Hochschule Karlsruhe

Faculty for Computer Science and Business Information Systems

Module manual

Course of studies Computer Science (Bachelor), ER 5

Winter semester 2022/2023

Module Computer Science (Bachelor), ER 5

Module Computer Science 1	
Internal number	INFB110
Coordinator	Prof. Dr. Patrick Baier
Scope	8 ECTS points, 6 Contact hours
Placement	1st Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	
Exams	Individual exams
Lecture Computer Science 1	
Internal number	INFB111
Lecturer	Prof. Dr. Christian Pape
Scope	5 ECTS points, 4 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 120 Min. (graded)
Comments	
Lecture Computer Science 1 Exercise	
Internal number	INFB112
Lecturer	Prof. Dr. Christian Pape
Scope	3 ECTS points, 2 Contact hours
Type/mode	Exercise
Language of instruction	German
Content	The students turn small computer sciences problems into practice (design, implementation with Java, testing, debugging). The students are able to create their own homepage.
Recommended reading	
Exams	Exercise 1 Semester (not graded)
Comments	Practical assignment in a computer laboratory.

Module Computer Engineering 1	
Internal number	INFB120
Coordinator	Prof. Dr. Dirk Hoffmann
Scope	7 ECTS points, 6 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	Written Exam 120 Min. (graded)
Lecture Computer Engineering 1	
Internal number	INFB121
Lecturers	Prof. Dr. Dirk Hoffmann Prof. Dr. Kurt Sutter
Scope	4 ECTS points, 4 Contact hours
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	Module exam
Comments	Lecture
Lecture Computer Engineering 1 Exercise	

Internal number	INFB122
Lecturers	Prof. Dr. Kurt Sutter Prof. Dr. Dirk Hoffmann
Scope	3 ECTS points, 2 Contact hours
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 Theoretical Computer Science 1	
Internal number	INFB130
Coordinator	Prof. Dr. Heiko Körner
Scope	4 ECTS points, 4 Contact hours
Placement	1st Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	Participants of this lecture will be in a position to recognize the fundamental limitations of today's computers when solving important problems. Hence, this course gives an intoduction to the basic areas of modern theoretical computer science. The Chomsky hierarchy helps the students to classify formal languages by their algorithmic complexity. Furthermore, the students use computational models (finite state automata, push-down automata) to represent today's computers and to understand their limits. Due to these limitations, several problems are shown to be unsolveable. Proving all these results requires precise mathematical and logical arguments, and the students are intensively trained to use them correctly.
Exams	Individual exams
Lecture Theoretical Computer Science 1	
Internal number	INFB131
Lecturer	Prof. Dr. Heiko Körner
Scope	4 ECTS points, 4 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	This course gives an introduction to the theory of formal languages. The Chomsky hierarchy will serve as a model to classify these languages by their computational complexity. Modern computers are represented by finite state automatons, showing theier principal limits. The students also learn how to apply several proof techniques. The lecture include the following areas of theoretical computer science: mathematical logic, formal languages, proof techniques, the O-calculus, finite automata, regular languages and expressions, the Chomsky hierarchy, the pumping lemma for regular and context-free languages and the minimization of finite automata by the theorem of Myhill-Nerode. Furthermore, the course covers pushdown automata, the CYK algorithm and closure properties of regular and context-free languages.

Recommended reading	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 90 Min. (graded)
Comments	This course will take place as a pure lecture. Numerous exercises deepen selected areas and will be discussed in tutorials.

Module Mathematics 1	
Internal number	INFB140
Coordinator	Prof. Dr. Frank Schaefer
Scope	8 ECTS points, 6 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	INFB141
Lecturer	Prof. Dr. Frank Schaefer
Scope	5 ECTS points, 4 Contact hours
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	INFB142
Lecturer	Prof. Dr. Frank Schaefer
Scope	3 ECTS points, 2 Contact hours

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	INFB150
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	4 ECTS points, 4 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	INFB151
Lecturer	Mehrere Dozenten
Scope	4 ECTS points, 4 Contact hours
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 90 Min. (graded)

Comments	Lecture participation, short talks, discussions

Module Computer Science 2	
Internal number	INFB210
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	7 ECTS points, 6 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	Theoretische Informatik 1, Informatik 1
Pre-requisites according to the examination regulations	none
Competences	The module is based on module "Informatik 1". The students will learn to develop a computer science project using object oriented techniques in Java. They become acquainted with advanced analysis, design and realization competences as well as abstract data types and their implementation by data structures and algorithms. The students will learn to choose an appropriate data type depending on the application area and the given runtime conditions. Furthermore they will be familiar with graphical user interfaces and object-based programming with JavaScript.
Exams	Individual exams
Lecture Computer Science 2	
Internal number	INFB211
Lecturers	Dipl.-Ing. Christian Meder Prof. Dr.-Ing. Holger Vogelsang
Scope	4 ECTS points, 4 Contact hours
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 Computer Science 2 Exercise

