Hochschule Karlsruhe

Faculty for Computer Science and Business Information Systems

Module manual

Course of studies Computer Science (Bachelor), ER 7

Summer semester 2024

Module Computer Science (Bachelor), ER 7

Module Computer Science 1

Internal number	INFB1107
Coordinator	Prof. Dr. Carsten Sinz
Scope	12.0 ECTS points, 10.0 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	Written Exam 120 Min. (graded)

Lecture Computer Science 1

Internal number	INFB1117.a
Lecturer	Prof. Dr. Carsten Sinz
Scope	5.0 ECTS points, 4.0 Contact hours 150 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	With weekly exercises the students deepen the practical contents of the lecture on the computer. They use an integrated Java development environment to create, test and modify programs. In the following exercises the students program simple calculations with Java using variables, expressions and control structures. This also includes graphical data processing tasks. Later, the students develop object-oriented programs on the computer. In the end, they solve recursive problems and implement solution strategies with the help of backtracking.
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	Module exam
Comments	Lecture participation. Solving simple exercises in the lecture with teacher support.

Lecture Theoretical Computer Science

Internal number	INFB1117.b
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	The course introduces the theory of formal languages and focusses on regular and context-free languages. The course first consolidates the basics of propositional logic, set theory, the O-calculus and elementary proof techniques. Then the classical areas of theoretical computer science such as finite automata and their minimisation, regular expressions, the Chomsky hierarchy, the pumping lemma for regular and context-free languages as well as associated decision algorithms are covered. Push down automata, normal forms and closure properties are also discussed. The aim is to develop an understanding of the basic computational power of classical computer models with limited memory capacity.
Recommended reading	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. Literature: D. W. Hoffmann: Theoretische Informatik, 3. Auflage. Hanser, 2015. M. Sipser: Introduction to the Theory of Computation, 3rd edition. Cengage Learning, Inc., 2012.
Exams	Module exam
Comments	This course will take place as a pure lecture. Numerous exercises deepen selected areas and will be discussed in tutorials.

Lecture Computer Science 1 Exercise

Internal number	INFB1127
Lecturer	Prof. Dr. Carsten Sinz
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	With weekly exercises the students deepen the practical contents of the lecture on the computer. They use an integrated Java development environment to create, test, and modify programs. In the following exercises the students program simple calculations with Java using variables, expressions and control structures. This also includes graphical data tasks. Later, the students develop object-oriented programs on the computer. In the end, they solve recursive problems and implement solution strategies with the help of backtracking.
Recommended reading	
Exams	Exercise 1 Semester (not graded)
Comments	Practical assignment in a computer laboratory.

Module Computer Engineering 1

Internal number	INFB1207
Coordinator	Prof. Dr. Dirk Hoffmann
Scope	5.0 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	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. They also understand the basic concepts of the instruction-set architecture of a processor and can easily create assembly programs for a selected elementary model processor.
Exams	Individual exams

Lecture Computer Engineering 1

Internal number	INFB1217
Lecturer	Prof. Dr. Dirk Hoffmann
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 gives a basic understanding for building a computer. It is shown how the functionality of a computer can be decomposed into elementary operations. It is shown how to elementary functional components are designed, how the interact and how they can be used to design more complex circuits. The following topics are covered in detail: Basic operation of a computer; knowledge of the basic logical circuit blocks; technologies for the realization of the basic components; knowledge of the main electrical characteristics; different codes for numbers and characters; boolean algebra; methods of simplification boolean expressions; the use of CAE software; designing combinatorial circuits; design of synchronous switching networks; Flipflops; counters and registers.
Recommended reading	Slides, blackboard, exercise sheets
Exams	Written Exam 120 Min. (graded)
Comments	Lecture

Lecture Computer Engineering 1 Exercise

Internal number	INFB1227
Lecturer	Prof. Dr. Dirk Hoffmann
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	Students will solve exercises taken from the following areas: Number representation, Boolean algebra, circuit design, logic minimization, standard circuit blocks and microprocessor architecture.
Recommended reading	
Exams	Exercise 1 Semester (not graded)
Comments	

Module Mathematics 1	
Internal number	INFB1307
Coordinator	Prof. Dr. Frank Schaefer
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 specifially needed in computer graphics, robotic, cryptography.
Exams	Individual exams

Lecture Mathematics 1	
Internal number	INFB1317
Lecturer	Prof. Dr. Frank Schaefer
Scope	5.0 ECTS points, 4.0 Contact hours 150 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German
Content	he 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 grafic and 3D simulations. Content of the lectures: Proof methods, relations, euqivalence 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.
Recommended reading	Own writings from the blackboard, Exercises and summaries from the internet, Tutorials given by students, 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	INFB1327
Lecturer	Prof. Dr. Frank Schaefer

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. Additionally we will look at functions, which can be represented by matrices.
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	INFB1407
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	INFB1417
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	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 leant: 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.
Recommended reading	Literature depends on grade, PowerPoint presentations, execises, Videos, DVDs

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

Module Computer Science 2	
Internal number	INFB2107
Coordinator	Prof. Dr. Christian Pape
Scope	9.0 ECTS points, 8.0 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	Informatik 1
Pre-requisites according to the examination regulations	none
Competences	This module is based on "Informatik 1". Students will learn to use and apply universal algorithms and data structures. They will be able to analyse the complexity of these algorithms and proof their correctness. In practical assignments the students are enabled to implement some of these algorithms and data structures.
Exams	Individual exams
Lecture Computer Science 2	
Internal number	INFB2117
Lecturer	Prof. Dr. Christian Pape
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, polymormism, generic programming, error handling an runtime typ information. Based on these techniques an introduction in modeling of class diagrams with UML is made. Additional practical exercises with a standard IDE adeepen 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, hashtables, tree and graphs and introduces basic algorithms to operate on them. The forth part introduces the modularization of applications with Spring.

