig im Sommer- oder Wintersemester angeboten.
Courses	Sichere Implementierungen auf Microcontrollern (4 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Vorlesung und praktische Übungen zur Vertiefung der erworbenen Kenntnisse.
Prerequisites	None
Usage possibilities	Wahlpflichtmodul für Masterstudiengänge, Pflichtmodul für den Masterstudiengang 'Industrielle Sicherheit'.
Total workload and its constituent parts	Credit hours: 4, CP credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Exam

Type of exam / required course achievements	Written examination, 90 minutes
Examination number	BIS2019 8005054 MIN2017 8900960
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

Methoden und Konzepte zur Leistungsbewertung:

- Sicherheitskonzepte
 - Modellklassifizierung
 - Zugriffskontrolle
 - Informationsfluss
- Schlüsselverwaltung
 - Schlüsselzertifizierung
 - Schlüsselerzeugung
 - Schlüsselaustausch
 - Schlüsselwiederherstellung
- Authentifizierung
 - Authentifizierung durch Wissen, Biometrie oder verteilte Systeme
- Sicherheit in Computernetzwerken
Firewall-Technologie, OSI-Sicherheitsarchitektur, sichere Kommunikation, IPSec, SSL/TLS
- Sicherheitsanforderungen in industriellen Netzwerken
- Sichere mobile drahtlose Kommunikation
 - GSM, UMTS, Long Term Evolution (LTE) und SAE, WLAN, Bluetooth

Qualification aims for the module learning objectives/skills

Die Studierenden kennen und verstehen die relevanten Aspekte von Sicherheitskonzepten und Protokollen. Sie können Sicherheitskonzepte vergleichen und hinsichtlich Schwachstellen analysieren.

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 Smart Sustainability Simulation Game (S3G)

Information about the module

engl. Name	Smart Sustainability Simulation Game (S3G)
Code	S3G2.WP
Coordinator	Prof. Dr. Björn Häckel
Faculty	Faculty of Computer Science
Type	Required elective module
Duration / Frequency	1 semester, summer semester
Courses	Smart Sustainability Simulation Game (S3G) (2 credit hours)
Teaching language	The module is taught in English.
Teaching and learning methods	Project work
Prerequisites	Knowledge of statistics is required. Knowledge of Python or another programming language as well as knowledge of Data Science/Machine Learning, is an advantage.
Usage possibilities	Required elective for master's degree programs
Total workload and its constituent parts	Credit hours: 2, CP credits: 5, Contact hours: 30h, Independent study: 120h, Total workload: 150h

Exam

Type of exam / required course achievements	Written and computerbased Portfolio exam: <ul style="list-style-type: none"> • Written assignment, 5-20 pages, 20% • 4 case studies: Prepared analysis results and software code, je 20%
Examination number	BIS2019 8005099 MIN2017 8901400
Grading	According to § 20 of the APO in the currently valid version.

Content of the module

- Work in a cross-university team in competition with other teams.
- Work on case studies along selected steps of a circular economy.
- Independent technical implementation of machine learning applications to solve business problems.
- Consideration and analysis of the technical, economic, environmental, and social implications of your work.

Qualification aims for the module learning objectives/skills

- Know and understand how to use and evaluate different machine learning approaches to solve business decision problems.
- Apply techno-economic skills.
- Structure business decision situations and analyze available data.
- Evaluate data using machine learning to make informed business decisions in the context of sustainability.
- Technically implement machine learning applications and evaluate (potential) economic, environmental, and social impacts.
- Practice team and project management skills and presentation techniques.

Reading list

Will be provided in the lecture.

Index

- 1st Foreign Language , 6
- 2nd Foreign Language 1 of 4 , 14
- 2nd Foreign Language 2 of 4 , 28
- 2nd Foreign Language 3 of 4 , 46
- 2nd Foreign Language 4 of 4 , 60

- Applied Artificial Intelligence , 72

- Bachelor Seminar , 90
- Bachelor Thesis , 88
- Business Modelling , 78

- Compulsory Elective Subjects , 84
- Computer Games Development , 110, 128
- Cost Accounting, Controlling & Financial Management , 68
- Customizing , 96

- Data Analytics , 50
- Data Science , 130
- Database Systems , 38
- Digital Transformation in Organizations , 112, 134

- E-Business , 52
- Embedded Security , 138

- General Science Elective Subjects , 86

- Implementation of Enterprise Systems , 36
- Interaction Engineering , 116, 142
- Intercultural Management & Law , 24
- International IT Project and Service Management , 54
- Internship , 64

- Introduction to Business
 - Administration, Financial Accounting , 10
- Introduction to Information Systems , 22
- IT Applications Seminar , 98
- IT Sourcing and Cloud Transformation , 120, 146

- Lean IT & Enterprise Architecture , 122, 148

- Master's Seminar , 104, 106
- Mathematics 1 , 8
- Mathematics 2 , 18

- Practical Seminar , 66
- Production and Logistics , 74
- Programming 1 , 4
- Programming 2 & Software Engineering , 20
- Programming of Enterprise Systems , 42
- Project 1 , 100
- Project 2 , 102
- Project Work , 58, 108
- Project Work 1 , 92
- Project Work 2 , 94

- Secure implementations on microcontrollers (Secure Concepts and Protocols) , 152
- Seminar New Technologies , 82
- Smart Sustainability Simulation Game (S3G) , 156
- Statistics , 32

- Visual Thinking for Business , 126