

Hochschule Karlsruhe

**Faculty for Computer Science and Business
Information Systems**

Module manual

**Course of studies Media and Communication
Computer Science (Bachelor), ER 3**

Summer semester 2025

Module Media and Communication Computer Science (Bachelor), ER 3

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Module Computer Science 1	
Internal number	MKIB1103
Coordinator	Prof. Dr. Carsten Sinz
Scope	8.0 ECTS points, 8.0 Contact hours
Placement	1st Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	The courses of this module teach the students fundamental programming and algorithmic skills. The students should be enabled to analyze small problems, find solutions to these problems, and develop them in the Java programming language.
Exams	Individual exams
Lecture Computer Science 1	
Internal number	MKIB1113
Lecturer	Prof. Dr. Christian Pape
Scope	5.0 ECTS points, 4.0 Contact hours 150 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	After attending the lecture, the students are able to solve small computer science problems with the Java programming language. They know common design methods, basic search and sort procedures, and can apply them in practice.
Recommended reading	Selected exercises with solutions, slides in PDF format, Java programs and their documentation as Javadoc. Supplementary Java exercises with solutions to deepen the programming skills.
Exams	Written Exam 120 Min. (graded)
Comments	Lecture participation. Solving simple exercises in the lecture with teacher support.
Lecture Computer Science 1 Exercise	
Internal number	MKIB1123
Lecturers	Prof. Dr. Heiko Körner Prof. Dr. Christian Pape
Scope	3.0 ECTS points, 4.0 Contact hours 90 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German

Content	The students turn small computer sciences problems into practice (design, implementation with Java, testing, debugging). The students are able to create their own homepage.
Recommended reading	
Exams	Exercise 1 Semester (not graded)
Comments	Practical assignment in a computer laboratory.

Module Media Design	
Internal number	MKIB1203
Coordinator	Prof. Thomas Hinz
Scope	7.0 ECTS points, 6.0 Contact hours
Placement	1st Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	
Exams	Individual exams
Lecture Media Design	
Internal number	MKIB1213
Lecturer	Prof. Thomas Hinz
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	The students become acquainted with the theoretical foundations of media design. This includes knowledge about creativity techniques, design rules and gestalt principles, systems of organisation, micro- and macro typography, colour theory, logos/pictograms/icons as well as grid systems for layouts. Additionally, they gain insights into analog and digital photography and the conception and design of digital media content exemplified through web applications. The students explore the history of design, starting at the dawn of industrialisation and including the seminal design movements of the 19th and 20th centuries as well as contemporary trends in design. This overview enables students to categorise and evaluate different design styles, allowing an integration of the acquired knowledge into their own design processes.
Recommended reading	<ul style="list-style-type: none"> - M. Jäger: "Grafik und Gestaltung: Mediengestaltung von A bis Z verständlich erklärt", Rheinwerk Verlag, 2014, ISBN 978-3-8362-2513-7 - S. M. Weinschenk: "100 Dinge, die jeder Designer über Menschen wissen muss", Addison-Wesley Verlag, 2011, ISBN 978-3827330994 - M. Pricken: "Kribbeln im Kopf", Schmidt Hermann Verlag, 2010, ISBN 978-3874397971 - T. Rempfen, Uwe Stoklossa: "Blicktricks", Schmidt Hermann Verlag, 2005, ISBN 978-3874396813 - C. Berents: "Kleine Geschichte des Design: Von Gottfried Semper bis Philippe Starck", C.H. Beck, 2011, ISBN 978-3406622410
Exams	Concept 1 Semester (graded)
Comments	
Lecture Media Design Exercise	

Internal number	MKIB1223
Lecturer	Prof. Thomas Hinz
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	
Recommended reading	
Exams	Exercise 1 Semester (not graded)
Comments	

Module Theoretical Computer Science	
Internal number	MKIB1303
Coordinator	Prof. Dr. Heiko Körner
Scope	4.0 ECTS points, 4.0 Contact hours
Placement	1st Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	Participants of this lecture will be in a position to recognize the fundamental limitations of today's computers when solving important problems. Hence, this course gives an introduction to the basic areas of modern theoretical computer science. The Chomsky hierarchy helps the students to classify formal languages by their algorithmic complexity. Furthermore, the students use computational models (finite state automata, push-down automata) to represent today's computers and to understand their limits. Due to these limitations, several problems are shown to be unsolvable. Proving all these results requires precise mathematical and logical arguments, and the students are intensively trained to use them correctly.
Exams	Individual exams
Lecture Theoretical Computer Science	
Internal number	MKIB1313
Lecturer	Prof. Dr. Heiko Körner
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	This course gives an introduction to the theory of formal languages. The Chomsky hierarchy will serve as a model to classify these languages by their computational complexity. Modern computers are represented by finite state automata, showing their principal limits. The students also learn how to apply several proof techniques. The lecture include the following areas of theoretical computer science: mathematical logic, formal languages, proof techniques, the O-calculus, finite automata, regular languages and expressions, the Chomsky hierarchy, the pumping lemma for regular and context-free languages and the minimization of finite automata by the theorem of Myhill-Nerode. Furthermore, the course covers pushdown automata, the CYK algorithm and closure properties of regular and context-free languages.

Recommended reading	<p>The substance of the lecture will be discussed at the blackboard. Lecture notes containing the complete material are also available. Furthermore, there are sample solutions to all exercises.</p> <p>Literature: D. W. Hoffmann: Theoretische Informatik, 3. Auflage. Hanser, 2015. M. Sipser: Introduction to the Theory of Computation, 3rd edition. Cengage Learning, Inc., 2012.</p>
Exams	Written Exam 90 Min. (graded)
Comments	This course will take place as a pure lecture. Numerous exercises deepen selected areas and will be discussed in tutorials.

Module Mathematics 1	
Internal number	MKIB1403
Coordinator	Prof. Dr.-Ing. Astrid Laubenheimer
Scope	8.0 ECTS points, 6.0 Contact hours
Placement	1st Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	Participants learn the mathematical basics from linear algebra, which are often used in computer science. These basics are specifically needed in computer graphics, robotic, cryptography.
Exams	Individual exams
Lecture Mathematics 1	
Internal number	MKIB1413
Lecturer	M.Sc. Martin Redlof
Scope	5.0 ECTS points, 4.0 Contact hours 150 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	<p>The participants should learn basic knowledge of mathematics and especially of linear algebra and acquire the methods to solve smaller mathematical tasks by themselves. In the part on linear algebra we will focus on knowledge needed in computer graphic and 3D simulations.</p> <p>Content of the lectures: Proof methods, relations, euivalence relations, modulo-calculation, Euklid's algorithm, functions, operations, groups, rings, fields, polynomial rings, finite fields, interpolation, vector spaces, basis, dimension, linear equations, rank, Gauß-Jordan-algorithm, determinant, matrices, linear map, inverse matrices, rotation, translation, scaling, scalarproduct, norm, vectorproduct, orthogonal matrizen, eigenvalues, eigenvectors, homogeneous coordinates.</p>
Recommended reading	Own writings from the blackboard, Exercises and summaries from the internet, Textbook: Peter Stingl: Mathematik für Fachhochschulen, Hanser Verlag, 8. Auflage, 2009, ISBN-10: 3-446-42065-7
Exams	Written Exam 90 Min. (graded)
Comments	Lecture, Exercises, Summary of the solutions in the lecture, Tutorials for further assistance
Lecture Mathematics 1 Laboratory	
Internal number	MKIB1423
Lecturer	M.Sc. Martin Redlof

Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German
Content	Improving the knowledge of the related lectures, basics in computer-algebra systems, mathematical problem solving with computer assistance. With the help of the computer algebra system Maple different, applied mathematical questions from the fields of geometry, curves, interpolation and linear equations will be solved. It will be focussed on matrices and homogenous coordinates, which are an important foundation for computer graphic.
Recommended reading	Short introduction will be given. Exercises distributed in the classes and also available on the internet.
Exams	Exercise 1 Semester (not graded)
Comments	Exercises in the labs with Maple (instructor will be present).

Module Language Competence	
Internal number	MKIB1503
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	4.0 ECTS points, 4.0 Contact hours
Placement	1st Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	The learning of a foreign language is an integral component of the in the course of studies communicated key qualification.
Exams	Individual exams
Lecture Foreign Languages	
Internal number	MKIB1513
Lecturer	Mehrere Dozenten
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	English
Content	<p>After a grading test students can deepen their English skills to three grades. The entry level requires the competence grade A2 (basic user) in the six-stage common European reference framework. The first two grades (English for advanced learners 1 and 2) engage besides a recapitulation of grammar mainly in issues of job-oriented common language and cultural studies, e.g. job application letters, descriptions of products and services, business telephone calls, progress of formal and informal conferences, presentations etc. The thus achieved grade complies with 173 points in the TOEFL (computer-based) or the competence grade B2 (independent user) of the European reference framework. In the following grade special language skills (English for science and technics) are learnt: In business English the priority is on spoken language and small study groups. At the beginning of the semester each group founds its own company which advances dynamically during the course of the semester. At the same time vocabulary and phrasing in respect of topics like company structures, meetings, negotiation, marketing, production and sale, finances, comprehending of reports and presentations are gone through in order to make the attendees handle the language instruments to cope with each step of the simulation in English. The highlights of the course are a simulated exhibition, a hiring procedure and the group presentation. In technical English the priority is on the learning and practice of a technical basis vocabulary and typical expressions of technical communication.</p>
Recommended reading	Literature depends on grade, PowerPoint presentations, excercises, Videos, DVDs

Exams	Written Exam 120 Min. (graded)
Comments	Lecture participation, short talks, discussions

Module Computer Science 2	
Internal number	MKIB2103
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	7.0 ECTS points, 6.0 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	Theoretical Computer Science, Computer Science 1
Pre-requisites according to the examination regulations	none
Competences	The students learn about basic algorithms and data structures. They can estimate in which situations specific and complex data types are used, how they work and how much time they take. They are able to prove the correctness of algorithms. In practical assignments the students are enabled to implement various algorithms and data structures.
Exams	Individual exams
Lecture Computer Science 2	
Internal number	MKIB2113
Lecturers	Prof. Dr.-Ing. Holger Vogelsang Dipl.-Ing. Christian Meder
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	This lecture consists of four parts. The first one introduces basic concepts of object oriented programming on the basis of the programming language Java. The main issues are among other things: Language elements of Java, data abstraction and encapsulation, inheritance, polymorphism, generic programming, error handling and runtime type information. Based on these techniques an introduction in modeling of class diagrams with UML is made. Additional practical exercises with a standard IDE deepen the knowledge. The second part introduces the development of mobile Apps with graphical user interfaces for Android. The third part of the lecture deals with some important data structures like lists, hash tables, tree and graphs and introduces basic algorithms to operate on them. The fourth part introduces the modularization of applications with Spring.