Internal number	INFB212
Lecturers	B.Sc. Manuel Vogel Dr. Martin Holzer Prof. Dr.-Ing. Holger Vogelsang
Scope	3 ECTS points, 2 Contact hours
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	INFB220
Coordinator	Prof. Dr. Martin Sulzmann
Scope	5 ECTS points, 4 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	Informatik 1
Pre-requisites according to the examination regulations	none
Competences	The students learn to apply the theoretical knowledge of "Informatik 2" using the programming language Java. They have design and implement projects with an increasing level of difficulty. The main topics are: - Practicing object oriented programming techniques - Preferring abstractions over concrete implementations - Modeling class and package diagrams before starting an implementation - Code quality assurance by writing automated tests - Teamwork
Exams	Individual exams
Lecture Software Laboratory	
Internal number	INFB221
Lecturers	Prof. Dr. Heiko Körner Prof. Dr. Christian Pape Prof. Dr. Martin Sulzmann
Scope	5 ECTS points, 4 Contact hours
Type/mode	Laboratory Course
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	Laboratory Work 1 Semester (not graded)
Comments	Laboratory work in small groups

Module Distributed Systems 1 and Theoretical Computer Science 2	
Internal number	INFB230
Coordinator	Prof. Dr. Heiko Körner
Scope	5 ECTS points, 4 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	Theoretische Informatik 1, Informatik 1
Pre-requisites according to the examination regulations	none
Competences	The students learn the theoretical foundations of computability and complexity theory. Certain undecidable problems are shown to be unsolvable with modern computers despite of their today's powerful hardware. Other intractable problems prove to be theoretically solvable, but with an unacceptable amount of computational time. Students also learn to identify as well as classify goals and problems of distributed systems. They sketch generic architectures, processes, communication as well as naming techniques and apply them to Web applications and services. Students distinguish software technologies for Web-based systems and evaluate their use cases.
Exams	Written Exam 120 Min. (graded)
Lecture Distributed Systems 1	
Internal number	INFB231.a
Lecturer	Prof. Dr. Christian Zirpins
Scope	3 ECTS points, 2 Contact hours
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.

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	Module exam
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 Theoretical Computer Science 2

Internal number	INFB231.b
Lecturer	Prof. Dr. Heiko Körner
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	The course deals with the computational limits of modern computer systems, showing the undecidability and intractability of important problems. Several computational conceps like Turing machines and WHILE-programs are presented. Other topics include the Church-Turing thesis, the theory of NP-completeness and zero-knowledge-proofs. For this course some basics concerning theoretical computer science are required (regular languages, finite automata, O-calculus, etc.). This knowledge can be purchased in the lecture Theoretical Computer Science I.
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.

Module Mathematics 2	
Internal number	INFB240
Coordinator	Prof. Dr.-Ing. Astrid Laubenheimer
Scope	7 ECTS points, 6 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	INFB241.a
Lecturer	Prof. Dr.-Ing. Astrid Laubenheimer
Scope	4 ECTS points, 4 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Module exam
Comments	
Lecture Statistics	
Internal number	INFB241.b
Lecturer	Prof. Dr. Reimar Hofmann
Scope	3 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Module exam
Comments	

Module Computer Engineering 2	
Internal number	INFB250
Coordinator	Prof. Dr. Christian Langen
Scope	7 ECTS points, 6 Contact hours
Placement	2nd Semester
Pre-requisites with regard to content	Technische Informatik 1
Pre-requisites according to the examination regulations	none
Competences	The students are familiar with the foundations required for design of embedded systems. They know computer aided hardware design techniques. They are able to implement simple designs using the hardware design lanquage VHDL. Additionally, students are familiar with internal functions of typical processors. They are able to implement the hardware related software parts using the "C" programming languege including the use of typical peripherals. All knowledge gained is reinforced by practical work in the laboratory.
Exams	Individual exams
Lecture Computer Engineering 2	
Internal number	INFB251
Lecturer	Prof. Dr. Christian Langen
Scope	4 ECTS points, 4 Contact hours
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	INFB252
Lecturer	Prof. Dr. Christian Langen
Scope	3 ECTS points, 2 Contact hours
Type/mode	Laboratory Course
Language of instruction	German
Content	Lab experiments will be conducted using: - Digital Circuits - Microcontrollers - Peripherals - Timers and Counters
Recommended reading	Exercises, equipment provided and various manuals and other support material.
Exams	Exercise 1 Semester (not graded)
Comments	All laboratory work will be group work. It will include the conduct of the experiment, demonstration of the required result and be prepared to answer questions on the work and the results. Groups are on their own and are required to come to the laboratory prepared to conduct the exercise. Each group will prepare a final documentation of the exercise.