Recommended reading	On the lecture homepage: PowerPoint presentation, program examples, script Books: - 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 120 Min. (graded)
Comments	Preparation of lecture contents and exam

Lecture Theoretical Computer Science 2

Internal number	INFB2127
Lecturer	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	The lecture conveys the limits of the computational power of today's computers, which occur even with a potentially infinite amount of available memory. The main topics are the computability and undecidability of various problems. An introduction to the theory of intractable problems is also given. Students are taught the following areas of theoretical computer science: elementary computational models such as Turing machines and WHILE programmes, the Church-Turing thesis, undecidability and an introduction to complexity theory. The P=NP question and the utilisation of intractable problems for so-called zero-knowledge proofs are also discussed. This course gives students an idea of problems that are difficult or even completely unsolvable in principle. They understand that compromises must be made in terms of the quality of the desired results or the runtime.
Recommended reading	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. Literature: D. W. Hoffmann: Theoretische Informatik, 3. Auflage. Hanser, 2015. M. Sipser: Introduction to the Theory of Computation, 3rd edition. Cengage Learning, Inc., 2012.
Exams	Written Exam 60 Min. (graded)

Comments	This course will take place as a pure lecture. Numerous exercises deepen selected areas and will be discussed in tutorials.

Lecture Computer Science 2 Exercise

Internal number	INFB2137
Lecturers	Dr. Martin Holzer Prof. Dr. Christian Pape
Scope	2.0 ECTS points, 2.0 Contact hours 60 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 Laboratory

Internal number	INFB2207
Coordinator	Prof. Dr. Martin Sulzmann
Scope	5.0 ECTS points, 4.0 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	Informatik 1
Pre-requisites according to the examination regulations	none
Competences	The students get an insight into the programming languages C/C++. The students are able to classify different language features (imperative, object-oriented, functional) and use them appropriately depending on the application. Modern memory obsolescence issues such as "copy/move semantics" are considered. The knowledge learned is tested in practice using a series of exercises. Newer programming languages such as Go and Rust are considered.
Exams	Individual exams

Lecture Software Project

Internal number	INFB2217
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	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 Breymann, C++ - Einführung und professionelle Programmierung, Hanser-Verlag
Exams	Written Exam 90 Min. (graded)
Comments	Laboratory work in small groups

Lecture Software Project Exercise

Internal number	INFB2227
Lecturers	Prof. Dr. Martin Sulzmann Dipl. Inf. (FH) Oktavian Gniot
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 Distributed Systems 1 and Theoretical Computer Science 2

Internal number	INFB2307
Coordinator	Prof. Dr. Christian Zirpins
Scope	4.0 ECTS points, 3.0 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	The students acquire knowledge about techniques and concepts of distributed systems using the example of web applications. In particular, they acquire skills to explain the general architecture of the Internet and the Web, to analyze requirements of a Web application, to create an interactive Web application with HTML, CSS and client-side JavaScript, to identify security issues in a Web application and to develop server-side code for application services with authentication, cookies and sessions.
Exams	Individual exams

Lecture Distributed Systems 1

Internal number	INFB2317
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	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. 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.
Recommended reading	- 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 JavaScrip", 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	Written Exam 90 Min. (graded)
Comments	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.

Lecture New Lecture

Internal number	INFB2327

Lecturer	Prof. Dr. Christian Zirpins
Scope	2.0 ECTS points, 1.0 Contact hours
	60 Stunden gesamt, davon 15 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German
Content	
Recommended reading	
Exams	Laboratory Work 1 Semester (not graded)
Comments	

Module Computer Engineering 2

Internal number	INFB2407
Coordinator	Prof. Dr. Christian Langen
Scope	6.0 ECTS points, 4.0 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	The students are familiar with the foundations required for design of embedded systems. This includes computer aided hardware design techniques and an introduction into the hardware design lanquage VHDL. Additionally, students are familiarized with internal functions of various processors and peripherals. All knowledge gained will be reinforced by practical work in the laboratory.
Exams	Individual exams

Lecture Computer Engineering 2

Internal number	INFB2417
Lecturer	Prof. Dr. Christian Langen
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 will provide an overview of programmable logic. This will be followed by a description of the basic modular devices that comprise programmable logic. The students will particapate in an exercise which exposes them to the CAD for programmable logic. An introduction to the design language VHDL will be given. This will be expanded to provide background in parallel and sequential description modes used in VHDL. The remaining description modes (processes and structures) will also be discussed. On the processor side, the lecture will cover the following, basic processor hardware, processor architecture, addressing modes, instructions, memory mapping, peripherals and bit processing.
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	INFB2427

Lecturer	Prof. Dr. Christian Langen
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 Mathematics 2

Internal number	INFB2507
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	INFB2517.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	INFB2517.b
Lecturer	Prof. Dr. Patrick Baier
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 System Software

Internal number	INFB3107
Coordinator	Prof. Dr. Thomas Fuchß
Scope	7.0 ECTS points, 6.0 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	Softwareprojekt, Informatik 2
Pre-requisites according to the examination regulations	none
Competences	Participants should know the design and implementation principles of modern operating systems. They should learn how to think in parallel structures and solve problems with the parallel programming paradigm.
Exams	Individual exams

Lecture System Software

Internal number	INFB3117
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	The "System Software" course focuses on the fundamental methods and techniques of modern operating systems. Students learn to apply these techniques independently and in a structured way to solve typical system-related development tasks. The course itself is diveded into four parts: - Process management and scheduling - File systems and persistence - Memory virtualisation - Concurrency: Processe und Threads While the first part establishes the relationship between computer architecture and operating system, the following parts focus on more specific problems and their typical solutions. In particular, the following topics are covered: Processor virtualisation, limited direct execution, scheduling algorithms, key file system concepts, memory management, segmentation, page frames, processes, threads, mutexes, semaphores, condition variables, monitors and patterns for parallel programming.

Recommended reading	Slides, videos, textbooks, and other literature: - Arpaci-Dusseau, Remzi H.; Arpaci-Dusseau, Andrea C. Operating Systems: Three Easy Pieces, (V. 1.00) Arpaci-Dusseau Books, 2018 - 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	INFB3127
Lecturer	Prof. Dr. Carsten Sinz
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	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: - generating processes / threads - terminating processes / threads - synchronizing processes / threads
Recommended reading	Slides and textbooks: - 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	Laboratory Work 1 Semester (not graded)
Comments	Attended teamwork and three lectures.