Recommended reading	<p>On the lecture homepage: PowerPoint presentation, program examples, script Books:</p> <ul style="list-style-type: none"> - Christian Ullenboom, Java ist auch eine Insel, Galileo Computing - R. C. Martin, Clean Code, mitp - B. Lahres, G. Raýman, Objektorientierte Programmierung, Galileo Computing - G. Popp, Konfigurationsmanagement mit Subversion, Maven und Redmine, dpunkt - M. Jeckle, C. Rupp, J. Hahn, B. Zengler, S. Queins, UML 2 - glasklar, Hanser-Verlag - G. Saake, K. Sattler, Datenstrukturen und Algorithmen: Eine Einführung mit Java, dpunkt - O. Zeigermann: "JavaScript für JavaEntwickler", entwickler.press - D. Flanagan: "JavaScript - kurz & gut", O'Reilly - M. Haverbeke: "Eloquent JavaScript", kostenlos unter http://eloquentjavascript.net/ - JavaScript-Referenz: https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference
Exams	Written Exam 90 Min. (graded)
Comments	Preparation of lecture contents and exam
Lecture Computer Science 2 Exercise	
Internal number	MKIB2123
Lecturers	Prof. Dr.-Ing. Holger Vogelsang Dr. Martin Holzer
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	The students solve Java and JavaScript exercises and model small applications using UML class diagrams.
Recommended reading	Script, compulsory and optional exercises on the homepage, solutions for optional exercises
Exams	Exercise 1 Semester (not graded)
Comments	Practical exercise with discussion of solutions

Module Software Project	
Internal number	MKIB2203
Coordinator	Prof. Dr. Martin Sulzmann
Scope	5.0 ECTS points, 4.0 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	Computer Science 1
Pre-requisites according to the examination regulations	none
Competences	<p>This course covers programming languages that belong to the C/C++ family of languages including new forms such as Go and Rust.</p> <p>After this course, students will be able to code in C/C++, are able to understand the commonalities and differences to Java and have an understanding of the latest developments such as C++20 plus new forms such as Go and Rust.</p> <p>Lectures introduce concepts via some live coding followed by some lab sessions where students work on smaller practical exercises. Several (online) quizzes allow students to test their knowledge.</p> <p>Content.</p> <p>C/C++ basics.</p> <ul style="list-style-type: none"> - Functions and basic data types - Pointers and the pitfalls of manual memory management - IO streams and overloading - Subclassing and virtual methods - Templates <p>C++11 copy/move semantics.</p> <p>Recent extensions and new directions.</p> <ul style="list-style-type: none"> - C++20 - Go - Rust <p>Written final exam, closed book. Exam questions refer to practical exercises that are covered in the lab.</p>
Exams	Individual exams
Lecture Software Project	
Internal number	MKIB2213
Lecturers	Prof. Dr. Martin Sulzmann Prof. Dr. Christian Pape

Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	The students implement projects with an increasing complexity in C++. They have to use generic classes, inheritance, polymorphism, abstract classes and interfaces and concepts for error handling and detection like exceptions and assertions. Additionally they will learn to use elements of the STL and to model the classes and their relationships with UML.
Recommended reading	On the homepage: Project description with a step-by-step instruction, Java script, optional exercise with solutions, books: - Ulrich Breyman, C++ - Einführung und professionelle Programmierung, Hanser-Verlag
Exams	Written Exam 90 Min. (graded)
Comments	Laboratory work
Lecture Software Project Exercise	
Internal number	MKIB2223
Lecturers	Prof. Dr. Martin Sulzmann Prof. Dr. Heiko Körner Prof. Dr. Christian Pape
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	
Recommended reading	
Exams	Exercise 1 Semester (not graded)
Comments	

Module Technologies of the Internet	
Internal number	MKIB2303
Coordinator	Prof. Dr. Christian Zirpins
Scope	5.0 ECTS points, 4.0 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	Computer Science 1
Pre-requisites according to the examination regulations	none
Competences	The two lectures on the topic of distributed systems ("Distributed Systems 1" and "Distributed Systems 2") teach both foundational and advanced principles that are illustrated through practical examples of existing paradigms and technologies. Principles treated in this course encompass foundations of goals and classes of distributed systems, as well as their architectures, processes, communication and name systems. Advanced principles include synchronisation, consistency and replicability, error-tolerance and security. The principles introduced in this course are exemplified through the paradigms of web-based systems and component-based systems. This includes sample implementations of individual principles. In addition, the course gives an introduction into the development of corresponding systems using actual technologies as examples.
Exams	Written Exam 120 Min. (graded)
Lecture Distributed Systems 1	
Internal number	MKIB2313.a
Lecturer	Prof. Dr. Christian Zirpins
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	<p>The course provides a practical introduction to the concepts and paradigms of distributed systems using the example of web technologies and application development on the web. This initially involves an introduction of the world wide web with basic protocols such as HTTP and other standards in the context of the Internet. After that an introduction to the design and construction of web applications is provided. This includes firstly the frontend development with HTML5, CSS3 as well as client-side JavaScript and secondly the backend development with server-side JavaScript on the Node.js platform. Interactions between frontend and backend follow modern REST/HTTP and AJAX techniques. In addition, mechanisms for personalization with cookies and sessions as well as to authenticate users are presented. The course closes with a detailed discussion of web application security.</p> <p>Upon completing this lecture class, students will acquire practical skills in the development and deployment of web applications, grounded in an understanding of distributed systems and web technologies. They will learn to proficiently use HTML5, CSS3, and JavaScript for frontend development, alongside server-side development with Node.js, enhancing their ability to create dynamic, full-stack web applications. Additionally, students will gain knowledge in implementing modern REST/HTTP and AJAX techniques for efficient frontend-backend communication, as well as in employing cookies, sessions, and authentication strategies for personalizing user experiences and ensuring application security. This comprehensive skill set will prepare students for a wide range of roles in web development and application design, equipping them with the necessary tools to address current and future challenges in the field.</p>
Recommended reading	<ul style="list-style-type: none"> - Semmy Purewal, "Learning Web App Development", O'Reilly, 1. Auflage, 2014 - David Gourley, Brian Totty, "HTTP: The Definite Guide", O'Reilly, 2002 - Mark Pilgrim, "HTML5 Up and Running", O'Reilly, 2010 (Online: http://diveintohtml5.info) - Marijn Haverbeke, "Eloquent JavaScript", No Starch Press, 2014 (Online: http://eloquentjavascript.net) - Peter Gasston, "The Book of CSS3 - A Developer's Guide to the Future of Web Design", 2nd Edition, No Starch Press, 2014 - Andy Budd, Emil Björklund, "CSS Mastery", Third Edition, Apress, 2016 (Online verfügbar im Hochschulnetz) - Ethan Brown, "Web development with Node and Express", O'Reilly, 2014 - Robert Prediger ; Ralph Winzinger, "Node.js : Professionell hochperformante Software entwickeln", Hanser, 2015 (Online verfügbar im Hochschulnetz) - Additional literature will be announced during the lecture
Exams	Module exam
Comments	<p>In preparation for individual lecture units, the self-study of basic content is required by means of the accompanying literature (relevant chapters will be announced in the event). Further independent work concerns the follow-up of the lecture contents and the exam preparation.</p>
Lecture Interfacedesign	
Internal number	MKIB2313.b

Lecturer	Prof. Daniel Schwarz
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	This course provides students with the theoretical and applied knowledge about the creation of media-based web applications. This includes the foundations of the markup language HTML and Cascading Style Sheets, how to embed different types of media, as well as the conception, design and programming of responsive web applications.
Recommended reading	Lecture notes, slides (PDF), multiple examples of programs
Exams	Module exam
Comments	Preparation of lecture contents and exam

Module Mathematics 2	
Internal number	MKIB2403
Coordinator	Prof. Dr.-Ing. Astrid Laubenheimer
Scope	7.0 ECTS points, 6.0 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	
Exams	Written Exam 120 Min. (graded)
Lecture Analysis	
Internal number	MKIB2413.a
Lecturer	Prof. Dr.-Ing. Astrid Laubenheimer
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Module exam
Comments	
Lecture Statistics	
Internal number	MKIB2413.b
Lecturer	Prof. Dr. Reimar Hofmann
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Module exam
Comments	

Module Computer Engineering	
Internal number	MKIB2503
Coordinator	Prof. Dr. Christian Langen
Scope	7.0 ECTS points, 6.0 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	Students will learn the basic concepts of computer engineering. They learn the mathematical concepts of number representation and Boolean algebra, which are required for the analysis and design of hardware circuits. They understand how the basic digital computing elements are constructed and how to combine them into complex switching networks. Furthermore, the students will be able to explain the structure and operation of current standard circuits such as adders or shift registers. Additionally, students are familiar with internal functions of typical processors. They are able to implement the hardware related software parts using the "C" programming language including the use of typical peripherals. All knowledge gained is reinforced by practical work in the laboratory.
Exams	Individual exams
Lecture Computer Engineering	
Internal number	MKIB2513
Lecturers	Prof. Dr. Christian Langen Prof. Dr. Dirk Hoffmann
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	On the processor side, the lecture will cover the following, basic processor hardware, processor architecture, addressing modes, instructions, memory mapping, peripherals and bit processing. The special features of the programming languages C / C++ needed for hardware programming will also be covered.
Recommended reading	Powerpoint slide, personal notes, web based exercises and the suggested solution (provided upon request).
Exams	Written Exam 90 Min. (graded)
Comments	The student will be required to come prepared to participate in the lecture and will be expected to be able to develop a summary upon completion of the lecture, all exercises provided for reinforcement will be required to be individual work.

Lecture Digital Technology Laboratory	
Internal number	MKIB2523
Lecturers	Prof. Dr. Albrecht Ditzinger Prof. Dr. Dirk Hoffmann
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German
Content	Lab experiments will be conducted using: - Digital Circuits - Microcontrollers - Peripherals - Timers and Counters
Recommended reading	Exercises, equipment provided and various manuals and other support material.
Exams	Exercise 1 Semester (not graded)
Comments	All laboratory work will be group work. It will include the conduct of the experiment, demonstration of the required result and be prepared to answer questions on the work and the results. Groups are on their own and are required to come to the laboratory prepared to conduct the exercise. Each group will prepare a final documentation of the exercise.

Module System Software	
Internal number	MKIB3103
Coordinator	Prof. Dr. Thomas Fuchß
Scope	9.0 ECTS points, 8.0 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	Theoretical Computer Science, Software Project, Computer Science 2, Computer Science 1
Pre-requisites according to the examination regulations	none
Competences	Having successfully completed the module, students will be able to understand and explain the functions and structures of modern operating systems and how they are embedded in various computer architectures. They will be able to use system-related knowledge to design, develop and implement performant software solutions. In addition, they are able to organize, collaborate on and successfully complete complex programming tasks in a team. They have further developed their technical, social and personal skills as well as their communication skills and self-management.
Exams	Individual exams
Lecture System Software	
Internal number	MKIB3113
Lecturer	Prof. Dr. Thomas Fuchß
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	<p>The course "System Software" covers the fundamental tasks and functionalities of modern operating systems and enables students to apply these techniques independently and systematically in teams to solve system-level development tasks. The course is divided into four main thematic areas:</p> <p>Fundamentals, Process Management, and Scheduling:</p> <ul style="list-style-type: none"> - Understanding the relationship between computer architecture and operating systems. - Principles of processor virtualization and limited direct execution. - Scheduling algorithms (e.g., Round-Robin, Shortes-Job-First). <p>File Systems and Persistence:</p> <ul style="list-style-type: none"> - Requirements and differences in HDDs and SSDs. - Structure and implementation of file systems. - Concepts of free-space management and crash consistency. <p>Memory Virtualization:</p> <ul style="list-style-type: none"> - Principles of memory segmentation and paging. - Management of page frames and allocation strategies. - Mechanisms for isolation and memory management. <p>Concurrency: Processes and Threads:</p> <ul style="list-style-type: none"> - Introduction to threads. - Synchronization mechanisms: Mutexes, semaphores, condition variables, monitors. - Patterns for parallel and concurrent programming. <p>In addition, the specific challenges of each topic are discussed, along with common strategies for addressing them. Practical exercises complement the lectures to facilitate the application of theoretical concepts to realistic scenarios.</p>
Recommended reading	<p>Slides, videos, textbooks, and other literature:</p> <ul style="list-style-type: none"> - Arpaci-Dusseau, Remzi H.; Arpaci-Dusseau, Andrea C. Operating Systems: Three Easy Pieces, (V. 1.10) Arpaci-Dusseau Books, 2023 - Tanenbaum, Andrew S.; Bos, H. Modern Operating Systems (4th Edition) – Pearson, 2014 - Stallings, W. Operating Systems: Internals and Design Principles (8th Edition) – Pearson, 2014
Exams	Written Exam 90 Min. (graded)
Comments	The lecture will take the form of seminars with exercises.
Lecture System Software Laboratory	
Internal number	MKIB3123
Lecturer	Prof. Dr. Carsten Sinz
Scope	5.0 ECTS points, 4.0 Contact hours 150 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German

Content	<p>The course is organized in three exercises, covering compiler construction and interprocess communication. Starting with a scanner, the students consolidate their skills in handling large dynamic data structures, pointers, and doing low level IO. The second exercise focuses on the development of a recursive descendent parser and a short introduction to semantic analysis and code generation. The third exercise is an introduction to the field of interprocess communication. Within the exercise, elementary techniques and concepts are trained:</p> <ul style="list-style-type: none"> - generating processes / threads - terminating processes / threads - synchronizing processes / threads
Recommended reading	<p>Slides and textbooks:</p> <ul style="list-style-type: none"> - Eduard Glatz. Betriebssysteme: Grundlagen, Konzepte, Systemprogrammierung - dpunkt.verlag, 2010 - A.V. Aho, M.S. Lam, R. Sethi und J.D. Ullman. Compiler - Prinzipien, Techniken und Werkzeuge - 2nd Edition - München: Pearson Studium, 2008. - D. Grune et. al. Modern compiler design - Wiley, 2000. - Andrew S. Tanenbaum. Betriebssysteme, Entwurf und Realisierung Teil 1 - Hanser, 1990.
Exams	Exercise 1 Semester (not graded)
Comments	Attended teamwork and three lectures.