Module System Software and System Programming	
Internal number	INFB310
Coordinator	Prof. Dr. Thomas Fuchß
Scope	9 ECTS points, 8 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	Informatik 1, Informatik 2, Softwarelabor, Theoretische Informatik 1
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	INFB311
Lecturer	Prof. Dr. Thomas Fuchß
Scope	4 ECTS points, 4 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 120 Min. (graded)
Comments	
Lecture System Programming	
Internal number	INFB312
Lecturer	Prof. Dr. Carsten Sinz
Scope	5 ECTS points, 4 Contact hours
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	INFB330
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	7 ECTS points, 6 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	Theoretische Informatik 1, Informatik 1, Informatik 2
Pre-requisites according to the examination regulations	none
Competences	The students know the current models of communication and database technology and are able to classify and evaluate unknown, e.g. new systems. They are familiar with the advantages and disadvantages of different architectures and will be considered when selecting the architecture for their own products. In the database area, they are largely familiar with the SQL-92 standard and are able to select, set up and safely operate database systems. The students are able to analyze given facts, to transfer these facts into a normalized data model, to create this data model under SQL and to use the resulting SQL databases under object-oriented languages. In the field of communication networks, students know the individual layers of the TCP/IP layer model and understand the tasks and service models of each layer. They can characterize and compare different protocols of each layer. They can analyze the requirements of a given application, select the most suitable protocols for that application, and combine them into a functioning network stack. You can also use the client-server approach and socket programming techniques to solve your own problems.
Exams	Written Exam 120 Min. (graded)
Lecture Databases 1	
Internal number	INFB331.a
Lecturer	Prof. Dr.-Ing. Holger Vogelsang
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	Introduction to information systems, basics of database systems, database organization, data models, database schema, architecture: 3-layer model, client-server architecture, language interfaces: SQL92 (queries, DDL, DML), SQL:2003 (object-oriented extensions, NF2), JDBC, recovery and transactions, ERM, mapping of 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	INFB331.b
Lecturer	Prof. Dr. Oliver P. Waldhorst
Scope	2 ECTS points, 2 Contact hours
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	INFB332
Lecturer	Prof. Dr.-Ing. Holger Vogelsang
Scope	3 ECTS points, 2 Contact hours
Type/mode	Laboratory Course

Language of instruction	German
Content	Adatabase application for a flight reservation system is designed and prototypically implemented. This includes setting up a DB scheme, the design and testing of SQL queries, the use of transactions and transaction levels, as well as programming a seat reservation transaction with Java, JDBC and SQLJ-based on Oracle.
Recommended reading	Sample database, JUnit test cases, test-GUI; Textbooks: - "Grundlagen von Datenbanksystemen", Ausgabe Grundstudium (Taschenbuch) von Ramez Elmasri, Shamkant B. Navathe, Pearson, 2005, ISBN: 3827371538 - "Datenbanksysteme" von Alfons Kemper, Andre Eickler, Oldenbourg, 2006, ISBN: 3486576909 - "Datenbanken & Java. JDBC, SQLJ, ODMG und JDO" von Gunter Saake, Kai-Uwe Sattler, Dpunkt Verlag, 2003, ISBN: 3898642283
Exams	Exercise 1 Semester (not graded)
Comments	Supervised laboratory with final presentation on the computer, self-work, preparation and after working of lab sessions, prepare a reportof the laboratory tasks.

Module Man-Machine-Communication	
Internal number	INFB340
Coordinator	Prof. Dr. Ulrich Bröckl
Scope	4 ECTS points, 3 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	Informatik 1
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. By means of periodic evening events they get basic understanding of association work, concretely the work of the Usability Professionals' Association (UPA).
Exams	Individual exams
Lecture Man-Machine-Communication Design	
Internal number	INFB341
Lecturer	Prof. Dr. Ulrich Bröckl
Scope	2 ECTS points, 2 Contact hours
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 Min. (graded)
Comments	
Lecture Man-Machine-Communication Design	
Internal number	INFB342
Lecturer	B.Sc. Valeria Zitz
Scope	2 ECTS points, 1 Contact hours
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.

Module Antomation and Declarative Programming	
Internal number	INFB350
Coordinator	Prof. Dr. Norbert Link
Scope	6 ECTS points, 5 Contact hours
Placement	3rd Semester
Pre-requisites with regard to content	Technische Informatik 2
Pre-requisites according to the examination regulations	none
Competences	
Exams	Written Exam 120 Min. (graded)
Lecture Automation	
Internal number	INFB351.a
Lecturer	Prof. Dr. Norbert Link
Scope	2 ECTS points, 2 Contact hours
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	Module exam
Comments	
Lecture Declarative Programming	
Internal number	INFB351.b
Lecturer	Prof. Dr. Christian Pape
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	English
Content	
Recommended reading	
Exams	Module exam

Comments	
Lecture Automation Laboratory	
Internal number	INFB352
Lecturer	Dipl. Inf. (FH) Oktavian Gniot
Scope	2 ECTS points, 1 Contact hours
Type/mode	Laboratory Course
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 Business Administration	
Internal number	INFB360
Coordinator	Prof. Dr. Uwe Haneke
Scope	4 ECTS points, 4 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	INFB361
Lecturer	Prof. Dr. Uwe Haneke
Scope	4 ECTS points, 4 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	Es werden folgende Kenntnisse vermittelt: - Java-Grundkenntnissen: Variablen, Kontrollstrukturen, Methoden, Klassen, Objekte, Felder, Schnittstellen, Dokumentation mit Javadoc, Testen mit JUnit, Programmierkonventionen. - Rekursion als Problemlösungs- und Programmierkonzept. - Objekt-orientierte Analyse und Entwurf mit Hilfe der UML (Grundla-gen von Aktivitäts-, Klassen-, Objekt- und Paketdiagramm). - Entwurf und die Aufwandsabschätzung von Algorithmen anhand typi-scher Such- und Sortierverfahren sowie Backtracking. - Entwurfsmethodiken wie die Schrittweise Verfeinerung, Bottom-Up, Top-Down und Teile-und-Beherrsche.
Recommended reading	Tafelmitschrift, Übungsaufgaben mit Lösungen, Java-Programme und deren Dokumentation als Javadoc. Weitere Java-Übungsaufgaben mit Lösungen zur Vertiefung. Joachim Goll, Cornelia Heinisch, "Java als erste Programmiersprache: Ein professioneller Einstieg in die Objektorientierung mit Java", Springer Vieweg, 7. Auflage, 2014. James Gosling, Bill Joy, Guy Steele, Gilad Bracha, Alex Buckley, "The Java Language Specification, Java SE 8 Edition", Oracle America, 8. Auflage, März 2015
Exams	Written Exam 90 Min. (graded)
Comments	Vorlesungsteilnahme. Lösen einfacher Aufgaben während der Vorlesung.