Module Databases and Communication Networks 1

Internal number	INFB3207
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	7.0 ECTS points, 7.0 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	Informatik 1, Informatik 2
Pre-requisites according to the examination regulations	none
Competences	Students know the common models of communication and database technology and are able to classify and evaluate unknown, e.g. new systems. They are aware of the advantages and disadvantages of different architectures and take them into account when selecting the architecture for their own products. In the database area, they have mastered the basics of the current SQL standard and are able to select and set up database systems and keep them securely in operation. Students are able to analyse given facts, transfer these facts into a normalized data model, create this data model under SQL and use the resulting SQL databases under object-oriented languages. In the area of communication networks, students learn to analyze application scenarios and problem situations by structuring them using the Internet layer model and applying their knowledge of protocols, mechanisms and programming of the individual layers in order to design applications taking communication aspects into account.
Exams	Written Exam 120 Min. (graded)

Lecture Databases 1

Internal number	INFB3217.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	The lecture covers the following topics: - 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	- 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	INFB3217.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	INFB3227
Lecturers	Prof. Dr.-Ing. Holger Vogelsang M.Sc. Amir Bukhari
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	The knowledge learned in "Databases 1" is deepened and practiced in group work. The interaction of a database with a higher programming language (Java) is understood. The use of SQL (DCL; DML; DDL), transactions and isolation levels and the avoidance of deadlocks is mastered. A database application for warehouse management will be designed and prototypically implemented. This includes the setup of a DB schema, the design and testing of SQL queries, the use of transactions and transaction levels as well as the programming of queries and transactions with Java using JDBC based on Oracle (the preparation for the laboratory should be done in PostgreSQL or MySQL). Finally, several given verbal facts are analyzed, transferred to an Entity Relationship model, normalized, transferred to a physical schema and finally created in SQL. Finally, the handling of the OR mapper Hibernate is practiced. Translated with www.DeepL.com/Translator

Recommended reading	- Script
	- Sample databases
	- Programming framework
	- 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	Exercise 1 Semester (not graded)
Comments	Supervised laboratory with final presentation on the computer, independent work, preparation and follow-up

Lecture New Lecture

Internal number	INFB3237
Lecturer	Prof. Dr. Oliver Waldhorst
Scope	1.0 ECTS points, 1.0 Contact hours
	30 Stunden gesamt, davon 15 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German
Content	
Recommended reading	
Exams	Laboratory Work 1 Semester (not graded)
Comments	

Module Antomation and Declarative Programming

Internal number	INFB3307
Coordinator	Prof. Dr. Patrick Baier
Scope	5.0 ECTS points, 4.0 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	Informatik 1
Pre-requisites according to the examination regulations	none
Competences	
Exams	Individual exams

Lecture Automation

Internal number	INFB3317
Lecturer	Prof. Dr. Patrick Baier
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	- Rembold, U., Levi, P. : Realzeitsysteme zur Prozeßautomatisierung, Carl Hanser Verlag, München Wien, 1994 - MANN, H., SCHIFFELGEN, H., FRORIEP, R. : Einführung in die Regelungstechnik, Carl- Hanser Verlag, München, Wien, 2000 - Etschberger, K. (Hrsg) : CAN, Controller Area Network, Hanser-Verlag, München, 2001 - Tietze, U. , Schenk, Ch. : Halbleiter-Schaltungstechnik, Springer-Verlag, Berlin, 2005 - DATA LOGIC : Der Strichcode-Fibel, Firmenprospekt, 2008 - FINKENZELLER,K.: RFID-Handbuch, Hanser Verlag, München, Wien, 2006
Exams	Written Exam 90 Min. (graded)
Comments	

Lecture Automation Laboratory

Internal number	INFB3327
Lecturer	Prof. Dr. Patrick Baier
Scope	2.0 ECTS points, 2.0 Contact hours 60 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German

Content	Practice of development processes for industrial, reactive systems with co-operating handling systems: modelling of system dynamics by means of state charts or Petri networks, implementation of the formal software models in PLC software (via AWL/FUP/KOP and STEP7-Graph), process visualisation on an control center PC (via WinCC), system communication via TCP/IP and real time channels, system co-operation.
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	Exercise 1 Semester (not graded)
Comments	Seminar-style teaching, practice, reporting

Module Man-Machine-Communication

Internal number	INFB3407
Coordinator	Prof. Thomas Hinz
Scope	6.0 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	The main objective of the module is the ability of students to create effective, efficient and satisfactory end user interfaces.
Exams	Individual exams

Lecture Man-Machine-Communication Design

Internal number	INFB3417
Lecturer	M.A. Daniel Hepperle
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	- "GUI Design Essentials " von Susan Weinschenk, Pamela Jamar, Sarah C. Yeo, Verlag John Wiley & Sons, 1997, ISBN: 0471175498
Exams	Written/verbal Exam 90/20 Min. (graded)
Comments	

Lecture Man-Machine-Communication Design

Internal number	INFB3427
Lecturer	B.Sc. Valeria Zitz
Scope	2.0 ECTS points, 1.0 Contact hours 60 Stunden gesamt, davon 15 Stunden Kontaktstudium.
Type/mode	Lecture
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.

Lecture Declarative Programming Exercise	
Internal number	INFB3437
Lecturer	Prof. Dr. Christian Pape
Scope	1.0 ECTS points, 2.0 Contact hours 30 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Exercise
Language of instruction	German
Content	Nach einem Einstufungstest können Studierende ihre Englischkenntnisse auf drei Niveaustufen vertiefen. Das Eingangsniveau setzt die Kompetenzstufe A2 (Basic User) im sechsstufigen Gemeinsamen Europäischen Referenzrahmen voraus. Die ersten zwei Niveaustufen (Englisch für Fortgeschrittene 1 und 2) beschäftigen sich neben einer Wiederholung der Grammatik vorwiegend mit Themen aus der berufsorientierten Allgemeinsprache und der Landeskunde, z. B. Bewerbungsschreiben, Beschreibung von Produkten und Dienstleistungen, Geschäftstelefonate, Ablauf von formellen und informellen Besprechungen, Präsentationen usw. Das damit erreichte Niveau entspricht einer Punktzahl im TOEFL von 173 (computer-based) bzw. der Kompetenzstufe B2 (Independent User) des Europäischen Referenzrahmens. Auf der anschließenden Niveaustufe werden fachsprachliche Kenntnisse (Englisch für Wirtschaft und Technik) erworben: In Business English liegt das Hauptgewicht auf gesprochener Sprache und Arbeit in kleinen Gruppen. Am Anfang des Semesters gründet jede Gruppe ein eigenes Unternehmen, das sich dann im Laufe des Semesters dynamisch weiterentwickelt. Parallel dazu werden systematisch Wortschatz und sprachliche Formulierungen zu solchen Themen wie Firmenstrukturen, Meetings, Verhandlungen, Marketing, Produktion und Verkauf, Finanzen, Erfassen von Berichten sowie Präsentationen kennengelernt, damit die Teilnehmer die sprachlichen Mittel beherrschen, jeden Schritt der Simulation auf Englisch zu bewältigen. Zu den Höhepunkten des Kurses gehören eine simulierte Messe, ein Einstellungsverfahren und die Gruppenpräsentation. In Technical English werden ein technischer Grundwortschatz und typische Ausdrucksformen technischer Kommunikation erworben und praktisch angewandt.
Recommended reading	Lehrbuch (je nach Kursstufe), PowerPoint-Folien, Tafelmitschrift, Übungsblätter, Video/DVD, Internetrecherchen
Exams	Exercise 1 Semester (not graded)
Comments	Vorlesungsteilnahme, Kurzvorträge fachlichen Inhalts sowie die Moderation der anschließenden Diskussion, Erstellung von Zusammenfassungen gehörter Fachvorträge und Gruppenarbeiten .

Module Business Administration and Service Management

Internal number	INFB3507
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	Individual exams

Lecture Business Administration

Internal number	INFB3517
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	Students are introduced to the basic concepts of business administration. They learn about economic processes and relationships and are familiarized with the typical processes and requirements in a company. They are able to name and outline the various areas of business administration. With the help of various tools and concepts, students are able to describe and analyze the situation of a company. In addition, students will be able to calculate and analyze various key figures (KPI) that provide information about the performance of a company. As part of the Business Administration lecture, the areas of economic environment (economics), organization, investment and financing, marketing and accounting are dealt with in depth so that students gain a holistic overview of how a company functions and the resulting requirements.
Recommended reading	- Slides - Case studies - Exercises
Exams	Written Exam 90 Min. (graded)
Comments	

Lecture IT Service Management

Internal number	INFB3527
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 60 Min. (graded)
Comments	

Module Internship Preparation and Roundup

Internal number	INFB4P07
Coordinator	Prof. Dr. Heiko Körner
Scope	6.0 ECTS points, 4.0 Contact hours
Placement	4th Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	Vorstudium
Competences	Students learn important job-related skills that are also relevant for the practical semester. They recognise how projects are managed and results presented using the Scrum process model. Students also learn techniques for the professional creation of scientific documents. To do this, they use common software products such as MS Office, create suitable calculations, evaluate them efficiently and visualise the results in an appealing form. After completing the programme, students will be able to work in Scrum teams, prepare data in a targeted manner and use modern presentation techniques.
Exams	Individual exams

Lecture Internship Preparation

Internal number	INFB4P17
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	The process of academic writing is presented in its entirety. Individual phases are examined step by step and guidelines for successful implementation are developed. The LaTeX typesetting system, which is widely used in the academic environment, is also introduced. Students will create documents in accordance with correct citation practices, among other things. The second course block introduces the Scrum process model. Numerous practical examples are analysed. After attending the course, students will be able to write papers according to common scientific standards. Note: Alternatively, international and refugee students may replace the second block with the seminar "Professionally successful in your new home country - starting an internship and career in Germany" in the Studium Generale.
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	INFB4P27
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	Exercise
Language of instruction	German
Content	The 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. The focus is on the efficient use of MS Office products. Participants in the course will then be able to quickly solve typical tasks.
Recommended reading	- Slides provided by lecturer, individual notes taken by students - General literature on scientific writing (e.g., "Writing scientific English" by Tim Skerns) - General literature / online tutorials on the LaTeX typesetting system
Exams	Exercise 1 Week (not graded)
Comments	Students are expected to attend this course regularly and to actively take part in discussions and practical lab exercises. To pass this course, they must further submit their written assignment by the end of the course (meeting the demands specified by the lecturer in the first session).

Module Internship

Internal number	INFB4PX7
Coordinator	Prof. Dr. Thomas Fuchß
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	INFB4PX17
Lecturer	Prof. Dr. Thomas Fuchß
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	INFB5107
Coordinator	Prof. Dr. Thomas Fuchß
Scope	7.0 ECTS points, 7.0 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	Betriebssysteme, Datenbanken und Kommunikationsnetze 1, Informatik 2, Mensch-Maschine-Kommunikation, Verteilte Systeme 1
Pre-requisites according to the examination regulations	none
Competences	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. 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.
Exams	Written Exam 120 Min. (graded)

Lecture Software Engineering

Internal number	INFB5117.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	With the experience gained during internships in mind, the "Software Engineering" course develops techniques and methods for large-scale structured software development. In addition to the repetition and consolidation of already learned elementary concepts such as: Object, Class, Association, Method, Inheritance or Polymorphism, the focus is on the software development process. Based on their practical experience, the students recognize the challenges that modern, agile software development poses for a structured and organized development process. Building on established process models, such as the Unified Software Development Process (Jacobson, Booch, Rumbaugh), in conjunction with Scrum and UML as a description language, students are given a framework to master this challenge. They learn to act independently in an agile environment and to make development decisions and document them using UML. In the associated practical course, the first iteration of a software development is carried out - from gathering the requirements to the creation of an analysis and design model up to the implementation in Java. The students not only learn what is hidden behind terms such as use-case-driven, architecture-oriented, iterative, incremental, and component-based, they also experience it and thereby learn to participate in an agile development team.
Recommended reading	Slides, videos, textbooks, and other literature: - 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	INFB5117.b
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	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. 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.
Recommended reading	- 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	INFB5127
Lecturer	Prof. Dr. Thomas Fuchß
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	Accompanying the software engineering lecture this course project covers a complete step in a modern software development process. Beginning with requirement engineering and analysis, central use cases are designed and finally implemented in Java. By this students learn more than facts, they get experiences and they understand the meaning of terms like architecture-oriented, iterative, incremental, or component-based.
Recommended reading	Slides, videos, textbooks, and other literature: - 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	Laboratory Work 1 Semester (not graded)
Comments	Attended teamwork

Lecture New Lecture

Internal number	INFB5137
Lecturer	Prof. Dr. Christian Zirpins
Scope	1.0 ECTS points, 1.0 Contact hours 30 Stunden gesamt, davon 15 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German

Content	
Recommended reading	
Exams	Laboratory Work 1 Semester (not graded)
Comments	

Module Databases and Communication Networks 2

Internal number	INFB5207
Coordinator	Prof. Dr. Zoltán Nochta
Scope	5.0 ECTS points, 4.0 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	Datenbanken und Kommunikationsnetze 1
Pre-requisites according to the examination regulations	none
Competences	
Exams	Written Exam 120 Min. (graded)

Lecture Databases 2

Internal number	INFB5217.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 Cloud Computing

Internal number	INFB5217.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	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	Module exam

Comments	

Module Computer Graphics with Laboratory

Internal number	INFB5307
Coordinator	Prof. Dr. Christian Pape
Scope	5.0 ECTS points, 3.0 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	Visual cognition and its creation through modern computer graphics, as well as color models, textures and graphic effects are understood in basic theoretical details as well as in practical application.
Exams	Individual exams

Lecture Computer Graphics

Internal number	INFB5317
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	Coordinate systemy and their transformations, models and their projection, transformation pipeline. Light and color, color models in computer graphics, coding of colors and brightness, lighting and shading models, visual realism, non-photorealistic rendering. Graphics processors, displays and human interface devices
Recommended reading	- Slides of presentation - Steve Marschner, Peter Shirley. Fundamentals of Computer Graphics. O'Reilly. - John Vince. Mathematics for Computer Graphics. Springer. - Matt Pharr, Wenzel Jakob, Greg Humphreys. Physically based Rendering. https://pbrt.org/
Exams	Written Exam 90 Min. (graded)
Comments	

Lecture Computer Graphics Laboratory

Internal number	INFB5327
Lecturer	Prof. Dr. Christian Pape
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	

Module Student Research Project

Internal number	INFB5407
Coordinator	Prof. Dr. Heiko Körner
Scope	5.0 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 are able to independently apply the knowledge acquired during their studies to a completed task. They analyse the problem, create a concept, think about an implementation and then implement it independently. In addition to the purely practical work, they produce documentation. The ability to defend their own work is put into practice in a colloquium. The research project thus serves as ideal preparation for the final thesis, in which the students will deal with a new problem in a very similar way.
Exams	Individual exams

Lecture Student Research Projekt

Internal number	INFB5417
Lecturer	Alle Dozenten
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Hands-on Experience
Language of instruction	German
Content	A student research project is the independent processing of a topic in the field of software or hardware. The aim is to carry out a practical task; however, work in the areas of evaluation or literature research is also possible. The students analyse the task and research which tools can be used to best implement the task. They then apply these accordingly. Comprehensive documentation must be prepared for the research project, covering all steps of the task and completion (e.g. the exact problem definition, the concept, the implementation, operating instructions and more). The scope and exact nature of this documentation is determined according to the requirements of the work. The research project is thus a preparation for the later final thesis, which the students will write according to very similar guidelines.
Recommended reading	
Exams	Homework 1 Semester (not graded)
Comments	All work will be individual work and will include basic literature research, system analysis, coding, documentation, and oral presentation.

Lecture Student Research Projekt Colloquium

Internal number	INFB5427

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 ERP Systems

Internal number	INFB5507
Coordinator	Prof. Dr. rer. pol. Mathias Philipp
Scope	5.0 ECTS points, 4.0 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	Betriebswirtschaftslehre und IT-Service-Management
Pre-requisites according to the examination regulations	none
Competences	The students shall learn to think in business processes on the basis of integrated ERP systems. They should recognize the interdependence of operational functions, and thus deepen their basic economical knowledge about processes (horizontal integration). Further, the students recognize the need for vertical integration as a prerequisite for the development of ERP systems for management information systems. In addition the students learn architecture, design and development of ERP systems.
Exams	Individual exams

Lecture ERP Systems

Internal number	INFB5517
Lecturer	Prof. Dr. rer. pol. Mathias Philipp
Scope	3.0 ECTS points, 3.0 Contact hours 90 Stunden gesamt, davon 45 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 ERP Laboratory

Internal number	INFB5527
Lecturer	Prof. Dr. rer. pol. Mathias Philipp
Scope	2.0 ECTS points, 1.0 Contact hours 60 Stunden gesamt, davon 15 Stunden Kontaktstudium.
Type/mode	Laboratory Course
Language of instruction	German

Content	Contents: The materials provide an introduction to Global Bike Inc. (GBI), an SAP ERP navigation case study, exercises and case studies for the following SAP ERP Modules: Sales (SD), Materials Management (MM), Production Planning and Control (PP), Financial Accounting (FI), Controlling (CO) . Independent work individually or as a group as a couple of the case studies in an SAP ERP system. Software: SAP ECC 6.0, Database: GBI Alternative to the laboratory: Introduction to the ABAP programming language with practical exercises in the SAP NetWeaver Application Server ABAP. Learning objectives include: language elements Workbench database, selection screens, function modules, ABAP OO.
Recommended reading	Recommended reading: Extensive material for introduction to the topic as well as on each case study. Provisioning is about the blended learning and e-learning platform ILIAS.
Exams	Exercise 1 Semester (not graded)
Comments	Kind of work: Labor participation and preparation of laboratory results. Exercises and case studies from the curriculum GBI powered by t he SAP University Alliances community. Some case studies have been extended to more detailed tasks.

Module Elective courses 1

Internal number	INFB5607
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 student should be able to lay his emphasis on individual interests.
Exams	Individual exams

Lecture New Lecture

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	- 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	Verbal Exam 20 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	The BSI's IT-Grundschutz provides a good basis for meeting the challenges of IT security management in a professional manner way to do justice. Students learn how to structure information security, how to systematically look for weak points, and the appropriateness of implementation to examine protective measures and to develop and update security concepts fit the business processes, tasks and organizational structures of a company institution and in general meet recognized standards.
Recommended reading	Lecture slides MC/MR practice questions in ILIAS BSI-Standards zum IT-Grundschutz BSI IT-Grundschutz-Kompendium ISO/IEC 27000 Normenreihe BSI: Online-Kurs IT-Grundschutz Thomas W. Harich: IT-Sicherheitsmanagement - Praxiswissen für IT Security Manager, mitp Verlag Jacqueline Naumann (Autor): ISO/IEC 27001 ISO/IEC 27002 und IT-Grundschutz: Schnelleinstieg Informationssicherheit
Exams	Written Exam 90 Min. (graded)
Comments	

Lecture New Lecture

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 New Lecture

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 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

Internal number	I W772
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	Written Exam 60 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 partt, the basic technologies and limitations of mobile devices are shown. The second part examins different development strategies like native applications, device independend 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	Leacture with exercise

Lecture Cloud Computing

Internal number	I W913
Lecturers	Dipl. Inform. (FH) Georg Magschok Dipl. Inform. (FH) Michael Fischer
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
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	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 systrms 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	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. During the course students acquire, among others, the following abilities: - 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	- 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	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	

Module Embedded Software

Internal number	INFB6107
Coordinator	Prof. Dr. Dirk Hoffmann
Scope	5.0 ECTS points, 4.0 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Informatik 2, Technische Informatik 1, Technische Informatik 2
Pre-requisites according to the examination regulations	Modul Internship
Competences	The courses of this module teach the students the fundamental concepts about embedded systems. Students know the basic terminology about embedded systems and they are able to distinguish different types of real-time systems from each other. By studying the CAN bus technology, students get to know a typical communication medium and acquain with the CDMA technology an important coding scheme for data transmission. Students are able to implement typical programming tasks in the field of embedded systems in C. Furthermore, students learn how to deal with software tools that are suited for analyzing and developing embedded systems.
Exams	Individual exams

Lecture Embedded Software

Internal number	INFB6117
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	The lecture introduces software development methods for embedded real time systems. Embedded systems within the meaning of this lecture are systems that are controlled by computer software and are part of a larger system whose primary function is not compute-oriented. For real-time systems, the result has to be computed within a specified time frame. In particular, topics from the following areas are covered: Design and architecture of automotive ECUs, bus architectures, data transmission encodings, Embedded C.
Recommended reading	Slides, blackboard, exercise sheets
Exams	Written Exam 90 Min. (graded)
Comments	Lecture

Lecture Embedded Software Laboratory

Internal number	INFB6127
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	
Recommended reading	
Exams	Laboratory Work 1 Semester (not graded)
Comments	

Module Computer architecture and Autonomous Systems

Internal number	INFB6207
Coordinator	Prof. Dr. Martin Sulzmann
Scope	5.0 ECTS points, 4.0 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Betriebswirtschaftslehre und IT-Service-Management, Technische Informatik 1
Pre-requisites according to the examination regulations	Modul Internship
Competences	Autonomous systems: Students apply concurrent programming methods to the practical implementation of autonomous systems. They gain insight into formal modeling and specification notations for describing and verifying complex autonomous systems. The students are able to use suitable notations depending on the application. Using practical examples, they recognize both the possibilities and the limits of formal methods. Thye apply concurrent programming methods to the practical implementation of autonomous systems. Computer architecture: Students deal with the most important principles of organization and design of microprocessors. Microprocessors are the central building blocks of practically all current computer systems, from smartphones to supercomputers and thus the digital world. The focus is on programming 64-bit ARMv8 processors as well as the logical design of processors using Verilog. In addition to teaching the theoretical basics, a lot of emphasis is placed on practical programming exercises.
Exams	Written Exam 120 Min. (graded)

Lecture Computer architecture

Internal number	INFB6217.a
Lecturers	Prof. Dr. Martin Sulzmann Dr. rer. nat. Peter Altevogt
Scope	3.0 ECTS points, 2.0 Contact hours 90 Stunden gesamt, davon 30 Stunden Kontaktstudium.
Type/mode	Lecture
Language of instruction	German

Content	In the lecture we will deal with the most important principles of organization and design of microprocessors. Microprocessors are the central building blocks of practically all current computer systems, from smartphones to supercomputers and thus of the complete digital world.
	The focus of the lecture will be the programming of 64-bit ARMv8 processors and the logical design of processors with the help of Verilog. In addition to teaching the theoretical basics, great emphasis is placed on practical programming exercises.
	The following topics are covered:
	- Computer Abstractions and Technology - Instructions: Language of the Computer - Arithmetic for Computers - Performance Analysis - Logic Design with Verilog - The Processor - The Memory Hierarchy - Parallel Processors
Recommended reading	Computer Organization and Design : The Hardware/Software Interface , ARM Edition, D.A. Patterson, J.L. Hennessy, Elsevier Inc. 2017
Exams	Module exam
Comments	In general, the lectures start with a discussion of the exercises associated with the previous lecture. Afterwards we address new topics. Questions and feedback are always welcome!

Lecture Autonomous Systems

Internal number	INFB6217.b
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	Students in this course
	- obtain an overview of methods for formal modelling and verification of autonomous/reactive systems,
	- get to know programming concepts to master highly concurrent/distributed systems.l
	Selection of topics covered:
	(1) Modeling and Verification
	- Statemachine models Mealy/Moore Communication statemachines Timed statemachines Harel Statecharts
	- Specification Reguar languages Temporal logic (CTL)
	- Modelchecking
	- Testcasegeneration via modelchecking
	- Run-Time Verification
	- Coverage criteria
	- UPPAAL
	(2) Concurrency and Synchronisation
	- Shared memory Threads and Locks Lock-free Algorithms Software Transactional Memory
	- Message-passing Foundations: CSP, Join Haskell, Go

Recommended reading	- Lecture notes and slides
	- Exercises
	- Selection of textbooks: Real World Haskell by Bryan O'Sullivan, Don Stewart, and John Goerzen Real-Time Systems and Programming Languages (Fourth Edition) Ada 2005, Real-Time Java and C/Real-Time POSIX by Alan Burns and Andy Wellings Principles of Model Checking Christel Baier and Joost-Pieter Katoen Real-Time UML: Developing Efficient Objects for Embedded Systems (2nd Edition)
Exams	Module exam
Comments	Mix of lecture and theoretical and practical exercises.

Module Communication Competence

Internal number	INFB6307
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	6.0 ECTS points, 6.0 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Praxistätigkeit
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	INFB6317
Lecturer	Alle Dozenten
Scope	5.0 ECTS points, 5.0 Contact hours 150 Stunden gesamt, davon 75 Stunden Kontaktstudium.
Type/mode	Seminar
Language of instruction	German
Content	
Recommended reading	
Exams	Homework 1 Semester (not graded)
Comments	

Lecture Presentation

Internal number	INFB6327
Lecturer	Alle Dozenten
Scope	1.0 ECTS points, 1.0 Contact hours 30 Stunden gesamt, davon 15 Stunden Kontaktstudium.
Type/mode	Seminar
Language of instruction	German
Content	
Recommended reading	
Exams	Verbal Exam 20 Min. (graded)
Comments	

Module Key Qualification

Internal number	INFB6407
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	6.0 ECTS points, 6.0 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Sprachkompetenz
Pre-requisites according to the examination regulations	Modul Internship
Competences	The job marked has an increased demand for graduates with certain key skills. In the context of globalization the most important skills are the ability to communicate with people of other culture groups and basic knowledge of laws to write contract documents. The third important capability the students will learn is a good self-manifestation to present their work results in an optimal manner.
Exams	Individual exams

Lecture Intercultural Communication

Internal number	INFB6417
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	- Central aspects of intercultural communication (e.g. cultural determined standards, behaviors, values, verbal and non verbal communication) with special interest in differences between object oriented cultures such as Germany and relationship-oriented cultures such as China and India - Influence of different cultural standards on international business relations (e.g. Business preparation, negotiations, personnel management, decision making, conflict resolution etc.) - Empirical investigations (e.g. Geert Hofstede, Fons, Trompenaars etc.) - Case studies from different cultural areas (e.g. Germany, France, the USA, Japan, China, India etc.)
Recommended reading	
Exams	Exercise 1 Semester (not graded)
Comments	

Lecture Presentation techniques

Internal number	INFB6427
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	
Recommended reading	
Exams	Verbal Exam 20 Min. (graded)
Comments	

Lecture Law

Internal number	INFB6437
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	INFB6507
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	8.0 ECTS points, 8.0 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	Modul Internship
Competences	
Exams	Individual exams

Lecture New Lecture

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	German
Content	
Recommended reading	
Exams	Module exam
Comments	

Lecture IoT Internet of Things - Use cases and algorithms

Internal number	I W000x
Lecturer	Prof. Dr. Christine Preisach
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 20 Min. (graded)
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	
Recommended reading	
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
Lecturers	RA Josua Neudeck
	RA Jeremias Held
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 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 securingnetworks, attack patterns and defense mechanisms againstthem. Basics of, variants of and defense against malicioussoftware. Analysis and judgement of security mechanismsand related activities. Excercies at the end of each semester provide practicalexperience in dealing with security topics.
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	Presentation with a lot of room for discussions andinteraction. 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 Advanced Embedded Software

Internal number	I W300
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	The lecture introduces the concepts of digital signal processors (DSPs). Specifically, the following topics are covered: History, DSP core principles, integer and floating point number representation, digital filter, vertex shader, Low-power design
Recommended reading	Slides, blackboard, exercise sheets
Exams	Written Exam 90 Min. (graded)
Comments	Lecture

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	Prof. Dr. Thomas Fuchß
	M.Sc. Alexander Hasel
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	Consulting market, basic methods and analysis tools, peculiarities of IT consulting, basis types of case studies.
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 New Lecture

Internal number	I W779
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	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	This lecture introduces various concepts and areas of sound design. Besides technical basics to:
	- Sound theory and waves - Recording technology, storage and processing - sound synthesis creative applications of sound design like: - Audio processing - music and audio production - music theory - use and effect of sound in applications or films will also be thematized. The lecture teaches how professional soundscapes and moods can be created to achieve desired effects. The lecture is accompanied by exercises in which the knowledge is practically applied. The content of the assignments ranges from editing audio tracks, sound synthesis and scoring of film scenes to the development of sound brands.
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	- Defining a business process and types of business processes - Analyzing business processes - Modelling business processes - Tools for modelling business processes - Simulating business processes with ARENA - Enterprise SOA: SAP's vision of a service-oriented-architecture - KPI's for the evaluation of 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	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. The course provides students with a broad basic knowledge of the core business processes, business interrelations, and integration of business processes in SAP ERP. 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.
Recommended reading	cource book
Exams	Written Exam 90 Min. (graded)
Comments	10-day training: in the moring: theory in the evening: laboratory last day: SAP certification 3 hours multiple chioce and multiple responce questions

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	This course covers the following areas. 1. Embedded software engineering 2. Programming language design and analysis. We will use the Go programming language to cover various aspects of programming language design and analysis. - Introduction to Go, a C style language with garbage collection. - Type inference - Method overloading Go interfaces Connection to other overloading approaches - Syntax analysis - Program analysis - Concurrency Multi-threading Message-passing Shared memory and data races
Recommended reading	- lectures notes and slides - exercies - online references
Exams	Written Exam 90 Min. (graded)
Comments	Prerequisistes: Softwareprojekt + Autonome Systeme

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	
Recommended reading	
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 New Lecture

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 New Lecture

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 New Lecture

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	
Recommended reading	
Exams	Hands-on Work 1 Semester (not graded)
Comments	

Lecture New Lecture

Internal number	WIB179
Lecturer	Prof. Dr. Ingo Stengel
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	

Module Elective courses 3

Internal number	INFB7107
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	8.0 ECTS points, 8.0 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	none
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 Emedded firmware for the Internet of Things

Internal number	I W161
Lecturer	M.Sc. Nils Ruf
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 Practical application of network engineering and system operations

Internal number	I W162
Lecturer	B.Sc Erik Dyka
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	Laboratory Work 1 Semester (graded)
Comments	

Lecture Game Design

Internal number	I W163
Lecturer	M.Sc. Kevin Torner
Scope	4.0 ECTS points, 4.0 Contact hours 120 Stunden gesamt, davon 60 Stunden Kontaktstudium.

Type/mode	Hands-on Experience
Language of instruction	German
Content	This course will give you an insight into the multifaceted world of game design. You will deal with fundamental questions such as the definition of a game, the constituent elements of a game and what actually constitutes fun. The aim of the course is to provide you with basic tools to help you analyze and design games.
Recommended reading	- Jesse Schell, "The Art of Game Design: A book of lenses", CRC Press. 1st edition, 2008. - Ernest Adams, Joris Dormans, "Game Mechanics: Advanced Game Design", New Riders Publishing, 1st edition, 2012. - Raph Koster, "Theory of Fun for Game Design", O'Reilly Media, 2nd edition, 2013.
Exams	Homework 1 Semester (graded)
Comments	

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	The course covers practical aspects from the field of software quality assurance. Each semester, a specific topic is selected and thoroughly discussed in multiple short student presentations.
Recommended reading	Hoffmann: "Software-Qualität", Springer-Verlag, 2013
Exams	Presentation 20 Min. (graded)
Comments	Lecture, student presentations

Lecture New Lecture

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 New Lecture

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 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 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	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. 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 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 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.
Recommended reading	
Exams	Verbal Exam 20 Min. (not graded)
Comments	

Lecture New Lecture

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 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	B.Sc. Stefan Schorn 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	Einführung in die Programmiersprache ABAP mit praktischen Übungen im SAP NetWeaver Application Server ABAP. Die Studenten sollen Sprachelemente, Workbench, Datenbank, Selektionsbilder, Funktionsbausteine und ABAP OO kennen lernen und eigenständig auf neue Fragestellungen anwenden können.
Recommended reading	Vorlesungsmaterial vollständig in PowerPoint-Folien, Tafelaufschrieb bei interaktiver Erarbeitung von Kernproblemstellungen, Übungsblätter und selbständige praktische Übungen am SAP System.
Exams	Written Exam 90 Min. (graded)
Comments	Seminaristischer Unterricht mit hohem Laboranteil

Lecture New Lecture

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	
Recommended reading	
Exams	Hands-on Work 1 Semester (graded)
Comments	

Lecture New Lecture

Internal number	SHELLSST
Lecturer	Prof. Dr.-Ing. Holger Vogelsang
Scope	5.0 ECTS points, 4.0 Contact hours 150 Stunden gesamt, davon 60 Stunden Kontaktstudium.
Type/mode	Project Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Student Research Project 1 Semester (graded)
Comments	

Module Scientific Working

Internal number	INFB7207
Coordinator	Prof. Dr. Heiko Körner
Scope	5.0 ECTS points, 2.0 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	Mensch-Maschine-Kommunikation, Projektarbeit
Pre-requisites according to the examination regulations	Modul Internship
Competences	Students learn the importance of a method-based approach in computer science and the basic principles of computer science research. To this end, they search specifically for suitable scientific literature and understand how to read it and how it can be used for their own work (research, evaluate, cite). They are then able to write their own scientific paper (topic formulation, problem definition, objectives, structuring and organisation, quality assurance) with confidence.
Exams	Individual exams

Lecture Scientific Working

Internal number	INFB7217
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	
Recommended reading	- "Informatik-Handbuch" von Peter Rechenberg, Gustav Pomberger, Hanser Fachbuch, 2006, ISBN: 3446218424 - "Die schriftliche Arbeit - kurz gefasst" von Jürg Niederhauser, Bibliographisches Institut, Mannheim, 2006, ISBN: 3411042346
Exams	Exercise 1 Month (not graded)
Comments	

Module Thesis

Internal number	INFB7307
Coordinator	Prof. Dr. Heiko Körner
Scope	12.0 ECTS points, 0.0 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	Betriebssysteme, Betriebswirtschaftslehre und IT-Service-Management, Computergrafik mit Labor, Datenbanken und Kommunikationsnetze 1, Datenbanken und Kommunikationsnetze 2, ERP-Systeme, Einführung in das Maschinelle Lernen, Embedded Software, Informatik 1, Informatik 2, Kommunikationskompetenz, Mathematik 1, Mathematik 2, Mensch-Maschine-Kommunikation, Praxistätigkeit, Praxisvor- und -nachbereitung, Projektarbeit, Rechnerarchitektur und Autonome Systeme, Schlüsselkompetenzen, Softwareengineering und Verteilte Systeme 2, Softwareprojekt, Sprachkompetenz, Technische Informatik 1, Technische Informatik 2, Verteilte Systeme 1, Wissenschaftliches Arbeiten
Pre-requisites according to the examination regulations	Modul Internship
Competences	Students are able to work independently on a practical problem or research task within a specified period of time using scientific methods and knowledge of the subject. They structure the task, check the dependencies, compile the necessary resources and work on the task according to a timetable. The results of the work can then be presented to a specialised audience and used for further work.
Exams	Individual exams

Lecture Thesis

Internal number	INFB7317
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 and knowledge of the subject. They structure the task, compile the necessary resources and work on the problem according to a timetable. They are then able to present the results of their work.
Recommended reading	
Exams	Bachelor Thesis 4 Months (graded)
Comments	All work will be individual work and will include basic literature research, system analysis, coding, documentation, and oral presentation.

Module Final examination

Internal number	INFB7407
Coordinator	Prof. Dr. Heiko Körner
Scope	3.0 ECTS points, 0.0 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	Einführung in das Maschinelle Lernen, Betriebswirtschaftslehre und IT-Service-Management, Kommunikationskompetenz, Technische Informatik 1, Technische Informatik 2, Computergrafik mit Labor, Informatik 1, Informatik 2, Rechnerarchitektur und Autonome Systeme, Datenbanken und Kommunikationsnetze 1, Datenbanken und Kommunikationsnetze 2, Verteilte Systeme 1, ERP-Systeme, Embedded Software, Praxistätigkeit, Praxisvor- und -nachbereitung, Schlüsselkompetenzen, Sprachkompetenz, Mensch-Maschine-Kommunikation, Mathematik 1, Mathematik 2, Wissenschaftliches Arbeiten, Softwareengineering und Verteilte Systeme 2, Softwareprojekt, Projektarbeit, Betriebssysteme, Wahlpflichtfächer 3
Pre-requisites according to the examination regulations	Modul Internship
Competences	Students convincingly present the findings and results achieved within a specialised, application-related piece of work to a knowledgeable audience. They evaluate the content of such work, select the key aspects and present them in a didactically meaningful way. The specialised audience can thus take away the most important added value of the work and use it for their own work.
Exams	Individual exams

Lecture Final examination

Internal number	INFB7417
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 computer science that are related to their final thesis. With the final examination, they prove that they have the competence to work independently on novel problems in computer science.
Recommended reading	
Exams	Verbal Exam 20 Min. (not graded)
Comments	