Module Databases and Communication Networks 1	
Internal number	MKIB3203
Coordinator	Prof. Dr. Oliver Waldhorst
Scope	7.0 ECTS points, 6.0 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	Computer Science 1, Mathematics 1, Theoretical Computer Science
Pre-requisites according to the examination regulations	none
Competences	<p>The module teaches the basics and practical skills in database systems and communication networks.</p> <p>Competence objectives in the field of databases:</p> <ul style="list-style-type: none"> - Students can model, normalize and implement relational databases. - They are proficient in SQL (DDL, DML, DCL), transaction management, JDBC and OR mapping (Hibernate). - They develop database applications independently and integrate them into programming languages such as Java. - Teamwork and problem-solving skills are encouraged through practice-oriented projects. <p>Competence goals in the area of communication networks:</p> <ul style="list-style-type: none"> - Students understand the architecture and functionality of networks and analyze protocols such as HTTP, TCP, UDP, IPv4/IPv6. - They plan, configure and evaluate networks, including routing and subnetting. - They implement protocol functions and use tools for network analysis and fault diagnosis. - They are able to analyze and evaluate network performance indicators. <p>The module promotes analytical thinking, practical problem-solving skills and teamwork and provides a foundation for topics such as network security and distributed systems.</p>
Exams	Written Exam 120 Min. (graded)
Lecture Databases 1	
Internal number	MKIB3213.a
Lecturer	Prof. Dr.-Ing. Holger Vogelsang
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	<p>The lecture covers the following topics:</p> <ul style="list-style-type: none"> - Introduction to information systems - Basics of database systems - Database organization - Data models - Database schema - Architecture: 3-tier model, client-server architecture - Current SQL standard (queries, DDL, DML, in particular SQL:2003 with object-oriented extensions, NF2, window functions) - Transactions - JDBC - ER modeling - Mapping entities and relationships to relational data models - Normalization - OR mapping
Recommended reading	<ul style="list-style-type: none"> - Script - Example databases of the lecture for the common database systems - Exercises - Sample programs - Collection of old exams and their solutions - Edwin Schicker, "Datenbanken und SQL", Springer Vieweg, 2017, ISBN: 978-3834817327 - Gunter Saake, Kai-Uwe Sattler, "Datenbanken - Konzepte und Sprachen", mitp, 2013, ISBN: 978-3286694530
Exams	Module exam
Comments	
Lecture Communication Networks 1	
Internal number	MKIB3213.b
Lecturer	Prof. Dr. Oliver Waldhorst
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	Distributed systems; data transmission and communication networking techniques (circuit/packet switching); Serial / Parallel, fault detection-/protection mechanisms; service and protocol specification; flow control; negotiating qualities of service; multiplexing; time charts and finite state machines as a means of describing protocols; OSI reference model (Layers, protocols, services), protocol-stacks; the physical layer: analog and digital transmission, transmission media, STP/UDP, ISDN, xDSL; the data link layer: character and bitorientierte protocols (BSC, HDLC), Local area networks (LAN e.g.ETHERNET, Token Ring), topology, access procedures; the network layer: connection oriented and connectionless services, routing, congestion control; the transport layer: transport layer classes; RPC; socketprogramming; TCP / IP; the application system: Internet, services and protocols in the Internet environment (Telnet, FTP , SMTP, SNMP, DNS, Web, HTML / HTTP);
Recommended reading	• Word handouts • Tanenbaum: Computer Networks, Pearson Studies, 2003 (german edition) • Collection of old exams and their solutions
Exams	Module exam
Comments	Lecture supported by transparencies and Power Point Slides. Student questions are welcome. In parallel to the lecture the participants should control their knowledge using the old exams and their solutions (available on the server).
Lecture Databases 1 Laboratory	
Internal number	MKIB3223
Lecturers	M.Sc. Amir Bukhari Prof. Dr.-Ing. Holger Vogelsang
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German
Content	A database application for a flight reservation system is designed and prototypically implemented. This includes setting up a DB scheme, the design and testing of SQL queries, the use of transactions and transaction levels, as well as programming a seat reservation transaction with Java, JDBC and SQLJ-based on Oracle.
Recommended reading	Sample database, JUnit test cases, test-GUI; Textbooks: - "Grundlagen von Datenbanksystemen", Ausgabe Grundstudium (Taschenbuch) von Ramez Elmasri, Shamkant B. Navathe, Pearson, 2005, ISBN: 3827371538 - "Datenbanksysteme" von Alfons Kemper, Andre Eickler, Oldenbourg, 2006, ISBN: 3486576909 - "Datenbanken & Java. JDBC, SQLJ, ODMG und JDO" von Gunter Saake, Kai-Uwe Sattler, Dpunkt Verlag, 2003, ISBN: 3898642283
Exams	Laboratory Work 1 Semester (not graded)

Comments	Supervised laboratory with final presentation on the computer, self-work, preparation and after working of lab sessions, prepare a report of the laboratory tasks.
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Module Man-Machine-Communication 1	
Internal number	MKIB3303
Coordinator	Prof. Dr. Ulrich Bröckl
Scope	5.0 ECTS points, 3.0 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	Computer Science 1
Pre-requisites according to the examination regulations	none
Competences	<p>The courses of this module teach the students fundamental programming and algorithmic skills. The students should be enabled to analyze small problems, find solutions to these problems, and develop them in the Java programming language.</p> <p>By means of periodic evening events they get basic understanding of association work, concretely the work of the Usability Professionals' Association (UPA).</p>
Exams	Individual exams
Lecture Man-Machine-Communication	
Internal number	MKIB3313
Lecturer	Prof. Dr. Ulrich Bröckl
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	- "GUI Design Essentials " von Susan Weinschenk, Pamela Jamar, Sarah C. Yeo, Verlag John Wiley & Sons, 1997, ISBN: 0471175498
Exams	Written/verbal Exam 20 Min. (graded)
Comments	
Lecture Man-Machine-Communication Design	
Internal number	MKIB3323
Lecturer	B.Sc. Valeria Zitz
Scope	3.0 ECTS points, 1.0 Contact hours 90 Stunden gesamt, davon 15 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	An MMC-task which is standard practice is designed starting from task analysis up to the paper prototype. This prototype is subject - possibly over several iterations - of a usability test until the specified quality targets are reached.

Recommended reading	Script, eye-tracker and user monitoring space in the Usability Lab Textbooks: - "GUI Design Essentials " von Susan Weinschenk, Pamela Jamar, Sarah C. Yeo, Verlag John Wiley & Sons, 1997, ISBN: 0471175498
Exams	Homework 1 Semester (not graded)
Comments	Supervised group work with presentation and discussion; test the usability of the prototype, prepare a test report with proposals for improvements.

Module Media Project	
Internal number	MKIB3403
Coordinator	Prof. Thomas Hinz
Scope	5.0 ECTS points, 5.0 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	
Exams	Individual exams
Lecture Media Project	
Internal number	MKIB3413
Lecturer	Prof. Thomas Hinz
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Concept 1 Semester (graded)
Comments	
Lecture Media Project Exercise	
Internal number	MKIB3423
Lecturer	Prof. Thomas Hinz
Scope	3.0 ECTS points, 3.0 Contact hours 90 Stunden gesamt, davon 45 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	
Recommended reading	
Exams	Exercise 1 Semester (not graded)
Comments	

Module Business Administration and Service Management	
Internal number	MKIB3503
Coordinator	Prof. Dr. Uwe Haneke
Scope	6.0 ECTS points, 6.0 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	
Exams	Written Exam 120 Min. (graded)
Lecture Business Administration	
Internal number	MKIB3513.a
Lecturer	Prof. Dr. Uwe Haneke
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	<p>Students are introduced to the fundamental concepts of general business administration. They learn about economic processes and interrelationships and become familiar with typical processes and requirements within companies. They are able to identify and outline the various areas of business administration.</p> <p>Using different tools and concepts, students can describe and analyze a company's situation.</p> <p>In addition, students are equipped to independently calculate and analyze key performance indicators that provide insights into a company's efficiency and effectiveness.</p> <p>In the Business Administration lecture, topics such as the economic environment (economics), business structures, organization, investment and financing, marketing, and accounting are covered in depth. This enables students to gain a comprehensive understanding of how a company operates and the resulting requirements.</p>
Recommended reading	<ul style="list-style-type: none"> - Slides - Case studies - Exercises
Exams	Module exam
Comments	
Lecture IT Service Management	
Internal number	MKIB3513.b
Lecturer	Prof. Dr. rer. pol. Mathias Philipp

Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	<p>The lecture covers the core processes of IT service management as well as methods for systematic planning, provision and support of IT services. For each process, the objectives, tasks, demarcation, mode of operation and the dependencies on the other processes are worked out. The students thus acquire the competence to know the relevant technical terms and to apply them in practical situations.</p> <p>The necessary roles and responsibilities are learned. The students understand how IT processes are represented in reference models. The lecture is based on the IT Infrastructure Library (ITIL), which is a generally accepted standard for the structure and operation of IT organizations.</p>
Recommended reading	<p>Lecture material as PowerPoint slides</p> <p>Blackboard notes for interactive development of core problems</p> <p>Numerous multiple-choice questions on each process in ILIAS</p>
Exams	Module exam
Comments	

Module Internship Preparation and Roundup	
Internal number	MKIB4P03
Coordinator	Prof. Dr. Heiko Körner
Scope	6.0 ECTS points, 4.0 Contact hours
Placement	4th Semester
Pre-requisites with regard to content	Computer Science 1
Pre-requisites according to the examination regulations	Vorstudium
Competences	After completing this module, students will be able to handle important work-related skills that are also relevant for the practical semester. They can use the Scrum process model to manage projects and work in corresponding Scrum teams. They master techniques for the professional creation of scientific documents, can prepare data in a targeted manner and visualise their findings in an appealing way using modern presentation tools.
Exams	Individual exams
Lecture Internship Preparation	
Internal number	MKIB4P13
Lecturers	Dr. Martin Holzer B.Sc. Veit Richter
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	This course deals with the general handling of MS Office products and gives specifically an introduction to the main functions of MS-Excel. Topics include input methods, formulas, chart depictions and search functions. Basic knowledge about the programming in VBA are also taught. These methods will also be used for macro skripts in MS-Word. Afterwards, the students have learned how to solve typicals problems efficiently with these today's standard programs.
Recommended reading	Exercises, programs with solutions and online documentation.
Exams	Exercise 1 Week (not graded)
Comments	Practical assignment in a computer laboratory.
Lecture Internship Roundup	
Internal number	MKIB4P23
Lecturers	Dipl. Wilnf. Lars Thoralf Thielemann Prof. Dr. Heiko Körner
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture

Language of instruction	German
Content	<p>This lecture deals with the general handling of MS Office products and specifically provides an introduction to the most important functionalities of MS Excel. Students learn, for example, how to use input methods, formulae, diagrams and search functions. Basic knowledge of programming under VBA is also taught. These are then used to create macro scripts in MS Word.</p> <p>The focus is on the efficient use of MS Office products. Participating students are then able to quickly solve typical tasks.</p>
Recommended reading	Lecture notes
Exams	Exercise 1 Week (not graded)
Comments	The course consists of a lecture (50%) and supervised practical exercises (50%).

Module Internship	
Internal number	MKIB4PX3
Coordinator	Dr. Patrick Baier
Scope	24.0 ECTS points, 0.0 Contact hours
Placement	4th Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	Vorstudium
Competences	The internship is designed to deepen the previously acquired knowledge and skills by qualified collaboration in a larger project. The focus is on improving the technical competence and the development of social and personal skills. The student needs to assert himself as an independent member of the team. He becomes acquainted with new fields of duty and will become familiar with new tools. He learns to evolve himself and to assess his skills. The internship may be pursued in a company, in a research facility or an authority.
Exams	Individual exams
Lecture Internship	
Internal number	MKIB4PX13
Lecturer	Dr. Patrick Baier
Scope	24.0 ECTS points, 0.0 Contact hours 720 Stunden gesamt, davon 0 Stunden Kontaktstudium.
Type/mode	On-the-job Training
Language of instruction	German
Content	
Recommended reading	
Exams	Hands-on Work 95 Days (not graded)
Comments	

Module Software Engineering and Distributed Systems 2	
Internal number	MKIB5103
Coordinator	Prof. Dr. Thomas Fuchß
Scope	8.0 ECTS points, 7.0 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	Databases and Communication Networks 1, Computer Science 2, Man-Machine-Communication 1, Internship, Technologies of the Internet
Pre-requisites according to the examination regulations	none
Competences	<p>The students learn how to work independently and productively in large software projects. This includes the decomposing of development tasks as well as the determination and assessment of appropriate architectures. They are able to capture the necessary steps in the context of a given task, to structure and clarify their decisions using suitable tools and methodologies, independently.</p> <p>In this context, the students also gain the ability to recognize and classify goals and problems of distributed software systems. They can explain the general concepts of architectures, processes, communication, naming, coordination, replication fault tolerance and security, and apply them to the construction of distributed software services and applications.</p>
Exams	Written Exam 120 Min. (graded)
Lecture Software Engineering	
Internal number	MKIB5113.a
Lecturer	Prof. Dr. Thomas Fuchß
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	<p>The course "Software Engineering" builds on the practical experience students have gained during their internships and introduces techniques and methods for structured large-scale software development. The lecture begins with a review and consolidation of fundamental concepts such as objects, classes, associations, methods, inheritance, and polymorphism to ensure a solid understanding of the basics. It then focuses on the challenges of modern software development processes and structured approaches to address them effectively.</p> <p>Students learn how to integrate agile methodologies, such as Scrum, with established process models like the Unified Software Development Process to manage complex software projects. UML is introduced as a core modeling language to document development decisions and facilitate clear communication. Particular emphasis is placed on understanding the complexities of large-scale systems and applying structured methods and processes to address these challenges.</p> <p>Throughout the course, students develop the ability to work independently in agile environments, make informed development decisions, and document these decisions methodically. Theoretical concepts are complemented by practical examples that help bridge the gap between theory and real-world applications.</p> <p>In the associated lab, students apply the knowledge gained in the lecture to various example projects. They conduct the first iteration of a software development process, practicing teamwork, the use of agile methods, and professional documentation with UML.</p>
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Recommended reading	<p>Slides, videos, textbooks, and other literature:</p> <ul style="list-style-type: none"> - Arlow, J.; Neustadt, I.: UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design, 2. ed. - Addison-Wesley Professional, 2005. - Shimp, D. and Rawsthorne, D. Exploring Scrum: The Fundamentals – CreateSpace, 2011. - Jacobson, I.; Booch, G. and Rumbaugh, J.: The unified software development process - Reading, Mass.: Addison-Wesley, 1999. - Kim, G.; Humble, J.; Debois, P. und Willis, J.: Das DevOps-Handbuch: Teams, Tools und Infrastrukturen erfolgreich umgestalten - Heidelberg: O'Reilly; Heidelberg: dpunkt.verlag, 2017. - Larman, C.: Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, 3. ed. - Upper Saddle River, NJ : Prentice Hall, 2004. - Larman, C. und Vodde, B.: Large-Scale Scrum: Scrum erfolgreich skalieren mit LeSS - Heidelberg: dpunkt.verlag, 2017. - Oestereich, B.: Developing Software with UML: Object-Oriented Analysis and Design in Practice 2. ed. - Addison-Wesley Professional, 2003. - Oestereich, B.: Analyse und Design mit UML 2.1: Objektorientierte Softwareentwicklung, 8. ed. - München; Wien : Oldenbourg, 2006 - OMG Object Management Group. Unified Modeling Language (OMG UML) Version 2.5.1 – OMG, 2017. - Seidl, M.; Scholz, M. and Huemer, C.: UML @ Classroom: An Introduction to Object-Oriented Modeling, Springer, 2015. - Schwaber, K. and Sutherland, J. The Scrum Guide: The Definitive Guide to Scrum – Scrumguides.org, 2020. - Sommerville, I.: Software Engineering, 10. Auflage - Pearson, 2018. - Wintersteiger, A.: Scrum: Schnelleinstieg, 4. Auflage - Frankfurt am Main: entwickler.press, 2018.
Exams	Module exam
Comments	The lecture will take the form of seminars with exercises.
Lecture Distributed Systems 2	
Internal number	MKIB5113.b
Lecturer	Prof. Dr. Christian Zirpins
Scope	3.0 ECTS points, 3.0 Contact hours 90 Stunden gesamt, davon 45 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	<p>The lecture conveys both fundamental and extended principles of distributed systems and illustrates these in practical form on the basis of concrete paradigms and technologies. The spectrum of principles covered includes fundamental aspects of the objectives and classes of distributed systems, as well as their architectures, processes, communications, and naming. Advanced principles include coordination, consistency and replication, fault tolerance and security. The covered principles are exemplified by various paradigms. Here, exemplary implementations of individual principles are presented. In addition, an introduction to the development of corresponding systems based on concrete software technologies is given.</p> <p>Upon completing this lecture class, students will achieve a comprehensive understanding of the principles underlying distributed systems, ranging from their fundamental objectives and architectures to advanced concepts such as coordination, consistency, replication, fault tolerance, and security. They will gain insights into the practical application of these principles through the examination of specific paradigms and technologies, enhancing their ability to analyze and design distributed systems. Moreover, the introduction to developing these systems using concrete software technologies will equip students with the practical skills necessary for implementing robust, efficient, and secure distributed systems in various computing environments.</p>
Recommended reading	<ul style="list-style-type: none"> - Andrew S. Tannenbaum, Marten van Steen, "Verteilte Systeme, Prinzipien und Paradigmen", 2. aktualisierte Auflage, Pearson Studium, 2008, ISBN 978-3-8273-7293-2 - George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, "Distributed Systems, Concepts and Design", Fifth Edition, Addison-Wesley, 2012, ISBN 978-0-13-214301-1 - Additional literature will be announced during the lecture
Exams	Module exam
Comments	Autonomous work includes pre- and post processing of lectures, exercises and exam preparation.
Lecture Softwareengineering Laboratory	
Internal number	MKIB5123
Lecturer	Prof. Dr. Thomas Fuchß
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German

Content	<p>In the Software Engineering Lab, students complete a full iterative software development process within a team. Starting with requirements analysis, they develop an analysis and design model and implement it in Java. Along the way, they actively engage with concepts such as use-case-driven development, architecture orientation, iterative and incremental approaches, and component-based software design.</p> <p>Through a concrete example project, students experience the practical application of these methods and learn to make independent design decisions while adhering to given requirements. The lab emphasizes teamwork and independent problem-solving, preparing participants to work effectively in agile development teams and address the challenges of complex software projects.</p>
Recommended reading	<p>Slides, videos, textbooks, and other literature:</p> <ul style="list-style-type: none"> - Arlow, J.; Neustadt, I.: UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design, 2. ed. - Addison-Wesley Professional, 2005. - Shimp, D. and Rawsthorne, D. Exploring Scrum: The Fundamentals – CreateSpace, 2011. - Jacobson, I.; Booch, G. and Rumbaugh, J.: The unified software development process - Reading, Mass.: Addison-Wesley, 1999. - Kim, G.; Humble, J.; Debois, P. und Willis, J.: Das DevOps-Handbuch: Teams, Tools und Infrastrukturen erfolgreich umgestalten - Heidelberg: O'Reilly; Heidelberg: dpunkt.verlag, 2017. - Larman, C.: Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, 3. ed. - Upper Saddle River, NJ : Prentice Hall, 2004. - Larman, C. und Vodde, B.: Large-Scale Scrum: Scrum erfolgreich skalieren mit LeSS - Heidelberg: dpunkt.verlag, 2017. - Oestereich, B.: Developing Software with UML: Object-Oriented Analysis and Design in Practice 2. ed. - Addison-Wesley Professional, 2003. - Oestereich, B.: Analyse und Design mit UML 2.1: Objektorientierte Softwareentwicklung, 8. ed. - München; Wien : Oldenbourg, 2006 - OMG Object Management Group. Unified Modeling Language (OMG UML) Version 2.5.1 – OMG, 2017. - Seidl, M.; Scholz, M. and Huemer, C.: UML @ Classroom: An Introduction to Object-Oriented Modeling, Springer, 2015. - Schwaber, K. and Sutherland, J. The Scrum Guide: The Definitive Guide to Scrum – Scrumguides.org, 2020. - Sommerville, I.: Software Engineering, 10. Auflage - Pearson, 2018. - Wintersteiger, A.: Scrum: Schnelleinstieg, 4. Auflage - Frankfurt am Main: entwickler.press, 2018.
Exams	Exercise 1 Semester (not graded)
Comments	Attended teamwork

Module Databases and Communication Networks 2	
Internal number	MKIB5203
Coordinator	Prof. Dr. Zoltán Nochta
Scope	5.0 ECTS points, 4.0 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	Databases and Communication Networks 1
Pre-requisites according to the examination regulations	none
Competences	
Exams	Written Exam 120 Min. (graded)
Lecture Databases 2	
Internal number	MKIB5213.a
Lecturer	Prof. Dr. Zoltán Nochta
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	- "Datenbanksysteme" von Alfons Kemper, Andre Eickler - "Database Solutions" von Thomas Connolly, Carolyn Begg
Exams	Module exam
Comments	
Lecture Communication Networks 2	
Internal number	MKIB5213.b
Lecturer	Prof. Dr. Oliver Waldhorst
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	<p>In this course, students expand their knowledge of communication networks, in particular by taking an in-depth look at the functionalities and challenges of the layers of the Internet protocol stack. After completing the course, they will be able to analyze, evaluate and practically apply advanced mechanisms and protocols in the application layer, transport layer, network layer and security layer. They will be able to identify complex network problems, combine specific solution modules and develop innovative solutions.</p> <p>The lecture covers the following topics:</p> <ul style="list-style-type: none"> - Transmission of multimedia content in the application layer, e.g. Netflix and Skype, as well as the basics of secure communication such as TLS and secure email. - Transport layer mechanisms, including extensions to TCP such as SACK and CUBIC, as well as new protocols such as QUIC. - Network layer with addressing and routing concepts, including IPv6, Software Defined Networking (SDN) and IPsec. - Data link layer with a focus on VLANs, MPLS and data center networks. <p>The lecture is taught in a flipped classroom format. Students prepare for the classroom sessions independently using lecture slides and explanatory videos. In these sessions, the topics are explored in greater depth through case studies and exercises. Online tests offer students the opportunity for self-assessment and to collect bonus points for the exam. The examination consists of a 60-minute written exam, which is part of the module exam "Databases and Communication Networks 2".</p> <p>The total workload is 75 hours, divided into 25 hours of attendance time, 25 hours of asynchronous learning and 25 hours for exam preparation and follow-up.</p>
Recommended reading	<ul style="list-style-type: none"> - Slide collection and explanatory videos in the ILIAS system - James Kurose, Keith Ross: Computer Networking - A Top-Down Approach, 8th edition, Pearson, 2021 - Various Internet standards, see https://www.rfc-editor.org - Further information in the lecture
Exams	Module exam
Comments	

Module Computer Graphics abd Computer Vision	
Internal number	MKIB5303
Coordinator	Prof. Dr. Peter Henning
Scope	7.0 ECTS points, 5.0 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	Computer Science 1, Computer Science 2, Technologies of the Internet
Pre-requisites according to the examination regulations	none
Competences	
Exams	Written Exam 120 Min. (graded)
Lecture Computer Graphics	
Internal number	MKIB5313.a
Lecturer	Prof. Dr. Peter Henning
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	Henning, Taschenbuch Multimedia.
Exams	Module exam
Comments	
Lecture Computer Vision	
Internal number	MKIB5313.b
Lecturer	Prof. Dr.-Ing. Astrid Laubenheimer
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Module exam
Comments	
Lecture Computer Graphics Laboratory	
Internal number	MKIB5323
Lecturer	Prof. Dr. Peter Henning
Scope	3.0 ECTS points, 1.0 Contact hours 90 Stunden gesamt, davon 15 Stunden Kontaktstudium.

Type/mode	Laboratory Course
Language of instruction	German
Content	Graphical primitives, polygonalmodels, transformations. Coloring, lighting and textures. Animation through sensors and interpolators. Elements of OpenGL: Vertices, polygons, transformation matrices. Lighting and textures
Recommended reading	Material from the lecture
Exams	Exercise 1 Semester (not graded)
Comments	Presence required, solution of lab problems

Module Student Research Project	
Internal number	MKIB5403
Coordinator	Prof. Dr. Heiko Körner
Scope	6.0 ECTS points, 4.0 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	Students will be able to independently apply the knowledge they have acquired in their previous studies to a complete task. They can analyse the problem, create a solution concept, find an implementation and implement it on their own. They can also write down their results observing scientific standards. They can also present their work in a short presentation and defend it in a subsequent discussion.
Exams	Individual exams
Lecture Student Research Projekt	
Internal number	MKIB5413
Lecturer	Alle Dozenten
Scope	5.0 ECTS points, 4.0 Contact hours 150 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Hands-on Experience
Language of instruction	German
Content	A student research project deals with a topic in the field of software or hardware. The aim is to carry out a practical task, but work in the areas of evaluation or literature research is also possible. Students analyse the task and research which tools are best suited to solve it. They then use these accordingly. Comprehensive documentation must be prepared for the project work, covering all steps of the task and its completion (e.g. the exact problem definition, the concept, the implementation, operating instructions and more). A joint colloquium concludes the project work. The students show their results in a short presentation and then take part in a discussion. The project work is thus a preparation for the later final thesis, which the students will write according to very similar guidelines.
Recommended reading	Depending on the task
Exams	Homework 1 Semester (not graded)
Comments	
Lecture Student Research Projekt Colloquium	
Internal number	MKIB5423
Lecturer	Alle Dozenten

Scope	1.0 ECTS points, 0.0 Contact hours 30 Stunden gesamt, davon 0 Stunden Kontaktstudium.
Type/mode	Hands-on Experience
Language of instruction	German
Content	The colloquium marks the conclusion of the project work. Students present their results in a short presentation and then take part in a discussion. In doing so, they demonstrate that they are able to explain and defend the problem, the realisation of the work and the solution found in a short, concise form.
Recommended reading	
Exams	Verbal Exam 20 Min. (graded)
Comments	All work will be individual work and will include the presentation, discussion, defense of the work.

Module Elective courses 1	
Internal number	MKIB5503
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	4.0 ECTS points, 4.0 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	The compulsory elective subjects enable students to set specialisations according to their own interests and thus apply further specialist areas of computer science or media informatics. The courses belonging to the module are announced on the intranet at the beginning of each semester.
Exams	Individual exams
Lecture Advanced Topics in Computer Science	
Internal number	I W156
Lecturer	Prof. Dr. Martin Sulzmann
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	English
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Business Intelligence	
Internal number	I W179
Lecturer	Prof. Dr. Uwe Haneke
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	<ul style="list-style-type: none"> - Introduction and business-management background - The concept of data warehousing - Business Analytics and Balanced Scorecard (BSC) - CRM and Data Mining - Trends in Business Intelligence-Case studies
Recommended reading	
Exams	Written Exam 90 Min. (graded)

Comments	
Lecture Parallel Systems	
Internal number	I W391
Lecturer	Prof. Dr. Christian Langen
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture IT-Security Management	
Internal number	I W394
Lecturer	Prof. Dr. rer. pol. Mathias Philipp
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Projective geometry	
Internal number	I W501
Lecturer	Prof. Dr. Frank Schaefer
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written/verbal Exam 90/20 Min. (graded)
Comments	
Lecture Philosophy and theory of computer science	
Internal number	I W502
Lecturer	Prof. Dr. Thomas Morgenstern

Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Presentation 20 Min. (graded)
Comments	

Lecture Methods in User Research „Empathic-pragmatic“

Internal number	I W503
Lecturer	Dipl.Design. Heike Biscosi
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	<p>User Research - methods all around fictitious and real users, to to establish a "human centered approach" in projects.</p> <p>Teaching contents are methods which contribute to a better understanding of people and their usage contexts, to improve the development, design and evaluation of interactive products and systems.</p> <p>Following topics - in theory and praxis - will be part of the seminar:</p> <ul style="list-style-type: none"> - Creative and qualitative research methods, such as target group analysis, mental models, persona design, persona-moodboard, job stories, cultural probes, user diaries, focus groups, interviews, scenarios and storyboards, user journeys, acceptance and usability testings. - Basic principles of different quantitative methods: survey and questionnaire design, descriptive statistics, laboratory-based studies, experimental studies. - Evaluation of quantitative methods, as described in research reports.
Recommended reading	<ul style="list-style-type: none"> - Lecture notes, - Case studies from practice, - further literature references will be given in the lecture.
Exams	Homework 1 Semester (graded)
Comments	Seminaristic lecture with practical exercises.

Lecture ERP Systems with Laboratory

Internal number	I W551
Lecturer	Prof. Dr. rer. pol. Mathias Philipp
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	Contents: ERP basics, system integration, system architectures, and logistics: Distribution (SD), Materials Management (MM), Production Planning and Control (PP) as well as Financial Accounting (FI) and Controlling (CO). In addition, an overview is given to the software selection.
Recommended reading	Recommended reading: Lecture material completely as PowerPoint documents, blackboard notes for interactive development of central problem positions, a main textbook to ERP, a main textbook to SAP ECC 6.0.
Exams	Written Exam 90 Min. (graded)
Comments	Kind of work: Lecture participation
Lecture Mathematics for Machine Learning	
Internal number	I W610
Lecturers	Prof. Dr.-Ing. Astrid Laubenheimer M.Sc. Ahmad Assani
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written/verbal Exam 90/20 Min. (graded)
Comments	
Lecture Game Programming	
Internal number	I W620
Lecturer	Prof. Dr. Peter Henning
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	English
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Computer Vision Laboratory	
Internal number	I W773
Lecturer	Prof. Dr.-Ing. Astrid Laubenheimer
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German
Content	

Recommended reading	
Exams	Laboratory Work 1 Semester (graded)
Comments	
Lecture App Programming	
Internal number	I W912
Lecturer	M.Sc. Adrian Wörle
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	The lecture teaches the construction of mobile media applications. The main concepts are discussed using the Android platform. In a first part, the basic technologies and limitations of mobile devices are shown. The second part examines different development strategies like native applications, device independent abstractions and web applications. A main part of the lecture is the integration of different media types into mobile applications and the constraints the developer has to keep in mind.
Recommended reading	will be announced
Exams	Written Exam 90 Min. (graded)
Comments	Lecture with exercise
Lecture Cloud Computing	
Internal number	I W913
Lecturers	Dipl. Inform. (FH) Michael Fischer Dipl. Inform. (FH) Georg Magschok
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	The buzzword "Cloud" represents a variety of interesting technologies which gained importance in the life of a computer science professional. Those are being collected, examined, explained and understood during the course. Primary objective is usefulness for the student, regardless of whether he acts as a cloud user, developer, administrator or even entrepreneur. Understand the broad meaning of "Cloud Computing" from a variety of perspectives: Definition, use cases, technology basics, key players, APIs, scaling, redundancy ...
Recommended reading	Powerpoint slides
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Affective Computing	
Internal number	I W924

Lecturers	Prof. Thomas Hinz M.Sc. Bernd Dudzik
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	Emotional expressions are important signals for people to make sense of situations, actions and relationships in their social interactions with each other. Is the empowerment of technological systems with the capacity to also sense and express emotions able to improve their users' interactions with them? This question is the driving force behind the field of Affective Computing. The students know different theories of emotions, contrast them with each other and debate them. They apply the acquired knowledge by addressing problems from within the primary areas of application for Affective Computing through the development of prototypical interactive systems that are capable of sensing or expressing emotions.
Recommended reading	Lecture notes, case studies.
Exams	Homework 1 Semester (graded)
Comments	
Lecture Video	
Internal number	I W925
Lecturers	Marc Steinmetz Prof. Thomas Hinz
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Homework 1 Semester (graded)
Comments	
Lecture Big Data Engineering	
Internal number	I W926
Lecturer	Prof. Dr. Christian Zirpins
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	<p>The lecture Big Data Engineering addresses the systematic construction of data-intensive systems. Generic architectural approaches are introduced in order to design robust, performant and scalable data systems for various applications. For different architectural areas various kinds of data storage and processing models are discussed. Topics include, among others, distributed file systems, serialization, batch and stream processing with MapReduce and other programming models, queuing mechanisms and NoSQL databases. These are both conceptually described as well as implemented by means of exemplary tools and techniques. The focus is on established industry standards such as Apache Thrift, Hadoop, Kafka, Cassandra, Storm. These are illustrated by means of an exemplary Web Analytics application.</p> <p>During the course students acquire, among others, the following abilities:</p> <ul style="list-style-type: none"> - They evaluate different approaches of data systems for given application problems with specific requirements. - They describe structure and function of specific architectural approaches for Big Data systems. - They categorize tools and techniques for Big Data systems and utilize them professionally. - They design architecture and data models as well as processing logic and queries for given Big Data applications and implement these based on specific open source tools and techniques.
Recommended reading	<ul style="list-style-type: none"> - Nathan Marz, James Warren, "Big Data: Principles and best practices of scalable realtime data systems", Manning, 2015, ISBN: 1-617290-34-3 - Martin Kleppmann, "Designing Data-Intensive Applications", O'Reilly, 2014 (Early Release), ISBN: 978-1-4493-7332-0 - Tom White, "Hadoop: the definitive guide: storage and analysis at internet scale", 4. ed., O'Reilly, 2015, ISBN: 978-1-491-90163-2 - Michael Frampton, "Big Data Made Easy: A Working Guide to the Complete Hadoop Toolset", Apress, 2015, ISBN: 978-148-420-094-0 - Vivek Mishra, "Beginning Apache Cassandra Development", Apress, 2014, ISBN: 978-148-420-142-8 - Additional literature will be announced during the lecture
Exams	Written Exam 90 Min. (graded)
Comments	Independent work relates to the preparation and followup of lectures, laboratory exercises and exam preparation.
Lecture Digital Transformation & digital marketing	
Internal number	I W929
Lecturers	Prof. Thomas Hinz Marc Steinmetz
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	

Recommended reading	
Exams	Homework 1 Semester (graded)
Comments	
Lecture Empatically pragmatic	
Internal number	I Wxxx
Lecturers	Dipl.Design. Heike Biscosi Prof. Thomas Hinz
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Verbal Exam/Concept 20 Min. (graded)
Comments	

Module Embedded Software	
Internal number	MKIB6103
Coordinator	Prof. Dr. Dirk Hoffmann
Scope	5.0 ECTS points, 4.0 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Computer Science 1, Computer Science 2, Computer Engineering
Pre-requisites according to the examination regulations	Modul Internship
Competences	The lectures in this module impart advanced knowledge in the field of embedded systems. Students know the basic terms in the field of embedded systems and are able to differentiate between different types of real-time systems. With CAN bus, the students have become familiar with a typical communication medium and with CDMA technology, an important coding used, for example, in satellite communication. Students are able to implement typical programming tasks in the field of embedded systems in the C language. During the course, students learn how to use software tools that can be used to measure and optimize the program runtime of the software created.
Exams	Individual exams
Lecture Embedded Software	
Internal number	MKI3B611
Lecturer	Prof. Dr. Dirk Hoffmann
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	Students will be able to understand the fundamental concepts of software development for embedded real-time systems. In the context of this lecture, embedded systems are all computers controlled by software that are part of a larger system and whose primary function is not computing. Real-time systems also involve aspects of temporal behavior, i.e., they are systems that not only have to provide a correct answer, but also have to calculate the system answer within a predetermined and guaranteed period of time. In detail, topics from the following areas are covered: design and architecture of automotive control units, fundamentals of real-time programming, coding for data transmission, embedded C. The participants of the lecture apply their knowledge on the basis of exercises.
Recommended reading	Slides, blackboard, exercise sheets
Exams	Written Exam 90 Min. (graded)
Comments	Lecture
Lecture Embedded Software Laboratory	

Internal number	MKIB6123
Lecturer	Prof. Dr. Dirk Hoffmann
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German
Content	Students will be able to develop typical algorithms used in embedded systems in the C++ programming language. Students will develop a prototypical CDMA decoder that is able to extract the bits sent by GPS satellites from a composite signal.
Recommended reading	Software and hardware tools für designing automative ECUs
Exams	Exercise 1 Semester (not graded)
Comments	Practical work

Module Man-Machine-Communication 2	
Internal number	MKIB6203
Coordinator	Prof. Dr. Matthias Wölfel
Scope	4.0 ECTS points, 4.0 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Computer Graphics and Computer Vision, Computer Science 1, Computer Science 2, Media Design, Media Project, Man-Machine-Communication 1, Software Engineering and Distributed Systems 2, Software Project
Pre-requisites according to the examination regulations	Modul Internship
Competences	This module integrates different media technologies. The students will be able to write user interfaces for rich fat clients and mobile media applications. They learn how computer vision works and how computer vision is used in media applications.
Exams	Individual exams
Lecture Graphical User Interfaces	
Internal number	MKIB6213
Lecturer	Prof. Dr. Matthias Wölfel
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	The lecture first deals with SWT/JFace and the Eclipse Rich Client Platform 4 (RCP), which uses SWT and JFace as its basis. The most important topics are the model-view-controller pattern, layout management and event handling using the observer pattern. Based upon this techniques advanced technologies like the separation of business logic and user interface code using data binding and dialog control are presented. Other topics are internationalization and multithreading in the context of user interfaces. The last part of the lecture shows the declarative construction of user interfaces and the application of the RCP framework.

Recommended reading	Books and Web sites: - Marc Teufel, "Eclipse 4", entwickler.press, Oktober 2012 - Lars Vogel, "Eclipse 4 Application Development", Mai 2012 - M. Marinilli, "Professional Java User Interfaces", Wiley & Sons, 2006 - R. Warner, R. Harris, "The Definite Guide to SWT and JFace", Apress, 2007 - M. Scarpino et.al., "SWT/JFace in Action", Manning Publications Co., 2005 - J. McAffer, J. M. Lemieux, "Eclipse Rich Client Platform", Addison-Wesley Longman (Pearson Education), 2010 - G. Wütherich, N. Hartmann, B. Kolb, M. Lübken, "Die OSGi Service Platform", dpunkt-Verlag, 2008 - http://www.ralfebert.de/rcpbuch/ - http://www.eclipse.org/swt/ - http://www.eclipse.org/articles/Article-UI-Guidelines/Index.html - http://www.eclipse.org/swt/snippets/ - http://wiki.eclipse.org/index.php/JFaceSnippets - http://www.java2s.com/
Exams	Written Exam 90 Min. (graded)
Comments	Lecture preparation, exam preparation, implementing the bonus exercise, 30% of the lecture is held as a computer exercise
Lecture App-Programming	
Internal number	MKIB6223
Lecturer	Prof. Dr. Matthias Wölfel
Scope	1.0 ECTS points, 2.0 Contact hours 30 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	The lecture teaches the construction of mobile media applications. The main concepts are discussed using the Android platform. In a first part, the basic technologies and limitations of mobile devices are shown. The second part examines different development strategies like native applications, device independent abstractions and web applications. A main part of the lecture is the integration of different media types into mobile applications and the constraints the developer has to keep in mind.
Recommended reading	will be announced
Exams	Module exam
Comments	Lecture with exercise

Module Communication Competence	
Internal number	MKIB6303
Coordinator	Prof. Dr. rer. pol. Mathias Philipp
Scope	7.0 ECTS points, 5.0 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Internship
Pre-requisites according to the examination regulations	Modul Internship
Competences	The student should learn how a common, computer science-related content will be refurbished for a specific group of audiants. Additionnally he should have learned how to give his presentation and defend it.
Exams	Individual exams
Lecture Seminar	
Internal number	MKIB6313
Lecturer	Alle Dozenten
Scope	6.0 ECTS points, 5.0 Contact hours 180 Stunden gesamt, davon 75 Stunden Kontaktstudium.
Type/mode	Seminar
Language of instruction	German
Content	Each participant of the seminar creates under the guidance of a supervising faculty staff a written report in housework. The contents of the report should be computer science related. Based on the report suitable presentation techniques (slides, video sequences, programmed examples) are selected. Each participant individually presents his report followed by a discussion. The seminar topics are classified into thematic groups. Besides the technical problem the student has to learn how to do 'self-marketing'. The assessment of the student is based on the following criteria: degree of difficulty, quality of written preparation; didactically skillful presentation.
Recommended reading	Depends on the topic
Exams	Homework 1 Semester (not graded)
Comments	Meetings with the faculty supervisor; eventually experimental studies, literature refurbishment; presenting the work-out; defend the own presentation; active participation in discussing the presentations of others.
Lecture Presentation	
Internal number	MKIB6323
Lecturer	Alle Dozenten
Scope	1.0 ECTS points, 0.0 Contact hours 30 Stunden gesamt, davon 0 Stunden Kontaktstudium.
Type/mode	Seminar

Language of instruction	German
Content	
Recommended reading	
Exams	Verbal Exam 20 Min. (graded)
Comments	

Module Key Qualification	
Internal number	MKIB6403
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	6.0 ECTS points, 6.0 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Language Competence
Pre-requisites according to the examination regulations	Modul Internship
Competences	<p>On successful completion of the module, students will be able to</p> <ul style="list-style-type: none"> - behave appropriately towards people from other cultures in relation to the increasing globalisation of their work, - understand statements made by these people, - understand simple legal issues and contracts, - present the results of their own work in the form of a specialised presentation.
Exams	Individual exams
Lecture Intercultural Communication	
Internal number	MKIB6413
Lecturer	Prof. Dr. Andrea Cnyrim
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	English
Content	<p>Participants learn to understand intercultural competence as a strategic competitive factor and to organise their own actions in a culturally appropriate way:</p> <ul style="list-style-type: none"> - Key aspects of intercultural communication (e.g. culturally determined norms, behaviours, values, verbal and non-verbal communication) with particular emphasis on differences between fact-oriented cultures such as Germany and relationship-oriented cultures such as China and India - Influence of different cultural standards on international business relationships (e.g. business initiation, negotiations, employee management, decision-making, conflict resolution, etc.) - Empirical studies (e.g. Geert Hofstede, Fons Trompenaars etc.) - Case studies from different cultural areas (e.g. Germany, France, USA, Japan, China, India, etc.).
Recommended reading	
Exams	Exercise 1 Semester (not graded)
Comments	
Lecture Presentation techniques	
Internal number	MKIB6423

Lecturer	Dr. Martin Holzer
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	To exist in the political, social, economical and cultural living nowadays the students must be able to held speeches and to participate in discussions without stoppages. This seminar shows how to express oneself independently of a concrete text.
Recommended reading	PowerPoint slides
Exams	Verbal Exam 20 Min. (graded)
Comments	Lectures and practical exercises
Lecture Law	
Internal number	MKIB6433
Lecturer	RA Karin Raab
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	- Introduction to the right - That "Bürgerliches Gesetzbuch" (BGB) - The "Handelsgesetzbuch" (HGB) - The judicial procedure
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	

Module Elective courses 2	
Internal number	MKIB6503
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	8.0 ECTS points, 8.0 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Internship, Internship Preparation and Roundup
Pre-requisites according to the examination regulations	Modul Internship
Competences	The student should be able to lay his emphasis on individual interests.
Exams	Individual exams
Lecture Digital signal processors	
Internal number	EITB622A
Lecturer	Prof. Dr. Christian Langen
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	English
Content	
Recommended reading	
Exams	Module exam
Comments	
Lecture HKA-APP	
Internal number	I W155
Lecturers	Prof. Dr. Manfred Seifert M.Sc. Daniel Weisser
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Hands-on Experience
Language of instruction	German

Content	<p>HsKAmpus is intended to provide comprehensive functions for students of all faculties of the HsKA:</p> <ul style="list-style-type: none"> - https://www.h-ka.de/hskampus/ - https://www.youtube.com/watch?v=OcyRZrwXzVM <p>This primarily includes functions from the so-called. Online services based on the LSF server (events/schedule, facilities, people, student life), the QIS server (grade view) and other servers (canteen, KIT, KVV, ...). Other formats and functions are possible:</p> <ul style="list-style-type: none"> - Creation or further development for Android, iOS, Windows, Web and our Broker/Server as well as the new Ersti-Hilfe - Provision in Google Play, Apple App Store, Microsoft Windows Store and as a web app - Marketing on various channels (website, FaceBook, Instagram, HsKA site, advertising material, ...) - User support - Communication at the university (campus day).
Recommended reading	<p>http://www.hskampus.de https://www.facebook.com/hskampus https://www.instagram.com/hskampus/</p>
Exams	Hands-on Work 1 Semester (graded)
Comments	

Lecture Graphical-geometric algorithms

Internal number	I W158
Lecturer	Prof. Dr. Christian Pape
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written/verbal Exam 90/20 Min. (graded)
Comments	

Lecture IT and media law

Internal number	I W159
Lecturer	Prof. Thomas Hinz
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Module exam

Comments	
Lecture Augmented and virtual reality	
Internal number	I W171
Lecturer	Prof. Dr. Matthias Wölfel
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture ERP Special Chapters	
Internal number	I W182
Lecturer	Prof. Dr. rer. pol. Mathias Philipp
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	Enterprise analysis, software choice, system integration, basics of customizing, small development task in ABAP in addition to an ABAP introduction, optional: project office: integrated project and service processing with SAP ECC 6.0
Recommended reading	Lecture material completely as pdf documents, blackboard notes for interactive development of central problem positions, extensive material for every case study.
Exams	Written Exam 90 Min. (graded)
Comments	Lecture, workshops, lab: Case study based participation in group oriented workshops about enterprise analysis, presentation of group results, independent implementation of the analysis results of into SAP by appropriate system customizing in the lab. Independent treatment of another lab task (e.g., ABAP course, case study project office)
Lecture IT Security	
Internal number	I W210
Lecturers	Dipl. Inform. (FH) Michael Fischer Dipl. Inform. (FH) Georg Magschok
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	Technological and topological mechanisms for securing networks, attack patterns and defense mechanisms against them. Basics of, variants of and defense against malicious software. Analysis and judgement of security mechanisms and related activities. Exercises at the end of each semester provide practical experience in dealing with security topics.
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	Presentation with a lot of room for discussions and interaction. Finalized by a hands-on session.
Lecture Robotics	
Internal number	I W233
Lecturer	Prof. Dr. Björn Hein
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written/verbal Exam 90/20 Min. (graded)
Comments	
Lecture Graphical User Interfaces	
Internal number	I W332
Lecturer	Dipl.-Inf. Per Sterner
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	The lecture first deals with SWT/JFace and the Eclipse Rich Client Platform 4 (RCP), which uses SWT and JFace as its basis. The most important topics are the model-view-controller pattern, layout management and event handling using the observer pattern. Based upon this techniques advanced technologies like the separation of business logic and user interface code using data binding and dialog control are presented. Other topics are internationalization and multithreading in the context of user interfaces. The last part of the lecture shows the declarative construction of user interfaces and the application of the RCP framework.

Recommended reading	Books and Web sites: - Marc Teufel, "Eclipse 4", entwickler.press, Oktober 2012 - Lars Vogel, "Eclipse 4 Application Development", Mai 2012 - M. Marinilli, "Professional Java User Interfaces", Wiley & Sons, 2006 - R. Warner, R. Harris, "The Definite Guide to SWT and JFace", Apress, 2007 - M. Scarpino et.al., "SWT/JFace in Action", Manning Publications Co., 2005 - J. McAffer, J. M. Lemieux, "Eclipse Rich Client Platform", Addison-Wesley Longman (Pearson Education), 2010 - G. Wütherich, N. Hartmann, B. Kolb, M. Lübken, "Die OSGi Service Platform", dpunkt-Verlag, 2008 - http://www.ralfebert.de/rcpbuch/ - http://www.eclipse.org/swt/ - http://www.eclipse.org/articles/Article-UI-Guidelines/Index.html - http://www.eclipse.org/swt/snippets/ - http://wiki.eclipse.org/index.php/JFaceSnippets - http://www.java2s.com/
Exams	Written Exam 90 Min. (graded)
Comments	Lecture preparation, exam preparation, implementing the bonus exercise, 30% of the lecture is held as a computer exercise
Lecture Softwareengineering Special Chapters	
Internal number	I W342
Lecturers	M.Sc. Alexander Hasel Prof. Dr. Thomas Fuchß
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	The course focuses on fundamental object-oriented design methods with an emphasis on design patterns and model driven concepts. The students learn to recognize, to know when to use, and to apply design patterns in varying situations in the context of an evolutionary development process. Furthermore the ability of an axiomatic rule base application of patterns, within a model driven approach, are discussed.

Recommended reading	Slides, textbooks, and other literature: Folien-Skript, Lehrbücher: - Gamma, Erich et. al. Entwurfsmuster: Elemente wiederverwendbarer objektorientierter Software - München : Addison-Wesley, 2001. - Buschmann, Frank. A system of patterns (Pattern-Oriented Software Architecture Volume 1) - John Wiley & Sons. 1996. - Schmidt, Douglas C. Patterns for concurrent and networked objects (Pattern-Oriented Software Architecture Volume 2) - John Wiley & Sons. 2000. - Michael Kircher, Prashant Jain. Patterns for Resource Management (Pattern-Oriented Software Architecture Volume 3) - John Wiley & Sons. 2004. - Frank Buschmann, Kevlin Henney, Douglas C. Schmidt. A Pattern Language for Distributed Computing (Pattern-Oriented Software Architecture Volume 4) - John Wiley & Sons. 2007. - Frank Buschmann, Kevlin Henney, Douglas C. Schmidt. On Patterns and Pattern Languages (Pattern-Oriented Software Architecture Volume 5) - John Wiley & Sons. 2007. - Fowler, Martin. Analysemuster: wiederverwendbare Objektmodelle: Ein Pattern-Katalog für Business-Anwendungen - Addison-Wesley-Longman. 1999. - OMG Object Management Group. Meta Object Facility (MOF) Specification - Version 2.4.1: OMG, 2011.
Exams	Verbal Exam/Concept 20 Min. (graded)
Comments	The lecture will take the form of seminars with exercises.
Lecture IT Consulting	
Internal number	I W433
Lecturer	Prof. Dr. rer. pol. Mathias Philipp
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	First, students are given an overview of the international consulting market and learn the methodological principles of this industry as well as the main areas of work of IT consulting. Various approaches to strategy consulting, process consulting and IT system consulting are discussed, along with the respective consulting tools and methods.
Recommended reading	Lecture material completely as pdf documents, blackboard notes for interactive development of central problem positions, instructions for interactive role play and case study material
Exams	Written Exam 90 Min. (graded)
Comments	Participation lecture, development of an interactive role play in the group, individual execution of a short case study.
Lecture Philosophy and theory of computer science	
Internal number	I W502
Lecturer	Prof. Dr. Thomas Morgenstern

Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written/verbal Exam 90/20 Min. (graded)
Comments	
Lecture Enterprise software from the cloud	
Internal number	I W779
Lecturer	Prof. Dr. Zoltán Nochtá
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Module exam
Comments	
Lecture Python frameworks	
Internal number	I W800
Lecturer	Prof. Dr. Jürgen Zimmermann
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Sound design	
Internal number	I W801
Lecturer	B.Sc. Noah Ibers
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	

Exams	Written Exam 60 Min. (graded)
Comments	
Lecture Business Process Management	
Internal number	I W854
Lecturer	Prof. Dr. Uwe Haneke
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	<p>Starting with clarifying the terminology of business process management, the lecture gives an introduction and analysis of various concepts for business process documentation and modeling. This includes a discussion of support through appropriate methodologies and software tools. Modern concepts such as process mining are also covered.</p> <p>Using different tools, business processes are documented and subsequently simulated as part of a case study. Finally, aspects of process quality assurance, performance evaluation, and process cost accounting are addressed. Students are enabled to independently handle processes in a business environment, including documentation, modeling, and analysis.</p> <p>Overview:</p> <ul style="list-style-type: none"> - The concept of processes and types of processes - Methodologies in process management - Process analysis (documenting processes) - Process modeling (modifying processes) - Tools for process modeling - Process simulation - Process mining - Key performance indicators for evaluating business processes
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Databases Special Chapters	
Internal number	I W907
Lecturer	M.Sc. Tobias Wink
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	

Exams	Written/verbal Exam 90/20 Min. (graded)
Comments	
Lecture SAP Certification	
Internal number	I W908
Lecturers	M.Sc. Matthias Mruzek-Vering Prof. Dr. rer. pol. Mathias Philipp
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	<p>TERP10: SAP ERP - Integration of Business Processes is a 10-day training course held at the universities participating in the pilot project. The students learn how the fundamental integrative business processes in procurement, production, planning, project management, sales, customer service, asset management, financial accounting, human resources, and analytics interact within the SAP ERP application.</p> <p>The course provides students with a broad basic knowledge of the core business processes, business interrelations, and integration of business processes in SAP ERP.</p> <p>At the end of the course, students take a certification examination. If they pass the examination, they receive an SAP certificate, which is a fully recognized qualification in the industry.</p>
Recommended reading	course book
Exams	Written Exam 90 Min. (graded)
Comments	<p>10-day training:</p> <p>in the morning: theory in the evening: laboratory</p> <p>last day: SAP certification 3 hours multiple choice and multiple response questions</p>
Lecture Serious Games	
Internal number	I W910
Lecturer	Prof. Daniel Schwarz
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Model-based Software Development	
Internal number	I W911

Lecturer	Prof. Dr. Martin Sulzmann
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	Formal Modelling Languages Synchronous languages (Lustre/SCADE) Temporal Specifications (LTL) Domain-specific Extensions Textual versus visual modelling Modeltransformation via internal DSLs Modelling guide lines Formal testing and verification Coverage criteria Testcasegeneration Static analysis and model-checking
Recommended reading	- lectures notes and slides - exercices - online references
Exams	Written Exam 90 Min. (graded)
Comments	Prerequisites: - UML Basics - C++, - Logic (propositional), - Lexer, Parser, EBNF (Compiler basics) Mix of lecture (2/3) and practical exercices/project work (1/3)
Lecture Mobile communication	
Internal number	I W914
Lecturer	Prof. Dr. Oliver Waldhorst
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	<p>In this course, students learn about the basic principles and technologies of mobile communication systems. After completing the course, they will be able to describe problems of mobile networks such as wireless signal transmission, media access and mobility management, identify and apply solution modules to solve these problems and evaluate existing solutions. They will also be able to analyze the characteristics and applications of various wireless systems such as WLAN, Bluetooth, mobile radio technologies (e.g. GSM, UMTS, LTE, 5G) and their underlying protocols and architectures.</p> <p>The lecture covers the following topics:</p> <ul style="list-style-type: none"> - Basics of mobile communication: wireless signal transmission, multiplexing techniques, band spreading, OFDM, MIMO and multipath propagation. - Media access: methods such as Aloha, Carrier Sense Multiple Access (CSMA) and time-slot-based protocols. - Mobility management: position management, handover and routing in mobile networks. - Technologies and standards: WLAN (IEEE 802.11), Bluetooth, mobile networks (GSM, UMTS, LTE, 5G). <p>The course is held in a flipped classroom format. Students prepare for the live sessions independently using lecture slides and explanatory videos. In the classroom sessions, the content is deepened through case studies and practical exercises. The examination consists of an oral examination or a written exam, depending on the agreement.</p> <p>The total workload is 60 hours, of which 20 hours are spent on asynchronous learning, 20 hours on face-to-face events and 20 hours on exam preparation.</p>
Recommended reading	<ul style="list-style-type: none"> - Slide collection and explanatory videos in the ILIAS system - Jochen Schiller, Mobile Communication. Pearson Studium, 2003. - Martin Sauter, Grundkurs Mobile Kommunikationssysteme, 8th edition, 2022 (available as an e-book via the KIT library) - Further information in ILIAS and in the lecture
Exams	Verbal Exam 20 Min. (graded)
Comments	
Lecture Concept, Design und Presentation of interactive Projects	
Internal number	I W915
Lecturer	Prof. Thomas Hinz
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Homework 1 Semester (graded)
Comments	
Lecture CC Operation	
Internal number	I W917

Lecturer	Dr. Günther Schreiner
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	

Lecture In-memory Databases

Internal number	I W920
Lecturer	Prof. Dr. Zoltán Nochta
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	

Lecture Planning and optimisation with evolutionary methods

Internal number	I W927
Lecturer	Dr.-Ing. Wilfried Jakob
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	

Lecture Predictive Modelling and Machine Learning

Internal number	I W928
Lecturer	Prof. Dr. Martin Sulzmann
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	English
Content	

Recommended reading	
Exams	Module exam
Comments	
Lecture Microservices	
Internal number	I W930
Lecturer	Prof. Dr. Jürgen Zimmermann
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture App Programming for iOS	
Internal number	I W931
Lecturer	B.Sc. David von Knobelsdorff
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Thesis
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Modern server applications and web apps with TypeScript	
Internal number	I W934
Lecturer	Prof. Dr. Jürgen Zimmermann
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Microtechnology Laboratory	
Internal number	I W935

Lecturer	Prof. Dr. rer. nat. Oliver Schecker
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German
Content	Development of applications with a microtechnology focus. Examples include autonomous micro airships, self-monitored first aid kits, energy self-sufficient door signs, components of the "High Speed Karlsruhe" racing car if the student is involved in this project (https://www.highspeed-karlsruhe.de/).
Recommended reading	
Exams	Hands-on Work 1 Semester (not graded)
Comments	

Module Elective courses 3	
Internal number	MKIB7103
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	8.0 ECTS points, 8.0 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	Internship, Internship Preparation and Roundup
Pre-requisites according to the examination regulations	Modul Internship
Competences	The student should be able to lay his emphasis on individual interests.
Exams	Individual exams
Lecture Autonomous Systems Labor	
Internal number	I W276
Lecturers	Prof. Dr. Norbert Link M.Sc. Mickael Cormier
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Project Lecture
Language of instruction	German
Content	Project 1: Implementation of an image-processing-based handling system, which performs transport activities on the basis of information extracted from a digital video camera Project 2: Implementation of the core functionality of an aircraft docking guidance system, which directs aircraft to their respective stopping position at the airport gate Project 3: Autonomous navigation, obstacle avoidance and object following with robots
Recommended reading	Lecture notes, task descriptions, project guidelines and FAQs, all accessible via the internet. Handbooks and relevant literature is available on site and for homework in the library.
Exams	Laboratory Work 1 Week (graded)
Comments	Theoretical familiarisation, practical work, reporting, partly as self-responsible work
Lecture Software Quality	
Internal number	I W392
Lecturer	Prof. Dr. Dirk Hoffmann
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	Students gain practical access to the field of software quality assurance. They work on a specific chapter from the field of software quality assurance and present their results to the other students in a series of short presentations. The participants then discuss the results.
Recommended reading	Hoffmann: "Software-Qualität", Springer-Verlag, 2013
Exams	Presentation 20 Min. (graded)
Comments	Lecture, student presentations
Lecture Search Engines	
Internal number	I W393
Lecturer	B.Sc. Michael Siebers
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Concept 1 Semester (graded)
Comments	
Lecture Project Management	
Internal number	I W422
Lecturer	Prof. Dr. Uwe Haneke
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Project Lecture
Language of instruction	German
Content	The lecture focuses mainly on practice oriented project management and new procedure models like Scrum. - Introduction to IT project management - Procedure models in IT project management - Defining a project - The project plan: the heart of the project - Getting started: Initialisation of the project - Project controlling - The final words: how to complete a project
Recommended reading	
Exams	Verbal Exam 20 Min. (graded)
Comments	
Lecture External selected chapter 1	
Internal number	I W600
Lecturer	Prof. Dr.-Ing. Holger Vogelsang

Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	This course is a placeholder for an external, graded course from another faculty or university. You must have the external subject approved before attending it.
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	

Lecture Inspiring

Internal number	I W600.a
Lecturer	Prof. Dr.-Ing. Holger Vogelsang
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Hands-on Experience
Language of instruction	German
Content	
Recommended reading	
Exams	Verbal Exam 20 Min. (graded)
Comments	

Lecture External selected chapter 2

Internal number	I W700
Lecturer	Prof. Dr.-Ing. Holger Vogelsang
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	This course is a placeholder for an external, graded course from another faculty or university. You must have the external subject approved before attending it.
Recommended reading	
Exams	Written Exam 90 Min. (not graded)
Comments	

Lecture Softwareengineering Special Chapters

Internal number	I W701
Lecturer	Prof. Dr. Peter Henning
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Seminar
Language of instruction	German

Content	The course focuses on fundamental object-oriented design methods with an emphasis on design patterns and model driven concepts. The students learn to recognize, to know when to use, and to apply design patterns in varying situations in the context of an evolutionary development process. Furthermore the ability of an axiomatic rule base application of patterns, within a model driven approach, are discussed.
Recommended reading	Slides, textbooks, and other literature: Folien-Skript, Lehrbücher: - Gamma, Erich et. al. Entwurfsmuster: Elemente wiederverwendbarer objektorientierter Software - München : Addison-Wesley, 2001. - Buschmann, Frank. A system of patterns (Pattern-Oriented Software Architecture Volume 1) - John Wiley & Sons. 1996. - Schmidt, Douglas C. Patterns for concurrent and networked objects (Pattern-Oriented Software Architecture Volume 2) - John Wiley & Sons. 2000. - Michael Kircher, Prashant Jain. Patterns for Resource Management (Pattern-Oriented Software Architecture Volume 3) - John Wiley & Sons. 2004. - Frank Buschmann, Kevlin Henney, Douglas C. Schmidt. A Pattern Language for Distributed Computing (Pattern-Oriented Software Architecture Volume 4) - John Wiley & Sons. 2007. - Frank Buschmann, Kevlin Henney, Douglas C. Schmidt. On Patterns and Pattern Languages (Pattern-Oriented Software Architecture Volume 5) - John Wiley & Sons. 2007. - Fowler, Martin. Analysemuster: wiederverwendbare Objektmodelle: Ein Pattern-Katalog für Business-Anwendungen - Addison-Wesley-Longman. 1999. - OMG Object Management Group. Meta Object Facility (MOF) Specification - Version 2.4.1: OMG, 2011.
Exams	Presentation 20 Min. (graded)
Comments	The lecture will take the form of seminars with exercises.
Lecture Teamteaching	
Internal number	I W730
Lecturers	Prof. Dr.-Ing. Holger Vogelsang Alle Dozenten
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Project Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Verbal Exam 20 Min. (graded)
Comments	- Preparation of a tutorial, support of student groups - Organisation of events
Lecture Multimedia (Blended Learning)	
Internal number	I W774

Lecturer	Prof. Dr. Peter Henning
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Project Lecture
Language of instruction	German
Content	
Recommended reading	Book: Henning, Taschenbuch Multimedia.
Exams	Online Test 4 Parts (graded)
Comments	
Lecture Reinforcement Learning	
Internal number	I W775
Lecturer	Prof. Dr. Patrick Baier
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written/verbal Exam 90/20 Min. (graded)
Comments	
Lecture Social commitment	
Internal number	I W776
Lecturer	Prof. Dr.-Ing. Holger Vogelsang
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Hands-on Experience
Language of instruction	German

Content	<p>This course enables students to obtain ECTS credits for social work done at Karlsruhe University of Applied Sciences. The activity must be closely coordinated with a professor of the faculty. This can be, for example, support for the O-Phase or support for visually impaired students. In the case of the O-Phase, you will usually have to work on two semesters in order to achieve the required minimum number of hours.</p> <p>If you are interested, you can also obtain the "Certificate of International and Intercultural Competence (CIIC)". It certifies the intercultural competences and foreign language skills acquired during the degree programme, provides evidence of study-related experiences abroad and lists the framework in which the participants have been involved in intercultural activities. To earn the CIIC, you must cover three of four subject areas. The main component in subject area 1 is the voluntary commitment of at least 50 hours (about 2 hours per week in one semester), which can be completed in institutions or projects with an international and/or intercultural connection. In addition to the commitment, you will attend an introductory event as well as a reflection workshop and prepare an experience report, which is necessary to pass the subject area. If you have any questions about the certificate, please contact the Center of Competence: https://www.h-ka.de/ciic</p> <p>Through the Center of Competence, it is also possible to obtain the "Certificate for Social Engagement (ZGE)". It takes into account an even wider range of opportunities to get involved. Find your suitable area, whether it is community, social, cultural or ecological engagement. Your social engagement should comprise at least 100 time hours and last for at least one year. In addition to your commitment, you will attend various seminars from the Studium Generale (a total of 8 ECTS) to link your practical experience with theoretical knowledge. This certificate cannot be recognised as an elective subject. You can find more information here: https://www.h-ka.de/zge</p> <p>At regular intervals, the Center of Competence offers introductory events and reflection workshops for HKA students who are involved in voluntary work outside of their studies. This gives them the opportunity to exchange their experiences as volunteers with other participants and learn to reflect on and classify the insights they have gained. The next dates can be found on the CIIC website.</p>
Recommended reading	
Exams	Verbal Exam 20 Min. (not graded)
Comments	
Lecture Real-time graphics	
Internal number	I W777
Lecturer	B.Sc. Tim Hänlein
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture

Language of instruction	German
Content	
Recommended reading	
Exams	Hands-on Work 1 Semester (graded)
Comments	
Lecture Seminar Digital Twin	
Internal number	I W778
Lecturer	Prof. Dr.-Ing. Holger Vogelsang
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Seminar
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 60 Min. (graded)
Comments	
Lecture High Performance Computing	
Internal number	I W909
Lecturer	Prof. Dr. Britta Nestler
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written/verbal Exam 90/20 Min. (graded)
Comments	
Lecture ABAP Programming	
Internal number	I W918
Lecturers	Prof. Dr. rer. pol. Mathias Philipp B.Sc. Soeren Schlegel
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	Introduction to the ABAP programming language with practical exercises in SAP NetWeaver Application Server ABAP. Students should familiarise themselves with language elements, workbench, database, selection screens, function modules and ABAP OO and be able to apply them independently to new problems.
Recommended reading	- Lecture material completely in PowerPoint slides - Blackboard notes for interactive development of core problems - Exercise sheets and independent practical exercises on the SAP system
Exams	Module exam
Comments	

Lecture Game AI

Internal number	I W923
Lecturers	Prof. Dr.-Ing. Astrid Laubenheimer Dr. Patrick Glauner
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	English
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	

Lecture High Speed Karlsruhe

Internal number	I W936
Lecturer	Prof. Dr.-Ing. Holger Vogelsang
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Hands-on Experience
Language of instruction	German
Content	Collaboration on the "High Speed Karlsruhe" project in the MMT faculty. If you are interested, please contact Mr Stumpf: oliver.stumpf@h-ka.de
Recommended reading	http://www.hskampus.de https://www.facebook.com/hskampus https://www.instagram.com/hskampus/
Exams	Hands-on Work 1 Semester (graded)
Comments	

Module Scientific Working	
Internal number	MKIB7203
Coordinator	Prof. Dr. Heiko Körner
Scope	5.0 ECTS points, 2.0 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	Student Research Project, Key Qualification
Pre-requisites according to the examination regulations	Modul Internship
Competences	This module enables students to apply the basic principles of research in computer science in a method-based manner. They can evaluate scientific literature to use it in their own work. They are then able to write their own scientific papers.
Exams	Exercise 1 Semester (not graded)
Lecture Scientific Working	
Internal number	MKIB7213
Lecturer	Alle Dozenten
Scope	5.0 ECTS points, 2.0 Contact hours 150 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Hands-on Experience
Language of instruction	German
Content	Students work independently on a practical problem using scientific and practical methods. Topics include the independent development of the methodology, the topic and the exact problem as well as the structure of the paper and the creation of a bibliography. The results are discussed and presented with the lecturers. The students thus learn the procedure for writing the final Bachelor's thesis.
Recommended reading	<ul style="list-style-type: none"> - Documents on the process, the structure of a paper and citation - Peter Rechenberg, Gustav Pomberger: Informatik-Handbuch. Hanser Fachbuch, 2006, ISBN 3446218424 - Jürg Niederhauser: Die schriftliche Arbeit - kurz gefasst. Bibliographisches Institut, Mannheim, 2006, ISBN 3411042346
Exams	Module exam
Comments	

Module Thesis	
Internal number	MKIB7303
Coordinator	Prof. Dr. Heiko Körner
Scope	12.0 ECTS points, 0.0 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	System Software, Business Administration and Service Management, Computer Graphics and Computer Vision, Databases and Communication Networks 1, Databases and Communication Networks 2, Embedded Software, Computer Science 1, Computer Science 2, Communication Competence, Mathematics 1, Mathematics 2, Media Design, Media Project, Man-Machine-Communication 1, Man-Machine-Communication 2, Internship, Internship Preparation and Roundup, Student Research Project, Key Qualification, Software Engineering and Distributed Systems 2, Software Project, Language Competence, Computer Engineering, Technologies of the Internet, Theoretical Computer Science, Elective courses 3, Scientific Working
Pre-requisites according to the examination regulations	Modul Internship
Competences	After successfully completing this module, students are able to independently solve a practical problem or research task using scientific methods within a specified period of time. They can structure the task, check dependencies, collect the necessary resources and then work on the task using a specially derived schedule. They can present the written results in an appealing form.
Exams	Individual exams
Lecture Thesis	
Internal number	MKIB7313
Lecturer	Alle Professoren
Scope	12.0 ECTS points, 0.0 Contact hours 360 Stunden gesamt, davon 0 Stunden Kontaktstudium.
Type/mode	Thesis
Language of instruction	German
Content	In the final thesis, students work independently on a practical problem or research task within a specified period of time using scientific methods. They structure the task, check dependencies, collect the necessary resources and work on the problem according to a timetable. The written thesis summarises the results in a didactically meaningful way and meets academic standards.
Recommended reading	Suitable for the task as agreed
Exams	Bachelor Thesis 4 Months (graded)
Comments	

Module Final examination	
Internal number	MKIB7403
Coordinator	Prof. Dr. Heiko Körner
Scope	3.0 ECTS points, 0.0 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	Thesis, System Software, Business Administration and Service Management, Computer Graphics and Computer Vision, Databases and Communication Networks 1, Databases and Communication Networks 2, Embedded Software, Computer Science 1, Computer Science 2, Communication Competence, Mathematics 1, Mathematics 2, Media Design, Media Project, Man-Machine-Communication 1, Man-Machine-Communication 2, Internship, Internship Preparation and Roundup, Student Research Project, Key Qualification, Software Engineering and Distributed Systems 2, Software Project, Language Competence, Computer Engineering, Technologies of the Internet, Theoretical Computer Science, Scientific Working
Pre-requisites according to the examination regulations	Modul Internship
Competences	Participation in this module enables students to convincingly present the results achieved within a specialised, application-related thesis to an expert audience. They can analyse the content of such work, select the key aspects and present these in a didactically appropriate short presentation. In a subsequent discussion, they are also able to defend their results.
Exams	Individual exams
Lecture Final examination	
Internal number	MKIB7413
Lecturer	Alle Professoren
Scope	3.0 ECTS points, 0.0 Contact hours 90 Stunden gesamt, davon 0 Stunden Kontaktstudium.
Type/mode	Colloquium
Language of instruction	German
Content	The final examination covers all topics relevant to computer science in the main study programme. Students demonstrate that they have understood and can apply interdisciplinary contexts. They answer questions from various areas of media informatics that are related to their final thesis. With the final examination, they demonstrate that they have the competence to independently work on novel problems in the field of media informatics.
Recommended reading	
Exams	Verbal Exam 20 Min. (not graded)
Comments	