Module Internship Preparation and Roundup	
Internal number	INFB4P0
Coordinator	Prof. Dr. Heiko Körner
Scope	6 ECTS points, 4 Contact hours
Placement	4th Semester
Pre-requisites with regard to content	Informatik 1
Pre-requisites according to the examination regulations	Vorstudium
Competences	The students improve their vocational skills which are also important for the internship. Topics include managing projects, time and cost planning. The students will lean how to use standard software like the MS-Office products for evaluating calculations and presenting them attractively. In addition to that, macro skripts will be taught to solve recurring problems.
Exams	Individual exams
Lecture Internship Preparation	
Internal number	INFB4P1
Lecturers	Dr. Martin Holzer B.Sc. Veit Richter
Scope	3 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	This course deals with the general handling of MS Office products and gives specifically an introduction to the main functions of MS-Excel. Topics include input methods, formulas, chart depictions and search functions. Basic knowledge about the programming in VBA are also taught. These methods will also be used for macro skripts in MS-Word. Afterwards, the students have learned how to solve typicals problems efficiently with these today's standard programs.
Recommended reading	Exercises, programs with solutions and online documentation.
Exams	Exercise 1 Week (not graded)
Comments	Practical assignment in a computer laboratory.
Lecture Internship Roundup	
Internal number	INFB4P2
Lecturers	Prof. Dr. Heiko Körner Dipl. WiInf. Lars Thoralf Thielemann
Scope	3 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German

Content	This course aims to systematically reflect the internship done by each student and especially to advise them with their written assignments to be submitted. To this end, we will discuss the entire process of scientific writing, address each particular step in more detail, and deduce general guidelines towards a smooth implementation into practice. Furthermore, this course provides a thorough introduction to the use of LaTeX, a typesetting system widespread throughout the scientific community.
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	INFB4PX0
Coordinator	Prof. Dr. Thomas Fuchß
Scope	24 ECTS points, 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	INFB4PX1
Lecturer	Prof. Dr. Thomas Fuchß
Scope	24 ECTS points, 0 Contact hours
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	INFB510
Coordinator	Prof. Dr. Thomas Fuchß
Scope	8 ECTS points, 7 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	Mensch-Maschine-Kommunikation, Praxistätigkeit, Verteilte Systeme 1 und Theoretische Informatik 2, Informatik 2, Betriebssysteme und Systemnahes Programmieren, Datenbanken und Kommunikationsnetze 1
Pre-requisites according to the examination regulations	Vorstudium
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 Softwareengineering Laboratory	
Internal number	INFB511
Lecturer	Prof. Dr. Thomas Fuchß
Scope	3 ECTS points, 2 Contact hours
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, textbooks, and other literature: - Craig Larman. Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, 3. ed. - Upper Saddle River, NJ: Prentice Hall, 2004. - I. Jacobson, G. Booch, and Rumbaugh. The unified software development process - Reading, Mass.: Addison-Wesley, 1999. - Jim Arlow, Ila Neustadt. UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design, 2. ed. - Addison-Wesley Professional, 2005. - Bernd Oestereich. Developing Software with UML: Object-Oriented Analysis and Design in Practice 2. ed. - Addison-Wesley Professional, 2003. - Bernd Oestereich. Analyse und Design mit UML 2.1: Objektorientierte Softwareentwicklung, 8. ed. - München; Wien; Oldenbourg, 2006. - OMG Object Management Group. UML 2.4.1 Superstructure Specification - Needham Ma: OMG, 2011. - Schwaber, K. and Sutherland, J. The Scrum Guide: The Definitive Guide to Scrum - Scrum.org, 2011. - Shimp, D. and Rawsthorne, D. Exploring Scrum: The Fundamentals - CreateSpace, 2011. - Sommerville, Ian. Software Engineering (9. Ausgabe) - Pearson Studium, 2012.
Exams	Exercise 1 Semester (not graded)
Comments	Attended teamwork

Lecture Distributed Systems 2

Internal number	INFB512.a
Lecturer	Prof. Dr. Christian Zirpins
Scope	3 ECTS points, 3 Contact hours
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.
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 Software Engineering	
Internal number	INFB512.b
Lecturer	Prof. Dr. Thomas Fuchß
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	The course "software engineering" concentrates on methods and techniques for the structured development of large software systems. Beyond the repetition of well-known object oriented concepts, the focus lies on establishing the fundamentals of modern and agile software development process. Based on their experiences made during internship, the students discover the real challenges associated to such a development process. The lecture is accompanied by a course-project, to gain experiences in practice. This covers agile and component based development techniques, containing requirement engineering, analysis, and design as well as a prototypical implementation of the software system in java.
Recommended reading	Slides, textbooks, and other literature: - Craig Larman. Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, 3. ed. - Upper Saddle River, NJ: Prentice Hall, 2004. - I. Jacobson, G. Booch, and Rumbaugh. The unified software development process - Reading, Mass.: Addison-Wesley, 1999. - Jim Arlow, Ila Neustadt. UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design, 2. ed. - Addison-Wesley Professional, 2005. - Bernd Oestereich. Developing Software with UML: Object-Oriented Analysis and Design in Practice 2. ed. - Addison-Wesley Professional, 2003. - Bernd Oestereich. Analyse und Design mit UML 2.1: Objektorientierte Softwareentwicklung, 8. ed. - München; Wien; Oldenbourg, 2006. - OMG Object Management Group. UML 2.4.1 Superstructure Specification - Needham Ma: OMG, 2011. - Schwaber, K. and Sutherland, J. The Scrum Guide: The Definitive Guide to Scrum - Scrum.org, 2011. - Shimp, D. and Rawsthorne, D. Exploring Scrum: The Fundamentals - CreateSpace, 2011. - Sommerville, Ian. Software Engineering (9. Ausgabe) - Pearson Studium, 2012.
Exams	Module exam
Comments	The lecture will take the form of seminars with exercises.

Module Databases and Communication Networks 2	
Internal number	INFB520
Coordinator	Prof. Dr. Zoltán Nochta
Scope	5 ECTS points, 4 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	Datenbanken und Kommunikationsnetze 1
Pre-requisites according to the examination regulations	Vorstudium
Competences	
Exams	Written Exam 120 Min. (graded)
Lecture Databases 2	
Internal number	INFB521.a
Lecturer	Prof. Dr. Zoltán Nochta
Scope	3 ECTS points, 2 Contact hours
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 New Lecture	
Internal number	INFB521.b
Lecturer	Prof. Dr. Oliver P. Waldhorst
Scope	2 ECTS points, 2 Contact hours
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 architecture and Autonomous Systems	
Internal number	INFB530
Coordinator	Prof. Dr. Martin Sulzmann
Scope	4 ECTS points, 4 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	The realisation of technical systems is at the teaching core of this module. Two different basic concepts are addressed: Concepts for the software development of autonomous systems and the hardware concepts, which have to be employed to realise such systems. The module spans the corresponding space of system compositions with respect to hardware and software. The module builds upon the previous courses of computer engineering and software engineering. Therefore it can advance the students quite far conceptually as well as concerning the application fields. The focus is on the domain specific conceptual thinking, which supports the decision making competence of the graduatesfor therealisation ofsystems. The module also enables the graduates for further scientific activities in system development.
Exams	Written Exam 120 Min. (graded)

Lecture Autonomous Systems	
Internal number	INFB531.a
Lecturer	Prof. Dr. Martin Sulzmann
Scope	2 ECTS points, 2 Contact hours
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.

Lecture Computer architecture

Internal number	INFB531.b
Lecturer	Prof. Dr. Martin Sulzmann
Scope	2 ECTS points, 2 Contact hours
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!

Module Student Research Project	
Internal number	INFB540
Coordinator	Prof. Dr. Heiko Körner
Scope	6 ECTS points, 4 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	none
Pre-requisites according to the examination regulations	none
Competences	The students gain the ability to elaborate an individual solution of a clearly defined design requirement. In addition to the practical work the students will develop a documentation which clearly defines their individual work. The students will demonstrate the ability to present resultant work in a colloquial setting.
Exams	Individual exams
Lecture Student Research Projekt	
Internal number	INFB541
Lecturer	Alle Dozenten
Scope	5 ECTS points, 4 Contact hours
Type/mode	Hands-on Experience
Language of instruction	German
Content	The project will require individual work to solve problems in both the software and hardware arenas. Normally the work will be comprised of a practical problem, but instead may include software or hardware evaluation or literature research. The student will prepare a final documentation for the project. The format, content, size, etc. will be determined by the project advisor depending upon the requirements set forth in the initial project. The project is concluded by a colloquium in which the student will defend his work.
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	INFB542
Lecturer	Alle Dozenten
Scope	1 ECTS points, 0 Contact hours
Type/mode	Hands-on Experience
Language of instruction	German

Content	The colloquium is the final step in completing the project work. The colloquium will include a description of the project, the work conducted and the final solution.
Recommended reading	
Exams	Verbal Exam 20 Min. (graded)
Comments	

Module ERP Systems	
Internal number	INFB550
Coordinator	Prof. Dr. rer. pol. Mathias Philipp
Scope	7 ECTS points, 6 Contact hours
Placement	5th Semester
Pre-requisites with regard to content	Betriebswirtschaftslehre
Pre-requisites according to the examination regulations	Vorstudium
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	Written Exam 90 Min. (graded)
Lecture ERP Systems	
Internal number	INFB551.a
Lecturer	Prof. Dr. rer. pol. Mathias Philipp
Scope	3 ECTS points, 3 Contact hours
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	Module exam
Comments	Kind of work: Lecture participation
Lecture IT Service Management	
Internal number	INFB551.b
Lecturer	Prof. Dr. rer. pol. Mathias Philipp
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	

Exams	Module exam
Comments	
Lecture ERP Laboratory	
Internal number	INFB552
Lecturer	Prof. Dr. rer. pol. Mathias Philipp
Scope	2 ECTS points, 1 Contact hours
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 Embedded Software	
Internal number	INFB610
Coordinator	Prof. Dr. Dirk Hoffmann
Scope	5 ECTS points, 4 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Informatik 1, 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	INFB611
Lecturer	Prof. Dr. Dirk Hoffmann
Scope	2 ECTS points, 2 Contact hours
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	INFB612
Lecturer	Prof. Dr. Dirk Hoffmann
Scope	3 ECTS points, 2 Contact hours
Type/mode	Laboratory Course

Language of instruction	German
Content	
Recommended reading	
Exams	Exercise 1 Semester (not graded)
Comments	

Module Computer Graphics with Laboratory	
Internal number	INFB620
Coordinator	Prof. Dr. Peter Henning
Scope	4 ECTS points, 3 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Verteilte Systeme 1 und Theoretische Informatik 2
Pre-requisites according to the examination regulations	Modul Internship
Competences	
Exams	Individual exams
Lecture Computer Graphics	
Internal number	INFB621
Lecturer	Prof. Dr. Peter Henning
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	Henning, Taschenbuch Multimedia.
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Computer Graphics Laboratory	
Internal number	INFB622
Lecturer	Prof. Dr. Peter Henning
Scope	2 ECTS points, 1 Contact hours
Type/mode	Laboratory Course
Language of instruction	German
Content	Graphical primitives, polygonalmodels, transformations. Coloring, lighting and textures. Animation through sensors and interpolators. Elements of OpenGL: Vertices, polygons, transformation matrices. Lighting and textures
Recommended reading	Material from the lecture
Exams	Exercise 1 Semester (not graded)
Comments	Presence required, solution of lab problems

Module Communication Competence	
Internal number	INFB630
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	7 ECTS points, 6 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	INFB631
Lecturer	Alle Dozenten
Scope	6 ECTS points, 6 Contact hours
Type/mode	Seminar
Language of instruction	German
Content	
Recommended reading	
Exams	Homework 1 Semester (not graded)
Comments	
Lecture Presentation	
Internal number	INFB632
Lecturer	Alle Dozenten
Scope	1 ECTS points, 0 Contact hours
Type/mode	Seminar
Language of instruction	German
Content	
Recommended reading	
Exams	Presentation 20 Min. (graded)
Comments	

Module Key Qualification	
Internal number	INFB640
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	6 ECTS points, 6 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Sprachkompetenz
Pre-requisites according to the examination regulations	Modul Internship,<= 4; siehe § 43-I/b (7)
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	INFB641
Lecturer	Prof. Dr. Andrea Cnyrim
Scope	2 ECTS points, 2 Contact hours
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	INFB642
Lecturer	Prof. Dr. Michael Thiele
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture

Language of instruction	German
Content	
Recommended reading	
Exams	Verbal Exam 20 Min. (graded)
Comments	
Lecture Law	
Internal number	INFB643
Lecturer	RA Karin Bähr
Scope	2 ECTS points, 2 Contact hours
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 Selected Chapters Computer Science 1	
Internal number	INFB650
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	8 ECTS points, 8 Contact hours
Placement	6th Semester
Pre-requisites with regard to content	Praxisvor- und -nachbereitung, Praxistätigkeit
Pre-requisites according to the examination regulations	§43 (3)
Competences	- Advanced Embedded Software - Business Intelligence - Graphical User Interfaces - Business Process Management - IT Consulting - Pattern Recognition - Network Security - Advanced ERP - Advanced Software Engineering
Exams	Individual exams
Lecture New Lecture	
Internal number	I W155
Lecturers	M.Sc. Daniel Weisser Prof. Dr. Manfred Seifert
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 W171
Lecturer	Prof. Dr. Matthias Wölfel
Scope	4 ECTS points, 4 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Pattern Recognition	
Internal number	I W172
Lecturer	Prof. Dr. Norbert Link
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	Risk minimisation Baysian decision theory Decision functions Perceptrons Linear machines Multi-Layer-Perceptrons k-Nearest-Neighbor classifiers Support vector machines Feature assessment via distance and separability measures Principal component analysis
Recommended reading	The matter is presented by means of animated slides and extensive derivations at the blackboard. The presentation is available on the internet. For further study four text books are recommended: - Pattern classification : a unified view of statistical and neural approaches / Jürgen SchürmannNew York [u.a.] : Wiley & Sons, 1996. - Pattern classification / Richard O. Duda ; Peter E. Hart ; David G. Stork. - 2. ed.New York ; Weinheim [u.a.] : Wiley, 2001. - Pattern recognition / Sergios Theodoridis and Konstantinos Koutroumbas. - 3. ed.Amsterdam ; Heidelberg[u.a.] : Elsevier Academic Press, 2006. - Learning with Kernels : support vector machines, regularization, optimization, and beyond / Bernhard Schölkopf ; Alexander J. SmolaCambridge, Mass. [u.a.] : MIT Press, 2002.
Exams	Written Exam 90 Min. (graded)
Comments	Class (including training) 50%, self-responsible work 50%
Lecture Business Intelligence	

Internal number	I W179
Lecturer	Prof. Dr. Uwe Haneke
Scope	2 ECTS points, 2 Contact hours
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 ERP Special Chapters	
Internal number	I W182
Lecturer	Prof. Dr. rer. pol. Mathias Philipp
Scope	2 ECTS points, 2 Contact hours
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) Georg Magschok Dipl. Inform. (FH) Michael Fischer
Scope	2 ECTS points, 2 Contact hours
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 maliciousssoftware. 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 W232
Lecturer	Dr. Michael Haag
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Advanced Embedded Software	
Internal number	I W300
Lecturer	Prof. Dr. Dirk Hoffmann
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Graphical User Interfaces	
Internal number	I W332
Lecturer	Dipl.-Inf. Per Sterner
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 W501
Lecturer	Prof. Dr. Frank Schaefer
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	
Exams	Presentation 20 Min. (graded)
Comments	
Lecture Game Programming	
Internal number	I W620
Lecturer	Prof. Dr. Peter Henning
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours

Type/mode	Laboratory Course
Language of instruction	German
Content	
Recommended reading	
Exams	Laboratory Work 1 Semester (graded)
Comments	
Lecture Business Process Management	
Internal number	I W854
Lecturer	Prof. Dr. Uwe Haneke
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 New Lecture

Internal number	I W910
Lecturer	Prof. Daniel Schwarz
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	This course covers principles and tools for the compilation and analysis of programs. Selection of topics covered: - Syntax analysis (Parser Tools/Generators) - Semantics of programs Typesystems Operational semantics Interpreters/Virtual machines - Program analysis

Recommended reading	- Lecture notes - Lab and written exercies - Online references
Exams	Written Exam 90 Min. (graded)
Comments	Prerequisistes - Some programming experiences - Logic (propositional logic) Mix of lecture and exercis. In case of an oral examination, group work will be permitted.

Lecture App Programming

Internal number	I W912
Lecturer	M.Sc. Adrian Wörle
Scope	2 ECTS points, 2 Contact hours
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) Michael Fischer Dipl. Inform. (FH) Georg Magschok
Scope	2 ECTS points, 2 Contact hours
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 New Lecture	
Internal number	I W914
Lecturer	Prof. Dr. Oliver P. Waldhorst
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	German
Content	
Recommended reading	

Exams	Written Exam 90 Min. (graded)
Comments	
Lecture Affective Computing	
Internal number	I W924
Lecturers	M.Sc. Bernd Dudzik Prof. Thomas Hinz
Scope	2 ECTS points, 2 Contact hours
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 New Lecture	
Internal number	I W925
Lecturers	Prof. Thomas Hinz Marc Steinmetz
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 New Lecture

Internal number	I W927
Lecturer	Dr.-Ing. Wilfried Jakob
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	English
Content	This course introduces the principles, theories and concepts of statistics and data modelling. Students will learn - how to construct and interpret graphical presentations of data, - conduct appropriate statistical tests, use the appropriate techniques in data modelling, - interpret the results generated, - apply these statistics and data modelling techniques in practical projects, and - develop real world analytics solutions using Spark Machine Learning and Scala.
Recommended reading	Lecture notes and online references provided. 1) Statistics for Managers: Using Microsoft Excel (6th ed.), David M. Levine et al. (2011), OT, B. 2) Foundations of Predictive Analytics, James Wu & Stephen Coggeshall (2012), OT, B. 3) Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, and Jian Pei, (2011), OT, B. 4) Programming in Scala, 3rd ed, by Martin Odersky, Lex Spoon and Bill Benners (2016), OT, B 5) Learning Spark: Lightning-Fast Big Data Analysis, by Andy Konwinski, Holden Karau, Matei Zaharia, and Patrick Wendell (2015), OR, B
Exams	Module exam
Comments	Prerequisites: Target audience are 6th and 7th semester students. If in doubt contact lecture in charge. Assessment: - Continuous assessment (individual) - Group project (presentation + term paper) Intensive course, given within the first two weeks of October. Schedule TBA. Teaching staff: Dr. Kenny Lu, Dr. Noi Sian Koh (Nanyang Polytechnic Singapore)
Lecture New Lecture	
Internal number	I W929
Lecturers	Marc Steinmetz Prof. Thomas Hinz
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture

Language of instruction	German
Content	
Recommended reading	
Exams	Homework 1 Semester (graded)
Comments	
Lecture Practical SAT Solving and Automated Planning	
Internal number	I W933
Lecturer	Dr. Tomas Balyo
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	English
Content	The course offers an introduction to the methods and techniques used in Boolean Satisfiability (SAT) solving and Aautomated Planning. The students will learn how to use SAT solvers and automated planners and also how they work. The topics covered in the lecture include: - Practical applications of SAT solving - The DPLL/CDCL algorithm and how they are implemented - Local search SAT solving algorithms - Encoding problems as SAT problems and selecting the proper SAT solver - Applications of automated planning - Formalization of planning problems and the PDDL language - Basic state space search algorithms (forwards/backwards search) - Heuristic search algorithms and planning heuristics - Satisfiability based planning - Hierarchical task network planning - classical scheduling approaches - constraint-based scheduling - planning for virtual agents in computer games Ziele: - The students will be able to model various problems as SAT or as planning tasks in the PDDL language and solve them using off-the-shelf solvers. - The students will understand the approaches used in SAT solving and automated planning algorithms, which will allow them to efficiently model and solve real world problems by selecting the proper tools for the given task.
Recommended reading	
Exams	Homework 1 Semester (graded)
Comments	
Lecture New Lecture	
Internal number	I W934
Lecturer	Prof. Dr. Jürgen Zimmermann
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
Type/mode	Laboratory Course
Language of instruction	German
Content	
Recommended reading	
Exams	Hands-on Work 1 Semester (not graded)
Comments	

Module Selected Chapters Computer Science 2	
Internal number	INFB710
Coordinator	Prof. Dr.-Ing. Holger Vogelsang
Scope	8 ECTS points, 8 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	Praxisvor- und -nachbereitung, Praxistätigkeit
Pre-requisites according to the examination regulations	§43 (4)
Competences	- Autonomous Systems Lab - Multimedia Studies (Blended Learning) - Project Management - Quality Assurance - Teamteaching
Exams	Individual exams
Lecture Autonomous Systems Labor	
Internal number	I W276
Lecturers	Dipl. Inf. (FH) Oktavian Gniot Prof. Dr. Norbert Link
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 Softwareengineering Special Chapters	
Internal number	I W701
Lecturer	Prof. Dr. Peter Henning
Scope	2 ECTS points, 2 Contact hours
Type/mode	Seminar

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

Lecturer	Prof. Dr. Peter Henning
Scope	2 ECTS points, 2 Contact hours
Type/mode	Project Lecture
Language of instruction	German
Content	
Recommended reading	Book: Henning, Taschenbuch Multimedia.
Exams	Online Test 4 Parts (graded)
Comments	
Lecture Reinforcement Learning	
Internal number	I W775
Lecturer	Prof. Dr. Patrick Baier
Scope	2 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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 ECTS points, 2 Contact hours
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. Soeren Schlegel Prof. Dr. rer. pol. Mathias Philipp
Scope	2 ECTS points, 2 Contact hours
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 Game AI

Internal number	I W923
Lecturers	Prof. Dr.-Ing. Astrid Laubenheimer Dr. Patrick Glauner
Scope	2 ECTS points, 2 Contact hours
Type/mode	Lecture
Language of instruction	English
Content	
Recommended reading	

Exams	Written Exam 90 Min. (graded)
Comments	
Lecture New Lecture	
Internal number	I W936
Lecturer	Prof. Dr.-Ing. Holger Vogelsang
Scope	2 ECTS points, 2 Contact hours
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	I Wxx2
Lecturer	Prof. Dr. Peter Henning
Scope	2 ECTS points, 2 Contact hours
Type/mode	Laboratory Course
Language of instruction	German
Content	
Recommended reading	
Exams	Exercise 1 Semester (graded)
Comments	

Module Scientific Working	
Internal number	INFB720
Coordinator	Prof. Dr. Heiko Körner
Scope	5 ECTS points, 3 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	Kommunikationskompetenz, Praxistätigkeit
Pre-requisites according to the examination regulations	§43 (4)
Competences	
Exams	Individual exams
Lecture Scientific Working	
Internal number	INFB721
Lecturer	Alle Dozenten
Scope	5 ECTS points, 3 Contact hours
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	INFB730
Coordinator	Prof. Dr. Heiko Körner
Scope	12 ECTS points, 0 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	Automatisierung und Deklarative Programmierung, Betriebssysteme und Systemnahes Programmieren, Betriebswirtschaftslehre, Computergrafik mit Labor, Datenbanken und Kommunikationsnetze 1, Datenbanken und Kommunikationsnetze 2, ERP-Systeme, 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, Softwarelabor, Sprachkompetenz, Technische Informatik 1, Technische Informatik 2, Theoretische Informatik 1, Verteilte Systeme 1 und Theoretische Informatik 2, Wissenschaftliches Arbeiten
Pre-requisites according to the examination regulations	Modul Internship,<= 4; siehe § 43-I/b (7); Min. 120 CP aus dem Hauptstudium
Competences	During the thesis phase the individual will demonstrate that s/he has the basic knowledge and ability to solve a complex practical problem or work on a research project in a specific timeframe using the scientific method, research in the specific field of interest. The student will be required to structure the problem, conduct the research, and develop a solution using PERT principles. The student will be required to orally present and defend the results.
Exams	Individual exams
Lecture Thesis	
Internal number	INFB731
Lecturer	Alle Professoren
Scope	12 ECTS points, 0 Contact hours
Type/mode	Thesis
Language of instruction	German
Content	
Recommended reading	
Exams	Bachelor Thesis 4 Months (graded)
Comments	

Module Final examination	
Internal number	INFB740
Coordinator	Prof. Dr. Heiko Körner
Scope	3 ECTS points, 0 Contact hours
Placement	7th Semester
Pre-requisites with regard to content	Abschlussarbeit, Ausgewählte Kapitel Informatik 1, Automatisierung und Deklarative Programmierung, Betriebssysteme und Systemnahes Programmieren, Betriebswirtschaftslehre, Computergrafik mit Labor, Datenbanken und Kommunikationsnetze 1, Datenbanken und Kommunikationsnetze 2, ERP-Systeme, 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, Softwarelabor, Sprachkompetenz, Technische Informatik 1, Technische Informatik 2, Theoretische Informatik 1, Verteilte Systeme 1 und Theoretische Informatik 2
Pre-requisites according to the examination regulations	Modul Internship
Competences	The students are able to present their work and the results gained in front of a skilled audience. The students show students their abilities to apply interdisciplinary knowledge to a given problem.
Exams	Individual exams

Lecture Final examination	
Internal number	INFB741
Lecturer	Alle Professoren
Scope	3 ECTS points, 0 Contact hours
Type/mode	Colloquium
Language of instruction	German
Content	The student has to apply different fields of computer science to find a solution for a given problem.
Recommended reading	
Exams	Verbal Exam 20 Min. (not graded)
Comments	