Study Program

Bachelor of Science in Computing Science

Module Descriptions

Carl von Ossietzky University Oldenburg

Bachelor of Science in Computing Science

Core Curriculum - Foundations 1

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Basismodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf001 - Algorithmen und Programmierung*	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* BC (base curriculum) *This module should be taken in* 1st semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Sebastian Lehnhoff
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -
Objective of the module / skills: Professional competence The students: - Know the fundamental constructs of programming languages - Evaluate the meaning of the core concepts of programming languages - Characterise the different programming paradigms - Use acquired concepts of programming languages practically - Apply the object-oriented concepts of programming - Apply the fundamental concepts of parallel programming - Learn new programming and application languages independently Methodological competence The students: - Transfer gained software development experiences onto new tasks Social competence The students: - Solve tasks in teams of 2-3 students and present the findings in small groups Self-competence The students: - Implement small programs to solve small tasks intrinsically - Integrate programming concepts into their planning and operations	

Content of the module:

One key challenge of computer science is the development of software. Software developers have to analyse tasks, model systems, design software structures and implent those with the suitable programming languages. For a given problem they need to know how to choose a suitable programming paradigm and, if necessary, have to learn new programming languages from different programming paradigms.

The Module „Algorithmen und Programmierung“ gives an overview of different programming paradigms and concepts of languages. It provides an overview of the most important elementary data structures and delves into the concepts of object-oriented programming. The module complements the „Progammierkurs“. The concrete programming language is complemented by abstract programming concepts.

This module provides preconditions to the modules „Algorithmen und Datenstrukturen (algorithms and data structures)“, „Software-Engineering“ and „Software-Project“. The module consists of a lecture and an exercise part:

Lecture: The lecture is given on basis of slides and animations. Where applicable, typical examples illustrate the use of different programming languages. Free available programming languages are used to describe paradigms of programming by examples. Exercises: There is a weekly tutorial of exercises. Each tutorial is based on an exercise sheet, which has to be prepared in teams of 2-3 students. The teams' results will be presented and discussed. The exercises are providing the possibility to repeat and deepen taught knowledge. Part of the exercises is also the implementation of programs.

Suggested reading:

M. Sonnenschein, U. Vogel (2013) "Skript zur Vorlesung Algorithmen und Programmierung“ (lecture notes, German)

Comments:

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Weblink:

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Prerequisites for admission:

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Helpful previous knowledge:

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Associated with the module(s):

inf003 Programmierkurs

Maximum number of students / selection criteria:

unrestrained

Types of examinations:

written exam or oral exam

Examination periods:

At the end of the lecture period

Registration procedure:

Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Basismodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf002 - Algorithmen und Datenstrukturen*	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* BC (base curriculum) *This module should be taken in* 2nd semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Michael Sonnenschein
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die im Modul Lehrenden

Objective of the module / skills:

Objective of the module / skills:
Professional competence:
The students:
- are aware of the general ideas in designing algorithms, e.g. greedy algorithms and divide-and-conquer algorithms
- understand algorithms and data structures for the most common problems and are able to evaluate the applicability of the algorithms,
- understand and evaluate the efficiency of concrete algorithmic solutions
- select appropriate algorithms and data structures for given problems
- apply adequate algorithms and data structures to solve concrete problems,

Methodological competence:
The students:
- solve tasks by means of concepts of algorithms and data structures,
- apply practical program development experience to new tasks.

Social Competence:
The students solve tasks in teams of 2-3 students and present their findings in small groups.

Self-competence:
The students integrate concepts of algorithms and data structures into their actions.

Content of the module:

Algorithms are a core concepts of computer science. Algorithms can be found in all application areas. They offer solutions for problems and are directly related to data structures, which represent the processed data.

Efficiency is an essential key element in the design of algorithms and data structures. Efficiency means the effort of calculation depending on the amount of data.

The module presents different efficient algorithms and data structures for a variety of common problems. Particularly these are:
- searching, inserting and deleting keys in datasets, e.g. AVL tree, B-tree, hash tables,
- search for text patterns
- sorting algorithms, e.g. Quick-Sort and Heap-Sort,
- graph-based applications, e.g. computing shortest paths in graphs,
- simple numeric algorithms (e.g. solving of linear equations, a discrete algorithm for linear programming, such as the simplex algorithm),
- optimization heuristics as tabu search or evolutionary algorithms.

Suggested reading:
essential:
handout (printed or digital version)

secondary literature:
- Ottmann, Widmayer: Algorithmen und Datenstrukturen. Spektrum Verlag, 5. Auflage, 2012
- Segdewick, Wayne: Algorithms. Addison Wesley, 4th ed., 2011
- Stiege: Einführung in die Informatik. Shaker Verlag, 2013

Comments:
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Weblink:
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Prerequisites for admission:
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Helpful previous knowledge:
JAVA programming

Associated with the module(s):
inf001 Algorithmen und Programmierung

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written exam or oral exam

Examination periods:
at the end of the lecture period

Registration procedure:
Stud. IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Basismodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf003 - Programmierkurs*	
Duration: 1 semester *Cycle:* every 6 months *Type of module:* mandatory *Level:* BC (base curriculum) *This module should be taken in* 1st semester und/oder 2nd semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Dr. Dietrich Boles
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

The art of programming is one key competence of computer science and is a prerequisite for the most modules when studying computer science. The objectives of this course are the basics of imperative and object oriented programming based on the computer language Java. The students should be able to develop Java programs for the solution of smaller and moderate problems independently at the end of the module.

Professioal Competence
The students
- Describe the core concepts of the imperative programming and the object oriented programming in Java
- Transfer the concepts of Java to other programming languages
- Are aware of the advantages of object oriented programming
- Recognise the terminology of imperative and object oriented programming and use these terms in discussions
- Describe what a given program does
- Develop programs to solve small and moderate problems
- Search errors in self written code and code written by someone else systematically
- Use modern software development environments for the development and the testing of programs
- Evaluate programming techniques in the context of a specific application

Methodological competence
The students solve problems aided by the object oriented paradigm

Social competence
The students
- Describe and explain the structure and the operations of self developed programs to other people or fellow students
- Present solutions in front of groups

Self-competence
- The students self-organise their development of programs and solve small and moderate problems

Content of the module:
The first part of this module provides the basic concepts of programming, e.g. algorithms, programming languages, computers, development environments, development stages, compilers, syntax diagrams, logics and documentations.
The second part of this module deals with concepts of imperative programming, e.g. data types, variables, expressions, statements, control structures, methods, parameters, recursion, reference data types, arrays and records.
The third part of this module provides the concepts of object oriented programming, e.g. class, object, enum, inheritance, encapsulation, packages, Java Development Kit, polymorphism, dynamic binding, abstract class, interface, exceptions, generics.

Suggested reading:
- Lecture notes and slides
- Videos, see also www.programmierkurs-java.de
- Dietmar Ratz, Jens Scheffler, Detlev Seese, Jan Wiesenberger: Grundkurs Programmieren in Java, Carl Hanser Verlag.
- Joachim Goll, Cornelia Heinisch: Java als erste Programmiersprache, Springer Vieweg Verlag.

Comments:
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Weblink:
http://www.programmierkurs-java.de

Prerequisites for admission:
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Helpful previous knowledge:
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Associated with the module(s):
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Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Written or oral exam or portfolio (3 written short tests (60-90min); comprising 20%, 30%, 50%; in case of absence due to illness or other important reasons (certificate) short tests can be replaced by short presentations)

Examination periods:
First short test after approx. 4 weeks; second short test after approx. 8 weeks; the third short test immediately after the end of the lecture period. Re-examination normally as a 3-hour written exam at the end of the semester. Exact exam formalities are announced during the course.

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Basismodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Technische Informatik
Module reference number/Title: - *inf200 - Grundlagen der Technischen Informatik*	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* BC (base curriculum) *This module should be taken in* 1st semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Wolfgang Nebel, Prof. Dr. Werner Damm
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Prof. Dr. Wolfgang Nebel, Prof. Dr. Werner Damm, Die im Modul Lehrenden

Objective of the module / skills:

The participants learn to understand the construction of digital circuits and digital computers. They know the technological parameters, the state of the art technologies, and the developments characterizing current and future design paradigms for digital hardware.
They learn to understand the concepts underlying current computer architectures and are able to explain how such architectures execute programs.
Successful participants will be able to analyse computer architectures as a whole, to understand in depth, to analyze, and to optimize their hardware components, and to discuss the properties induced by selecting design alternatives.

Professional competence
The students:
- identify the fundamental components of digital circuitry and digital computers,
- are aware of the virtues of hierarchical and abstract descriptions of hardware systems,
- name the fundamental parameters, criteria, conditions, and development trends of current and future t hardware design
- describe the basic concepts of current computer architectures and the execution of machine programs

Methodological competence
The students:
- evaluate computer architectures

- design and optimize digital hardware components
- transfer systematic methods of hardware design to unknown design problems

Social competence
The students:
- present their understanding of the operational principles underlying digital computers to others

Content of the module:
This module is the first part of the introduction to computer engineering. It explains the construction principles of computers, from the implementation of an easy Instruction Set Architecture and fundamental methods for the specification, construction and optimization of computer components to elementary components.

Suggested reading:
- handout manuscript of the course
- Schiffmann, W.; Schmitz, R. (2001): Technische Informatik I, II, Übungsbuch; Springer Verlag, Berlin.
- Dal Cin, M. (1996): Rechnerarchitektur; B.G. Teubner.
- Lagemann, K. (1987): Rechnerstrukturen; Springer-Verlag, Berlin.
- Oberschelp, W.; Vossen, G. (1989): Rechneraufbau und Rechnerstrukturen; Oldenbourg-Verlag.
- Mano, Morris M.(1993): Computer System Architecture 3; Prentice Hall.
- Gajski, D.(1997): Principles of Digital Design; Prentice Hall.
- Patterson, D.A.; Hennessy, J.L. (1997): Computer Organization and Design:
- The Hardware/Software Interface; 2. Edition; Morgan Kaufmann Publishers.
- Wilkinson, B. (1996): Computer Architecture Design and Performance; 2. Edition; Prentice Hall.
- Tannenbaum, A.S.(1999): Structured Computer Organization; 4. Edition; Prentice Hall.

Comments:
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Prerequisites for admission:
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Helpful previous knowledge:
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Associated with the module(s):
inf201 Technische Informatik
prx106 Praktikum Technische Informatik

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Written or oral exam

Examination periods:
At the end of the semester

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Basismodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Theoretische Informatik
Module reference number/Title: - *inf400 - Theoretische Informatik I*	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* BC (base curriculum) *This module should be taken in* 2nd semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Eike Best, Prof. Dr. Annegret Habel, Prof. Dr. Ernst-Rüdiger Olderog
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

Introduction to propositional logic, predicate logic, logic programming, and temporal logic

Professional competence
The students:
- Know syntax, semantics and applications of propositional logic, predicate logic, logic programming, and temporal logic
- Specify problems by using logical formulas
- Solve questions concerning propositional formulas with truth tables
- Draw conclusions in the field of propositional logic and predicate logic by means of natural deduction
- Answer queries to logic programs by using SLD resolution
- Perform model checking of Kripke structures with regard to CTL formulas algorithmically

Methodological competence
The students:
- Recognize logic as a versatile tool in computer science

Social competence
The students:
- Work together in small groups to solve problems
- Present solutions to problems to groups of other students

Self-competence
The students:
- Learn persistence in pursuing difficult tasks
- Learn precision in writing down solutions

Content of the module:
The course introduces propositional, predicate and temporal logic. In computer science it is essential to have a good understanding of logic because the language of logical formulas is widely used in the field of computer science. For example, Boolean expressions appear in every programming language and in circuit design; Horn clauses are used in knowledge representation; predicate logic and temporal logic are used for specifying software and hardware. More recent applications such as interactive and automatic proving as well as the logic programming language PROLOG emphasize the tool character of logic in computer science.

The course introduces syntax, semantics, procedures, and calculi to prove the validity of formulas of propositional, predicate, and temporal logic. This is illustrated by many examples.
Central is the concept of logical consequence.

Topics:
- Propositional logic: syntax and semantics, truth tables, natural deduction
- Predicate logic: syntax and semantics, natural deduction
- Logic programming: declarative and procedural semantics, unification algorithm (Robinson), SLD resolution, PROLOG
-Temporal logic CTL: syntax and semantics of Kripke structures, CTL model checking algorithm

Suggested reading:
Essential:
- Script "Logik" (in German), in its current edition

Recommended:
- D. van Dalen: "Logic and Structure", Fourth Edition. Springer-Verlag, 2004.

Good secondary reading:
- U. Schöning: "Logic for Computer Scientists“, Birkhäuser, 1994.

Comments:
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Prerequisites for admission:
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Helpful previous knowledge:
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Associated with the module(s):
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Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written exam or oral exam

Examination periods:
At the end of the lecture period

Registration procedure: Stud.IP

Core Curriculum - Foundations 2

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Aufbaumodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf005 - Softwaretechnik I* Software Engineering I	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* AC (extended curriculum) *This module should be taken in* 3rd semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Andreas Winter
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

The objective of the module is to convey the development and maintainance of large scale software systems. The complete software developing process including requirements collection, software architecture and quality control is observed. The basics of object oriented modelling and software development are enhanced.

Professional competence
The students:
- comprehend the different developmental phases of software (especially requirements engineering, software design, software implementation and quality control)
- name the tasks of each phase
- select appropriate methodical utilities
- select suitable methods and utilities for each project phase
- understand the advantages of the modelling process with UML
- model moderate tasks in UML
- understand and develop solutions for given problems by means of development environments

Methodological competence
The students:

- structure, document and evaluate problems and solutions with the tools of object oriented modelling
- apply methods and techniques of object oriented modelling purposefully

Social competence
The students:
- create, present and discuss solutions with modelling techniques
- present and solve modelling problems in teams

Self-competence
The students:
- reflect their problem-solving behaviour with regard to the capabilities of software technology

Content of the module:
The module introduces fundamental terms and concepts in software engineering. This includes:
- need for software engineering
- activities and process-models in software development
- object-oriented modelling, meta modelling
- Interdependencies between code and models
- requirements elicitation
- definition of software architectures
- application of software patterns
- software quality management
- software maintenance, evolution and operation.

Software engineering tools are presented and applied in practical exercises.

Suggested reading:
Ian Sommerville: Software Engineering, Addison-Wesley Longman, Amsterdam, 10. Ed. 2012
Jochen Ludewig, Horst Lichter: Software Engineering, dpunkt.verlag, 3. Auflage 2013
Helmut Balzert: Lehrbuch der Software-Technik, Spektrum Akademischer Verlag, 3. Auflage 2009
Chris Rupp, Stefan Queins: UML 2 glasklar. Praxiswissen für die UML-Modellierung, Carl Hanser Verlag, 4. Auflage 2012

Comments:
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Prerequisites for admission:
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Helpful previous knowledge:
inf003 Programmiering in Java
inf002 Algorithms and Daten structures
inf001 Algorithms and Programming

Associated with the module(s):
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Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written exam or oral exam or portfolio (3 services)

Examination periods:
At the end of the lecture period or during the lecture period (portfolio)

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Aufbaumodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf007 - Informationssysteme I* **Information systems I**	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* AC (extended curriculum) *This module should be taken in* 3rd semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Marco Grawunder, Prof. Dr. Hans-Jürgen Appelrath
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

This module introduces the core concepts, languages and architectures of databases. In software systems these concepts are important.

Professional competence
The students:
- name the core concepts of the languages and architectures of databases (especially)
- select data models
- integrate structuring concepts of information systems in their designs

Methodological competence
The students:
- design database systems appropriately
- analyse problems from the field of database-supported information systems and solve them appropriately

Social competence
The students:
- enhance their ability to work in a team

Self-competence
The students:

- reflect their problem-solving behaviour with regard to the information processing concepts
Content of the module: - Relational data models - Relational algebra and its implementation in SQL (the standard of databases) - Database design on different abstractions (conceptual and logical design) - Normalisation - Data base architectures - Distributed and active databases - Object-oriented, object-related and XML-based database systems
Suggested reading: Ramez Elmasri und Shamkant B. Navathe (2016), Fundamentals of Databases Systems, 7th Revised edition, Pearson/Addison Wesley.

Comments: - *Weblink:* - *Prerequisites for admission:* -	*Helpful previous knowledge:* - *Associated with the module(s):* inf002 Algorithmen und Datenstrukturen

Maximum number of students / selection criteria: unrestrained *Types of examinations:* hands-on exercises and written or oral exam *Examination periods:* At the end of the lecture period *Registration procedure:* Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Aufbaumodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf010 - Rechnernetze I*	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* AC (extended curriculum) *This module should be taken in* 4th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Oliver Kramer
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -
Objective of the module / skills: Professional competence: The students: Identify the layers of the ISO/OSI model - Recognise the main concepts and algorithms of each IOS/OSI layer - Assign technical processes to the layers - Classify new technologies to the main concepts of the ISO/OSI model - Compare different methods and approaches of a layer (i.e. TCP and UDP) - Characterise safety-critical aspects of each layer Methodological competence: The students - Administer small networks - Characterise safety-critical aspects of networks Social competence: The students work on exercises in small teams Self-competence: The students recognise their administraiton abilities	
Content of the module: Contents of this lecture (cf. suggested reading Tanenbaum and Wetherall)	

- Introduction to networks and the internet
- Physical Layer
- Data Link Layer
- MAC Sub-Layer
- Network Layer
- Transport Layer
- Session Layer
- Presentation Layer
- Application Layer
- Technologies (Cable and Co)
- Nyquist Shannon and Transmissions
- CDMA
- Hamming & CRC
- Stop & wait, go back n, selective repeat
- Aloha & CSMA
- Ethernet technologies
- Wifi
- Paket switchen & Dijsktra
- IP Adressing & Header
- TCP
- UDP
- Buckets & TCP-Reno
- DNS
- Flask
- RSA & PGP
- Firewalls

Suggested reading:
- lecture notes
- A. Tanenbaum & D. Wetherall: Computernetzwerke, Pearson Studiu, 5. Aufl. 2012

Comments:
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Weblink:
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Prerequisites for admission:
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Helpful previous knowledge:
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Associated with the module(s):
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Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Written or oral exam

Examination periods:
at the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Aufbaumodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf012 - Betriebssysteme I*	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* AC (extended curriculum) *This module should be taken in* 4th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Oliver Theel
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

To gain knowledge of and capabilities in the design, the implementation, and the evaluation of operating systems.

Professional competence
The students:
- Develop an understanding of operating systems regarding terminology, structure, functionality, conception, central challenges and solutions
- Evaluate the performance of operating systems
- Are aware of the implementation problems of operating systems
- Realise and evaluate solutions of subproblems
- Comprehend and evaluate the functional connections between application systems and hardware
- Understand operating systems as a link between technical and applied computer science

Methodological competence
The students:
- Transfer concepts of implementations to other contexts
- Question different solutions wrt. properties

Social competence
The students:
- Solve problems in small teams
- Present their solutions to the members of the tutorial

- Discuss their different solutions with members of the tutorial

Self-competence
The students:
- Accept criticism
- Question their initial solutions in the light of newly learned methods

Content of the module:
The contents of this module are:
1. “Operating systems'' definition and structure
2. Requirements of operation systems
3. Technical characteristics of related hardware
4. The need and implementation options of parallel processes
5. Cooperation of processes: communication and synchronisation (semaphores)
6. Memory management: virtual und non-virtual memory management
7. File management

Suggested reading:
A. Tanenbaum (2009). Modern Operating Systems. 3rd edition, Prentice Hall
W. Stallings (2012).Operating Systems. 7th edition, Prentice Hall

Comments:
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Prerequisites for admission:
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Helpful previous knowledge:
inf001 Algorithmen und Programmierung
inf002 Algorithmen und Datenstrukturen
inf003 Programmierkurs
inf200 Grundlagen der Technischen Informatik
mat950 Diskrete Strukturen

Associated with the module(s):
inf014 Praktikum Betriebssysteme

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written or oral exam

Examination periods:
end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Aufbaumodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Technische Informatik
Module reference number/Title: - *inf201 - Technische Informatik*	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* AC (extended curriculum) *This module should be taken in* 2nd semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Wolfgang Nebel, Prof. Dr. Werner Damm
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

The module qualifies students to analyse computer architectures, understand computer components, design and optimize computers and components, and to discuss domain-specific hardware design.

Professional competence
The students:
- describe computer components
- design and optimise computer components
- understand manufacturing processes for VLSI circuits

Methodological competence
The students:
- analyse computer architectures

Social competence
The students:
- discuss computer hardware and manufacturing processes competently
- are able to transfer their knowledge of hardware design to other domains different from computer science

Self-competence
The students:
- are able to assess their own competences in relation to qualified personnel from related domains

Content of the module:

This module is the second part of the introduction to technical computer science. Typical examples of

combinatory circuits, like an adder, are used to illustrate modular design methods. More advanced design methods are demonstrated on sequential circuits, i.e. circuits with memory. Additionally iIn this part, the electrotechnical fundamentals of computing are taught. The construction and the manufacturing process of digital components is explained and the scope of the introduction to computer architecture is broadened to cover embedded systems as well.

Suggested reading:

- Lecture notes
- Oberschelp, W., Vossen, G.: Rechneraufbau und Rechnerstrukturen; Oldenbourg Verlag
- Gajski, D.: Principles of Digital Design; Prentice Hall 1997
- Patterson, D.A., Hennesy, J.L.: Computer Organisation and Design: The Hardware/Software Interface; 2. Edition; Morgan Kaufman Publishers, 1997
- Tannenbaum, A.S.: Structured Computer Organization ; 4. Edition; Prentice Hall, 1999

additional literature will be mentioned in the lectures

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
inf200 Grundlagen der Technische Informatik

Associated with the module(s):
prx106 Praktikum Technische Informatik

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written or oral Exam

Examination periods:
at the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Aufbaumodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Theoretische Informatik
Module reference number/Title: - *inf401 - Theoretische Informatik II*	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* AC (extended curriculum) *This module should be taken in* 3rd semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Eike Best, Prof. Dr. Annegret Habel, Prof. Dr. Ernst-Rüdiger Olderog
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

Introduction to the theory of automata, formal languages, computability, and complexity

Professional competence
The students:
- Know different classes of languages (e.g. regular and context-free languages)
- Know automata models corresponding to the respective language classes (e.g. finite automata, pushdown automata, Turing machines)
- Construct automata, Turing machines, and grammars for given tasks
- Know equivalent formalisations of the concept of algorithm
- Classify functions as algorithmically computable and problems as algorithmically decidable
- Know and recognize undecidable problems
- Evaluate the complexity of algorithms
- Know problems that are solvable deterministically or nondeterministically in polynomial time

Methodological competence
The students:
- Learn about the power of abstract models of computation

Social competence
The students:
- Work together in small groups to solve problems

- Present solutions to problems to groups of other students

Self-competence
The students:
- Learn persistence in pursuing difficult tasks
- Learn precision in writing down solutions

Content of the module:
In the first part of the course, different classes of languages are introduced (regular and context-free languages).
For each class a matching automata model is presented (finite automata, pushdown automata).
Various properties are proven for the introduced classes of languages and models of automata.

In the second part of the course, we examine which functions are computable and which problems are decidable. To this end, the concept of algorithm is formalised. Turing machines and grammars turn out as equivalent approaches. We show that there are problems that are undecidable. Many of these problems are of practical interest.

The third part of the course deals with the complexity of algorithms, i.e. how much time and space is required to solve a problem. In particular, we consider problems that are solvable in polynomial time, either deterministically or non-deterministically. These problems are classified as P and NP.

Suggested reading:
- essentiell: Skript "Grundbegriffe der Theoretischen Informatik", jeweils in aktueller Ausgabe
- empfohlen: Schöning: "Theoretische Informatik kurzgefasst", 5. Auflage, Spektrum, 2008
- Gute Sekundärliteratur: Hopcroft, Motwani, Ullman: "Einführung in die Automatentheorie, Formale Sprachen und Komplexitätstheorie", Pearson, 2002 (ein Klassiker...)

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
-

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written or oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Specialization

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: *- inf006 - Softwaretechnik II* **Software Engineering II**	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 4th semester	*Type of program:* V (2 semester hours), S (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Andreas Winter
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

The objective of the module inf005 Software Engineering II is to deepen the subjects and skills of the module Software Engineering I. Special software engineering topics will be presented, deepened and discussed. The lecture deals with different software engineering methods and technology which will be discussed in the seminar. The discussions are contextualised by scientific research projects, practical projects and latest research findings.

Professional competence
The students:
- Deepen software engineering methods and techniques
- Use specific software engineering methods and techniques
- Differentiate developmental techniques of software systems
- Discuss software engineering topics
- Design software systems by using appropriate methods
- Solve software engineering problems independently
- Reflect self-designed software engineering solutions critically and present them appropriately

Methodological competence
The Students:
- Structure problems with modelling techniques

- Develop actual methods of software engineering
- Present software engineering solutions
- Write scientific papers independently

Social competence
The Students:
- Explain and discuss software development solutions in their practical use
- Accept criticism and see it as an asset

Self-competence
The Students:
- Reflect their problem-solving behaviour with regard to the possibilities of software technology
- Internalize the presented developmental methods and integrate them in their own actions

Content of the module:
The following subjects are provided:
- Concept of systems
- Iterative and agile process models of software development
- System development and cost estimation
- Methods, techniques and tools to collect requirements
- Techniques to develop and describe software architecture
- Measurement and evaluation of software systems
- Extended techniques of modelling, meta-modelling, domain specific languages
- Model based development
- Methods and techniques of software evolution

Suggested reading:
- Ian Sommerville: Software Engineering, Addison-Wesley Longman, Amsterdam, 10. Ed. 2012
- Jochen Ludewig, Horst Lichter: Software Engineering, dpunkt.verlag, 3. Auflage 2013
- Helmut Balzert: Lehrbuch der Software-Technik, Spektrum Akademischer Verlag, 3. Auflage 2009
- Chris Rupp, Stefan Queins: UML 2 glasklar. Praxiswissen für die UML-Modellierung, Carl Hanser Verlag, 4. Auflage 2012

and actual papers from IEEE Software, IEEE Transactions on Software-Engineering, Informatik-Spektrum and conferences (z.B. ICSE, ICSM, WCRE, CSMR, ICPC, SLE, u.a.)

Comments:
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Weblink:
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Prerequisites for admission:
-

Helpful previous knowledge:
inf005 Software Engineering I

Associated with the module(s):
-

Maximum number of students / selection criteria:
unlimited

Types of examinations:
Portfolio (30-minute presentation, 1 paper (4 pages, IEEE) and oral exam)

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf008 - Informationssysteme II*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 3rd semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Marco Grawunder
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The Module “Information Systems II” enhances the knowledge and the concepts of “Information Systems I”.

Professional competence
The students:
- Know further concepts, languages and architectures of databases
- Analyse advanced information processing tasks
- Analyse complex requirements of information systems appropriately
- Realize information requirements and gather relevant information

Methodological competence
The students:
- Propose concrete processing principles for special application classes
- Reflect specific technologies' consequences and proceedings

Social competence
The students:

Self-competence
The students:
- Reflect their problem-solving behaviour with regard to extended information processing concepts

Content of the module:
- Implementation of databases (architecture, index structures, query processing and optimization)
- Data integration and data analysis (data integration, data warehouses, data mining)
- Information retrieval
- Parallel databases

Suggested reading:
Suggested reading:
- Härder, T.,Rahm, E.:Datenbanksysteme -Konzepte und Techniken der Implementierung, Morgan Kaufmann
- Raghu Ramakrishnan, Johannes Gehrke: Database Management Systems, McGraw-Hill
- U. Leser, F. Naumann. Informationsintegration: Architekturen und Methoden zur Integration verteilter und heterogener Datenquellen. dpunkt
- Bauer/Günzel. Data-Warehouse-Systeme, dpunkt
- Han/Kamber/Pei. Data Mining: Concepts and Techniques, Morgan Kaufmann

Comments:
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Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
Java, Informationssysteme I

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written or oral Exam

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf009 - Praktikum Datenbanken*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 3rd semester	*Type of program:* PR (4 semester hours) PR *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Marco Grawunder
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The objective of this module is to gather practical experience on databases and information systems. The students get an overview of the technical realisation, implementation and optimisation of a professional database management system.

Professional competence
The students:
- Realise, implement and program data base systems
- Program and implement database-oriented system routines
- Implement optimisation goals in the modelling phase
- Administer professional database systems (installation, maintenance and adjustment)
- Recognise database systems' performance problems and are able to fix them with according methods
- Organise and control processes of database systems

Social competence
The students:
- Solve database system problems in a team

Self-competence
The students:
- Acknowledge the limits of their ability to cope with pressure during the implementation and are aware of failures
- Reflect their self-perception

Content of the module:
The module “Practical Course Databases” is a related practical course of the module “Information Systems I”. The objectives of this module are special technical concepts of a database system and practical solutions in database programming and optimisation.
Contents of this module are:
- System-oriented database management programming,
- Implementation of catalogue systems,
- Optimisation strategies based on parallelisation and partitioning requirements

Suggested reading:
Ramez Elmasri und Shamkant B. Navathe (2007).
Fundamentals of Databases Systems. Fifth Edition, Pearson/Addison Wesley.
Held Andrea (2005), Oracle 10g Hochverfügbarkeit Addison-Wesley.
Held Andrea (2015), Oracle 12c New Features Addison Wesley.
Feuerstein Steven, Pribyl Bill, Dawes Chip (2007).
Oracle PL/SQL. 4. Auflage, O'Reillys Taschenbibliothek

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
inf007 Informationssysteme I
inf012 Betriebssysteme I

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
StudIP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf011 - Rechnernetze II*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Die im Modul Lehrenden
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die im Modul Lehrenden
Objective of the module / skills: -	
Content of the module: -	
Suggested reading: -	
Comments: - *Weblink:* - *Prerequisites for admission:* -	*Helpful previous knowledge:* - *Associated with the module(s):* -
Maximum number of students / selection criteria: unrestrained *Types of examinations:* - *Examination periods:* - *Registration procedure:*	

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Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf013 - Betriebssysteme II*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Oliver Theel
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The module “Operating Systems II“ comprises the continuation of “Operating Systems I”. It deepens the knowledge about the conception, implementation and evaluation of operating systems.

Professional competence
The students:
- Evaluate the performance of operating systems in detail
- Realise the implementation challenges of operating systems
- Evaluate realizations of extended subproblems and apply them

Methodological competence
The students:
- Transfer implementation concepts to other contexts
- Question different solutions wrt. properties

Social competence
The students:
- Solve problems in small teams
- Present their solutions to the members of the tutorial
- Discuss their different solutions with members of the tutorial

Self-competence
The students:

- Accept criticism
- Question their initial solutions in the light of newly learned methods

Content of the module:

The contents of this module are:
1) Additional aspects of file systems
2) Input/output control
3) User representation
4) Additional synchronisation concepts
5) User interfaces
6) Job management
7) Operating systems' structures
8) Operating systems' examples

Suggested reading:

A. Tanenbaum (2009). Modern Operating Systems. 3rd edition, Prentice Hall
W. Stallings (2012). Operating Systems. 7th edition, Prentice Hall
J.Nehmer (2001) Systemsoftware – Grundlagen moderner Betriebssysteme, dpunkt-verlag.

Comments:

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Weblink:

-

Prerequisites for admission:

-

Helpful previous knowledge:

Betriebssysteme I

Associated with the module(s):

-

Maximum number of students / selection criteria:

unrestrained

Types of examinations:

written or oral exam

Examination periods:

End of the semester

Registration procedure:

Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf014 - Praktikum Betriebssysteme*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* PR (4 semester hours) PR *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 112 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Oliver Theel
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The aim of this module is to get practical experience in the field of analysis, design, and implementation methods of components of operating systems and their interactions.

Professional competence
The students:
- Familiarise with complex software systems
- Implement hardware-related components of operating systems
- Describe parallel system operation executions
- Understand the basic concepts of the programming language C++
- Identify software errors systematically, especially regarding parallel software
- Work in teams
- Use UNIX standard software to solve problems
- Recognise the advantage of working with virtual machines

Methodological competence
The students:
- Are aware of the challenges in handling operating systems
- Transfer operating system concepts to a practical context
- Analyse different solutions to a problem wrt. their properties
- Select the most suitable solution

Social competence
The students:
- Solve problems in small teams
- Present their solutions to all teams
- Discuss their different solutions within their own team and among all teams

Self-competence
The students:
- Accept criticism
- Organise the workflows within their teams
- Question their potential solutions in the light of criticism received
- Identify own shortcomings in their initial ability to successfully transfer theory to praxis

Content of the module:
The contents of this module are:
- Analysis of a rudimentary operating system
- Design and implementation of a process management subsystem
- Design and implementation of process synchronisation mechanisms
- Design and implementation of a virtual memory management subsystem
- Design and implementation of a file subsystem or dialog subsystem

Suggested reading:
Patterson and Hennessy, Computer Organization and Design, 3rd edition, Morgan Kaufmann, 2007

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
Inf012 Betriebssysteme I

Associated with the module(s):
inf012 Maschinennahe Programmierung

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Active participation / work report and oral exam

Examination periods:
At the end of the semester

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf015 - Verteilte Betriebssysteme*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 3rd semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Oliver Theel
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

This module deals with the fundamentals of distributed operating systems. It gives an understanding of the terminology, structures, functions, conceptions, key problems and implementation concepts of distributed operating systems.

Professional competence
The students:
- Evaluate the performance and functionality of distributed operating systems
- Are aware of the realisation problems of distributed operating systems
- Know and evaluate standard methods of solving problems in the context of distributed operating systems
- Use standard methods to solve problems in the context of distributed operating systems

Methodological competence
The students:
- Use standard methods of the distributed operating system domain to solve problems in other contexts
- Analyse and rank different solutions in the problem domain wrt. relevant properties

Social competence
The students:
- Solve problems in small teams

- Present their solutions to the members of the tutorial
- Duscuss their sdifferent solutions with members of the tutorial

Self competence
The students:
- Accept critcism
- Question their initial solutions in the light of newly learned methods

Content of the module:
The contents of this module are:
1) The historical development towards distributed operating systems
2) Models of distributed computer systems
3) Models of distributed operating systems
4) Design criteria of distributed operating systems
5) Interprocess communication (Computer Networks, Message Passing, Remote Procedure Call)
6) Memory management
- DSM
7) Process management
- Task allocation
- Load balancing
- Load distribution
- Process migration
8) Synchronisation
- Clocks
- Ordering of events
- Distributed mutual exclusion
- Distributed leader lection
- Deadlocks
9) Naming and locatisation of objects
10) Distributed file systems
11) Fault tolerance concepts

Suggested reading:
- Chow and Johnson (1998) Distributed Operating Systems and Algorithms, Addison-Wesley
- Tanenbaum und van Steen (2007): Distributed Systems: Principles und Paradigms, 2nd edition, Pearson/Prentice Hall
- Singhal und Shivaratri (1996): Advanced Concepts in Operating Systems, McGraw-Hill
- Coulouris, Dollimore, Kindberg (2001): Distributed Systems: Concepts and Design, Addison-Wesley

Comments:
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Weblink:
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Prerequisites for admission:
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Helpful previous knowledge:
Betriebssysteme I

Associated with the module(s):
Betriebssysteme I and II, Betriebssysteme-Praktikum, Fehlertoleranz in verteilten Systemen (as a possible differentiation)

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Training tasks, written exam or oral exam

Examination periods:
End of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf016 - Internet-Technologien*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 3rd semester und/oder 5th semester	*Type of program:* V (2 semester hours), PR (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Susanne Boll-Westermann
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden
Objective of the module / skills: The graduates of the module know different Internet concepts and technologies. They are able to evaluate the capability of the concepts and techniques to design internet-based applications. The students will apply these concepts and techniques in a project. Professional competence The students: - Know basic concepts and technologies of the Internet and the web Methodological competence The students: - Are able to use techniques in projects Social competence The students: - Implement web-based projects in a team Self-competence The students: - Reflect their own capability to develop web-based applications	
Content of the module: This module deals with the basic development concepts of internet-based applications. It covers the web languages: HTML, CSS, XML, XML-Schema, XPath, XSTL. It includes the relevant client technologies of web applications (Applets, AJAX, COMET) and server technologies (Forms, Servlets, