

Module Catalogue

»Courses in English«



**Hochschule
Augsburg** University of
Applied Sciences

Fakultät für
Informatik

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The purpose of the module descriptions is to provide a content-related overview of your degree course.
Only the current version of the university catalogue and examination regulations shall be deemed legally binding.

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1 Computer Science - Bachelor's Degree

1.1 Project Work 1

Title	Projektarbeit 1
Title in English	Project Work 1
Examination number	3975450
Module code	PA1
Module coordinator	Director of studies
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Project Work 1 (6 credit hours)
Teaching language	German/English
Content of the module	<p>Over the course of one semester, the project work is made up of the following items of work (attendance at each event is compulsory):</p> <ul style="list-style-type: none">• 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.
Teaching and learning methods of the module	Project Work
Prerequisites for participation	
Total workload and its constituent parts	Credit hours: 6, ECTS credits: 8, Contact hours: 90h, Independent study: 150h, Total workload: 240h
Type of examination / required course achievements	<p>Portfolio exam:</p> <ul style="list-style-type: none">• Project work, 10-30 Seiten, 80%• Presentation, 20-40 minutes, 20%
Reading list	

1.2 Project Work 2

Title	Projektarbeit 2
Title in English	Project Work 2
Examination number	3975450
Module code	PA2
Module coordinator	Director of studies
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Project Work 2 (8 credit hours)
Teaching language	German/English
Content of the module	<p>Over the course of one semester, the project work is made up of the following items of work (attendance at each event is compulsory):</p> <ul style="list-style-type: none"> • 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.
Teaching and learning methods of the module	Project Work
Prerequisites for participation	
Total workload and its constituent parts	Credit hours: 8, ECTS credits: 10, Contact hours: 120h, Independent study: 180h, Total workload: 300h
Type of examination / required course achievements	<p>Portfolio exam:</p> <ul style="list-style-type: none"> • Project work, 10-30 Seiten, 80% • Presentation, 20-40 minutes, 20%
Reading list	

2 Business Information Systems - Bachelor's Degree

2.1 IT Applications Seminar

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

2.2 Project 1

Title	Projekt 1
Title in English	Project 1
Examination number	3975450
Module code	PRO1
Module coordinator	Director of studies
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Project Work 1 (4 credit hours)
Teaching language	German/English
Content of the module	<p>Over the course of one semester, the project work is made up of the following items of work (attendance at each event is compulsory):</p> <ul style="list-style-type: none"> • 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.
Teaching and learning methods of the module	Project Work
Prerequisites for participation	
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 8, Contact hours: 60h, Independent study: 180h, Total workload: 240h
Type of examination / required course achievements	<p>Portfolio exam:</p> <ul style="list-style-type: none"> • Project work, 10-30 Seiten, 80% • Presentation, 20-40 minutes, 20%
Reading list	

2.3 Project 2

Title	Projekt 2
Title in English	Project 2
Examination number	3975450
Module code	PRO2
Module coordinator	Director of studies
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Project Work 2 (4 credit hours)
Teaching language	German/English
Content of the module	<p>Over the course of one semester, the project work is made up of the following items of work (attendance at each event is compulsory):</p> <ul style="list-style-type: none"> • 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.
Teaching and learning methods of the module	Project Work
Prerequisites for participation	
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 8, Contact hours: 60h, Independent study: 180h, Total workload: 240h
Type of examination / required course achievements	<p>Portfolio exam:</p> <ul style="list-style-type: none"> • Project work, 10-30 Seiten, 80% • Presentation, 20-40 minutes, 20%
Reading list	

3 Computer Science - Master's Degree

3.1 Master's Seminar

Title	Masterseminar
Title in English	Master's Seminar
Examination number	8900110
Module code	MASEM
Modul area	Academic work
Module coordinator	Prof. Dr. Alessandra Zarcone
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester, summer semester
Courses that make up the module	Master's seminar (2 credit hours)
Teaching language	English
Content of the module	The aim of the master's seminar is to promote the autonomous development of in-depth knowledge of the field of specialisation at hand. The students summarise the results in an essay and then make a presentation on the results. As all of the content is thematically related, synergistic effects are produced over the course of the seminar. The prevailing issues surrounding the chosen field of specialisation within computer science are addressed.
Qualification aims for the module learning objectives/skills	The students acquire detailed knowledge of the chosen specialist-field, develop their presentation and elocution expertise and improve their English language skills.
Teaching and learning methods of the module	The topics are announced in good time so that any students who are interested in the module can sign up online and select topics. Students are expected to make a presentation (in English) lasting approx. one hour which is followed by a discussion (content of presentation, presentation style). The topic must be set out in writing 1-2 weeks before the presentation date (covering approx. 10-15 pages of text, i.e. without images) and submitted to your supervisor.
Prerequisites for participation	Basic knowledge of the chosen specialist field.
Total workload and its constituent parts	Credit hours: 2, ECTS credits: 5, Contact hours: 30h, Independent study: 120h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation, 20-30 minutes, 40% • Written assignment, 10-15 pages, 60%
Reading list	

4 Business Information Systems - Master's Degree

4.1 Master's Seminar

Title	Masterseminar
Title in English	Master's Seminar
Examination number	8004091
Module code	MSEM
Modul area	Academic work
Module coordinator	Prof. Dr. Alessandra Zarcone
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Compulsory module
Duration of module / frequency of module offer	1 semester, winter semester, summer semester
Courses that make up the module	Master's seminar (2 credit hours)
Teaching language	English
Content of the module	The aim of the master's seminar is to promote the autonomous development of in-depth knowledge of the field of specialisation at hand. The students summarise the results in an essay and then make a presentation on the results. As all of the content is thematically related, synergistic effects are produced over the course of the seminar. The prevailing issues surrounding the chosen field of specialisation within computer science are addressed.
Qualification aims for the module learning objectives/skills	The students acquire detailed knowledge of the chosen specialist-field, develop their presentation and elocution expertise and improve their English language skills.
Teaching and learning methods of the module	The topics are announced in good time so that any students who are interested in the module can sign up online and select topics. Students are expected to make a presentation (in English) lasting approx. one hour which is followed by a discussion (content of presentation, presentation style). The topic must be set out in writing 1-2 weeks before the presentation date (covering approx. 10-15 pages of text, i.e. without images) and submitted to your supervisor.
Prerequisites for participation	Basic knowledge of the chosen specialist field.
Total workload and its constituent parts	Credit hours: 2, ECTS credits: 5, Contact hours: 30h, Independent study: 120h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation, 20-30 minutes, 40% • Written assignment, 10-15 pages, 60%
Reading list	

4.2 Project Work

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

5 Required Electives–Bachelor's Degree

5.1 Computer Games Development

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

Reading list	<p>Sylvester, T. (2013) Designing Games: A Guide to Engineering Experiences. O'Reilly</p> <p>Gamasutra Website (http://www.gamasutra.com/)</p>
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5.2 Digital Transformation in Organizations

Title	Digitale Transformation in Organisationen
Title in English	Digital Transformation in Organizations
Examination number	IN 3970377, 2970875 TI 2976686 WI 3975795
Module code	DTO4.WP
Module coordinator	Prof. Dr. Jens Lauterbach
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Digital Transformation in Organizations (4 credit hours)
Teaching language	The module is taught in English.

Content of the module	<p>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:</p> <ul style="list-style-type: none"> • 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 <p>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:</p> <ul style="list-style-type: none"> • Stage models for digital transformation in organizations • Key design aspects for digital transformations • Methods and instruments to design, manage and facilitate digital transformations <p>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.</p>
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Qualification aims for the module learning objectives/skills	<p>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:</p> <ul style="list-style-type: none"> • 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
Teaching and learning methods of the module	Seminar format, practical group work and case studies, industry talks
Prerequisites for participation	Students should have acquired basic skills in informatics or business information systems to understand core concepts/fundamentals behind business organizations and digital technologies. Bachelor (5th semester) or master in business information systems or computer science is recommended.
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	<p>Portfolio exam:</p> <ul style="list-style-type: none"> • Project work, 50% • Written assignment, 10-15 pages, 50%
Reading list	Literature recommendations will be provided in the lecture

5.3 Enterprise Architecture Management

Title	Enterprise Architecture Management
Title in English	Enterprise Architecture Management
Examination number	IN 3970357, 2970853 TI 2976664 WI 3975771
Module code	EAM4.WP
Module coordinator	Prof. Dr. Stephan Zimmermann
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	The duration of the module is one semester. The module is offered regularly in the summer semester.
Courses that make up the module	Enterprise Architecture Management (4 credit hours)
Teaching language	The module is taught in English.

Content of the module	<p>Information technology used in companies is becoming more and more important and complex. A numerous and increasing number of enterprise applications and systems used in business processes substantiates this development. Enterprise architecture management (EAM) helps companies to address related challenges. In this regard, EAM describes the management practice based on the business strategy to support the transformation of the IT landscape by defining, communicating and using a coherent set of guidelines, governance and architectural principles.</p> <p>In this course students will learn about the fundamental concepts of enterprise architectures and their management. They also get to know basic techniques to develop business models, digital strategies and transform these into business, information system and technology architectures. Students will solve several case studies regarding enterprise architecture challenges in practice. This provides a good overview of typical IT landscapes and systems, as well as related methods in managing the complexity within the enterprise.</p> <p>Knowledge focus:</p> <ul style="list-style-type: none"> • Introduction to Enterprise Architecture (EA): Business Architecture, Information System Architecture (Application and Data Architecture) and Technology Architecture • Digital Strategy Development and Business IT Alignment as a starting point for the design of Enterprise Architectures (EA) • Business Capability Management • Application/Service Portfolio Management • EA Governance as the basis for a Strategic EA Transformation • Frameworks in the EA context: e.g. Zachman Framework, TOGAF (The Open Group Architecture Framework) • Architectural views and visualization of IT landscapes • Methods for modelling architecture domains with the modelling language Archimate • Market overview of selected software tools for EA management (EAM lab) • Selected EAM Challenges from practice (Standardization, Transformation, Shadow IT...)
Qualification aims for the module learning objectives/skills	<p>After successful participation in the module, the students are able to:</p> <ul style="list-style-type: none"> • demonstrate competencies with the application of EA methods and IT landscape modelling • understand how to develop business, information systems and technology architectures • apply business model development methods and business capability and application portfolio techniques • illustrate enterprise architecture frameworks • solving practical case studies and scenarios • articulate course related ideas and concepts in English

Teaching and learning methods of the module	Lecture and seminar lessons with laboratory exercises and case studies to apply the knowledge acquired. In addition, the exercises support self-study.
Prerequisites for participation	The requirements for this course are basic skills in business management and enterprise applications (e.g. enterprise resource planning), good command of the English language, and an interest in understanding the complexity and management of enterprise architectures and business models.
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Project work, 15-30 pages, 80% • Presentation, 10-20 minutes, 20%
Reading list	<p>Ahlemann, F., Stettiner, E., Messerschmidt, M., Legner, C. (2012): Strategic Enterprise Architecture Management Challenges, Best Practices, and Future Developments, Springer-Verlag Berlin Heidelberg.</p> <p>Lankhorst M. (2013): Enterprise architecture at work: Modelling, communication, and analysis. Springer, Berlin.</p> <p>Peppard J., Ward J. (2016): The strategic management of information systems: Building a digital strategy. Wiley, Chichester, West Sussex.</p> <p>The Open Group (2018), The Open Group Architectural Framework (TOGAF) Version 9.2. The Open Group, Reading, UK.</p>

5.4 Interaction Engineering

Title	Interaction Engineering
Title in English	Interaction Engineering
Examination number	IN 3970326, 2970796 TI 2976571
Module code	INTENG4.WP
Module coordinator	Prof. Dr. Michael Kipp
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Interaction Engineering (4 credit hours)
Teaching language	The module is taught in English.
Content of the module	<p>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.</p> <p>Students will also get to know and apply methods to evaluate interactive systems objectively (measurable aspects) and subjectively (user feedback).</p>
Qualification aims for the module learning objectives/skills	<p>Knowledge</p> <ul style="list-style-type: none"> • Fundamentals of human-computer interaction • Touch interaction • Gestural interaction • Tangible interaction • Proxemic, spatial, full-body interaction • Cross-device interaction <p>Skills</p> <ul style="list-style-type: none"> • 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 <p>Competencies</p> <ul style="list-style-type: none"> • Understanding and further developing a research topic • Informally evaluating a prototype

Teaching and learning methods of the module	The course includes a series of lectures by the lecturer. Students will give oral presentations and work on assignments at home, both individually and in teams. Students will also work on a final team project which engages them in scientific thinking, practical implementation and critical reflection.
Prerequisites for participation	The requirements for this course are solid programming skills, prior experience with working scientifically, a good command of the English language (reading, writing and speaking) and an interest in working both analytically and creatively to develop novel interaction methods.
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs: Computer Science and Computer Engineering
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation, 15 minutes, 25% • Project work, 50% • Written assignment, 15-20 pages, 25%
Reading list	<p>B. Buxton, S. Greenberg, S. Carpendale, N. Marquardt (2012) Sketching User Experiences: The Workbook, Morgan Kaufmann, 262 pages.</p> <p>B. Albert, T. Tullis (2013) Measuring the User Experience, 2. Edition, Morgan Kaufmann, 301 pages.</p> <p>J. Butler, K. Holden, W. Lidwell (2010) Universal Principles of Design, Rockport Publishers, 272 pages.</p>

5.5 IT Sourcing and Cloud Transformation

Title	IT Sourcing and Cloud Transformation
Title in English	IT Sourcing and Cloud Transformation
Examination number	IN 3970380, 2970878 TI 2976689 WI 3975798
Module code	ITSCT4.WP
Module coordinator	Prof. Dr. Arne Mayer
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	IT Sourcing and Cloud Transformation (4 credit hours)
Teaching language	The module is taught in English.
Content of the module	<p>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.</p> <p>The following blocks are covered:</p> <ul style="list-style-type: none"> • 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	<p>With successful participation in the module, students can:</p> <ul style="list-style-type: none"> • 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
Teaching and learning methods of the module	Seminar-based instruction at the beginning - Supported by case studies, group discussions and guest lectures. In the further course, work in small groups, in which the students work out the practice-relevant content themselves.
Prerequisites for participation	None
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs

Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written examination, 60 minutes, auxiliary: non-programmable calculator
Reading list	Will be announced in the first lecture

5.6 Visual Thinking for Business

Title	Visual Thinking for Business
Title in English	Visual Thinking for Business
Examination number	IN 3970353, 2970849 TI 2976659 WI 3975767
Module code	VISTH.WP
Module coordinator	Philip McClenaghan
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	The module is regularly offered as a block course during the semester break. (February/March) and (August/September)
Courses that make up the module	Visual Thinking for Business (4 credit hours)
Teaching language	The module is taught in English.
Content of the module	<p>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.</p> <p>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.</p> <p>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.</p>
Qualification aims for the module learning objectives/skills	<p>The students should develop the following skills during the course:</p> <ul style="list-style-type: none"> • 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.
Teaching and learning methods of the module	Seminar format, practical classes and workshops
Prerequisites for participation	None
Possibility to use module within student's own study programme or other programmes	Required elective for bachelor's degree programs
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation, 10-25 minutes, 40% • Written assignment, 10-15 pages, 60%
Reading list	Will be announced in the first lecture.

6 Required Electives–Master’s Degree

6.1 Computer Games Development

Title	Computer Games Development
Title in English	Computer Games Development
Examination number	BIS2019 8005036, BIS2011 7953400 MIN2017 8900730
Module code	COMGA.WP
Module coordinator	Philip McClenaghan
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	The module is regularly offered as a block course during the semester break. (February/March) and (August/September)
Courses that make up the module	Computer Games Development (4 credit hours)
Teaching language	The module is taught in English.
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: <ul style="list-style-type: none"> • 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.
Teaching and learning methods of the module	Seminar format, practical classes and workshops
Prerequisites for participation	None
Possibility to use module within student’s own study programme or other programmes	Required elective for master’s degree programs
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation, 10-30 minutes, 40% • Written assignment, 8-25 pages, 60%
Reading list	Sylvester, T. (2013) Designing Games: A Guide to Engineering Experiences. O'Reilly Gamasutra Website (http://www.gamasutra.com/)

6.2 Data Science

Title	Data Science
Title in English	Data Science
Examination number	BIS2019 8005026, BIS2011 7953250 MIN2017 8900650
Module code	DASC4.WP
Module coordinator	Prof. Dr.-Ing. Honorary Doctor of ONPU Thorsten Schöler
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Data Science (4 credit hours)
Teaching language	The module is taught in English, if necessary also in German
Content of the module	<p>Introduction to Data Science: Introduction, Data Science and the Internet of Things</p> <p>Short introduction to Python</p> <p>Extract Transform Load (ETL): Setup, ETL and Hadoop, How Uber designed it's 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</p> <p>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</p> <p>Statistics and classification: Literature, Statistics, Linear regression, Correlation and covariance, Classification</p> <p>Machine Learning: Introduction, Unsupervised learning, Supervised learning, (Reinforcement learning)</p> <p>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,</p> <p>Datenkraken: Examples, Workshop</p> <p>Sensor data fusion: Introduction, JDL data fusion model, Subsumption architecture, Literature</p>
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.

Teaching and learning methods of the module	<ul style="list-style-type: none"> • Seminar format • Scientific Seminar • Studies • Small projects
Prerequisites for participation	<ul style="list-style-type: none"> • Good programming skills (Python, Java, etc.) • Interest in scientific challenges • Solid mathematical understanding
Possibility to use module within student's own study programme or other programmes	Required elective for master's degree programs
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written assignment, 8-20 pages
Reading list	<p>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.</p> <p>W. McKinney, Datenanalyse mit Python: Auswertung von Daten mit Pandas, NumPy und IPython, 1. Auflage, O'Reilly, 2015.</p> <p>J. Grus, Einführung in Data Science: Grundprinzipien der Datenanalyse mit Python, 1. Auflage, O'Reilly, 2016.</p> <p>R. Bruns und J. Dunkel, Event-Driven Architecture: Softwarearchitektur für ereignisgesteuerte Geschäftsprozesse, 1. Auflage, Berlin u.a.: Springer, 2010.</p>

6.3 Digital Transformation in Organizations

Title	Digitale Transformation in Organisationen
Title in English	Digital Transformation in Organizations
Examination number	BIS2019 8005083, BIS2011 ——— MIN2017 8901240
Module code	DTO4.WP
Module coordinator	Prof. Dr. Jens Lauterbach
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	Digital Transformation in Organizations (4 credit hours)
Teaching language	The module is taught in English.
Content of the module	<p>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:</p> <ul style="list-style-type: none"> • 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 <p>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:</p> <ul style="list-style-type: none"> • Stage models for digital transformation in organizations • Key design aspects for digital transformations • Methods and instruments to design, manage and facilitate digital transformations <p>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.</p>

Qualification aims for the module learning objectives/skills	<p>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:</p> <ul style="list-style-type: none"> • 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
Teaching and learning methods of the module	Seminar format, practical group work and case studies, industry talks
Prerequisites for participation	Students should have acquired basic skills in informatics or business information systems to understand core concepts/fundamentals behind business organizations and digital technologies. Bachelor (5th semester) or master in business information systems or computer science is recommended.
Possibility to use module within student's own study programme or other programmes	Required elective for master's degree programs
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	<p>Portfolio exam:</p> <ul style="list-style-type: none"> • Project work, 50% • Written assignment, 10-15 pages, 25% • Presentation, 15-25 minutes, 25%
Reading list	Literature recommendations will be provided in the lecture

6.4 Embedded Security

Title	Embedded Security
Title in English	Embedded Security
Examination number	BIS2019 8005037, BIS2011 7953410 MIN2017 8900740
Module code	EMBSEC.WP
Module coordinator	Prof. Dr.-Ing. Dominik Merli
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Embedded Security (4 credit hours)
Teaching language	The module is taught in English.
Content of the module	<ol style="list-style-type: none"> 1. Introduction, Standards and Processes <ul style="list-style-type: none"> • Standards for Secure Components • Secure Development Process 2. Fundamental Embedded Security Building Blocks <ul style="list-style-type: none"> • Random Number Generators • Cryptographic Implementations • Secure Memory and Data Storage • Secure Device Identity • Secure Communication 3. Hardware and Firmware Level Security Measures <ul style="list-style-type: none"> • Secure Boot Process • Secure Firmware Update • Robust Device Architecture 4. Operating System Level Security Measures <ul style="list-style-type: none"> • Access Control and Management • System Monitoring
Qualification aims for the module learning objectives/skills	<p>After successful participation, students are able to:</p> <ul style="list-style-type: none"> • 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

Teaching and learning methods of the module	Seminar-like lectures and supporting practical exercises
Prerequisites for participation	None
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Written examination, 90 minutes, auxiliary: calculator, English-Dictionary
Reading list	<p>D. Mukhopadhyay, R. S. Chakraborty: "Hardware Security: Design, Threats, and Safeguards", Chapman and Hall/CRC, 2014</p> <p>S. Mangard, E. Oswald, T. Popp: "Power Analysis Attacks: Revealing the Secrets of Smart Cards", Springer, 2007</p> <p>C. Paar, J. Pelzl: "Understanding Cryptography: A Textbook for Students and Practitioners", Springer, 2010</p> <p>C. K. Koc (Ed.): "Cryptographic Engineering", Springer, 2009</p>

6.5 Enterprise Architecture Management

Title	Enterprise Architecture Management
Title in English	Enterprise Architecture Management
Examination number	BIS2019 8005055, BIS2011 7953630 MIN2017 8900970
Module code	EAM4.WP
Module coordinator	Prof. Dr. Stephan Zimmermann
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	The duration of the module is one semester. The module is offered regularly in the summer semester.
Courses that make up the module	Enterprise Architecture Management (4 credit hours)
Teaching language	The module is taught in English.

Content of the module	<p>Information technology used in companies is becoming more and more important and complex. A numerous and increasing number of enterprise applications and systems used in business processes substantiates this development. Enterprise architecture management (EAM) helps companies to address related challenges. In this regard, EAM describes the management practice based on the business strategy to support the transformation of the IT landscape by defining, communicating and using a coherent set of guidelines, governance and architectural principles.</p> <p>In this course students will learn about the fundamental concepts of enterprise architectures and their management. They also get to know basic techniques to develop business models, digital strategies and transform these into business, information system and technology architectures. Students will solve several case studies regarding enterprise architecture challenges in practice. This provides a good overview of typical IT landscapes and systems, as well as related methods in managing the complexity within the enterprise.</p> <p>Knowledge focus:</p> <ul style="list-style-type: none"> • Introduction to Enterprise Architecture (EA): Business Architecture, Information System Architecture (Application and Data Architecture) and Technology Architecture • Digital Strategy Development and Business IT Alignment as a starting point for the design of Enterprise Architectures (EA) • Business Capability Management • Application/Service Portfolio Management • EA Governance as the basis for a Strategic EA Transformation • Frameworks in the EA context: e.g. Zachman Framework, TOGAF (The Open Group Architecture Framework) • Architectural views and visualization of IT landscapes • Methods for modelling architecture domains with the modelling language Archimate • Market overview of selected software tools for EA management (EAM lab) • Selected EAM Challenges from practice (Standardization, Transformation, Shadow IT...)
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Qualification aims for the module learning objectives/skills	<p>After successful participation in the module, the students are able to:</p> <ul style="list-style-type: none"> • demonstrate competencies with the application of EA methods and IT landscape modelling • make informed judgements on the development and complex issues of business, information systems and technology architectures • apply business model development methods and business capability and application portfolio techniques • use and evaluate enterprise architecture frameworks • discuss the status and value of EA management and governance • evaluate, solve and present practical challenges in enterprise architectures • articulate course related ideas and concepts in English.
Teaching and learning methods of the module	Lecture and seminar lessons with laboratory exercises and case studies to apply the knowledge acquired. In addition, the exercises support self-study.
Prerequisites for participation	The requirements for this course are basic skills in business management and enterprise applications (e.g. enterprise resource planning), good command of the English language, and an interest in understanding the complexity and management of enterprise architectures and business models.
Possibility to use module within student's own study programme or other programmes	Required elective for master's degree programs
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	<p>Portfolio exam:</p> <ul style="list-style-type: none"> • Project work, 15-30 pages, 60% • Presentation A, 10-20 minutes, 10% • Presentation B, 30-40 minutes, 30%
Reading list	<p>Ahlemann, F., Stettiner, E., Messerschmidt, M., Legner, C. (2012): Strategic Enterprise Architecture Management Challenges, Best Practices, and Future Developments, Springer-Verlag Berlin Heidelberg.</p> <p>Lankhorst M. (2013): Enterprise architecture at work: Modelling, communication, and analysis. Springer, Berlin.</p> <p>Peppard J., Ward J. (2016): The strategic management of information systems: Building a digital strategy. Wiley, Chichester, West Sussex.</p> <p>The Open Group (2018), The Open Group Architectural Framework (TOGAF) Version 9.2. The Open Group, Reading, UK.</p>

6.6 Interaction Engineering

Title	Interaction Engineering
Title in English	Interaction Engineering
Examination number	BIS2019 8005031, BIS2011 7953330 MIN2017 8900510
Module code	INTENG.WP
Module coordinator	Prof. Dr. Michael Kipp
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, winter semester
Courses that make up the module	Interaction Engineering (4 credit hours)
Teaching language	The module is taught in English.
Content of the module	<p>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.</p> <p>Students will also get to know and apply methods to evaluate interactive systems objectively (measurable aspects) and subjectively (user feedback).</p>
Qualification aims for the module learning objectives/skills	<p>Knowledge</p> <ul style="list-style-type: none"> • Fundamentals of human-computer interaction • Touch interaction • Gestural interaction • Tangible interaction • Proxemic, spatial, full-body interaction • Cross-device interaction <p>Skills</p> <ul style="list-style-type: none"> • 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 <p>Competencies</p> <ul style="list-style-type: none"> • Finding and formulating a research topic • Formally evaluating a prototype

Teaching and learning methods of the module	The course includes a series of lectures by the lecturer. Students will give oral presentations and work on assignments at home, both individually and in teams. Students will also work on a final team project which engages them in scientific thinking, practical implementation and critical reflection.
Prerequisites for participation	The requirements for this course are solid programming skills, prior experience with working scientifically, a good command of the English language (reading, writing and speaking) and an interest in working both analytically and creatively to develop novel interaction methods.
Possibility to use module within student's own study programme or other programmes	Required elective for master's degree programs: Interactive Media Systems, Computer Science and Business Information Systems
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h
Type of examination / required course achievements	Portfolio exam: <ul style="list-style-type: none"> • Presentation, 15 minutes, 25% • Project work, 50% • Written assignment, 15-20 pages, 25%
Reading list	<p>B. Buxton, S. Greenberg, S. Carpendale, N. Marquardt (2012) Sketching User Experiences: The Workbook, Morgan Kaufmann, 262 pages.</p> <p>B. Albert, T. Tullis (2013) Measuring the User Experience, 2. Edition, Morgan Kaufmann, 301 pages.</p> <p>J. Butler, K. Holden, W. Lidwell (2010) Universal Principles of Design, Rockport Publishers, 272 pages.</p>

6.7 IT Sourcing and Cloud Transformation

Title	IT Sourcing and Cloud Transformation
Title in English	IT Sourcing and Cloud Transformation
Examination number	BIS2019 8005086, BIS2011 ——— MIN2017 8901270
Module code	ITSCT4.WP
Module coordinator	Prof. Dr. Arne Mayer
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	1 semester, summer semester
Courses that make up the module	IT Sourcing and Cloud Transformation (4 credit hours)
Teaching language	The module is taught in English.
Content of the module	<p>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.</p> <p>The following blocks are covered:</p> <ul style="list-style-type: none"> • 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	<p>With successful participation in the module, students can:</p> <ul style="list-style-type: none"> • 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
Teaching and learning methods of the module	Seminar-based instruction at the beginning - Supported by case studies, group discussions and guest lectures. In the further course, work in small groups, in which the students work out the practice-relevant content themselves.
Prerequisites for participation	None
Possibility to use module within student's own study programme or other programmes	Required elective for master's degree programs
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Type of examination / required course achievements	<p>Portfolio exam:</p> <ul style="list-style-type: none"> • Written examination, 60 minutes, auxiliary: non-programmable calculator, 70% • Presentation, 15 minutes, plus 10 minutes Discussion, 30%
Reading list	Will be announced in the first lecture

6.8 Secure Concepts and Protocols

Title	Sichere Konzepte und Protokolle
Title in English	Secure Concepts and Protocols
Examination number	BIS2019 8005054, BIS2011 7953620 MIN2017 8900960
Module code	SKUP.WP
Module coordinator	Prof. Dr. Alexander von Bodisco
Name of university lecturer	You can find the name of the lecturer for the current semester in the timetable.
Faculty	Faculty of Computer Science
Module type	Required elective module
Duration of module / frequency of module offer	The module is held in summer or winter term on an irregular basis depending on the demand.
Courses that make up the module	Secure Concepts and Protocols (4 credit hours)
Teaching language	The module is taught in English.
Content of the module	<p>Methods and concepts for performance evaluation:</p> <ul style="list-style-type: none"> • Security concepts <ul style="list-style-type: none"> – Model classification – Access control – Flow of information • Key Management <ul style="list-style-type: none"> – Key certification – Key generation – Key exchange – Key recovery • Authentication <ul style="list-style-type: none"> – Authentication through knowledge, biometry or distributed systems • Security in Computer Networks Firewall technology, OSI-security architecture, secure communication, IPSec, SSL/TLS • Security requirements in industrial networks • Secure mobile wireless communication <ul style="list-style-type: none"> – GSM, UMTS, Long Term Evolution (LTE) and SAE, WLAN, Bluetooth
Qualification aims for the module learning objectives/skills	Student know and understand the basics of security concepts and communication protocols. Students are able to evaluate and compare security concepts with regard to security vulnerabilities.
Teaching and learning methods of the module	Lecture and practical exercises to deepen the gained knowledge.
Prerequisites for participation	None
Possibility to use module within student's own study programme or other programmes	Required elective module for master's degree programs, Compulsory module for the master degree 'Industrial Safety and Security'.
Total workload and its constituent parts	Credit hours: 4, ECTS credits: 5, Contact hours: 60h, Independent study: 90h, Total workload: 150h

Type of examination / required course achievements	Written examination, 90 minutes
Reading list	<p>Eckert, C.; "IT-Sicherheit -Konzepte -Verfahren -Protokolle", 9te Auflage, De Gruyter Oldenbourg, ISBN-13:978-3486200003.</p> <p>Kurose, J. und Ross, K.; "Computernetzwerke - Der Top-Down Ansatz", 6te Auflage, Pearson IT, ISBN-13:978-3-86894-237-8.</p> <p>Tanenbaum, A. S.; "Computernetzwerke", 5te Auflage, Pearson Studium, ISBN-13:978-3-8689-4137-1.</p> <p>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.</p>

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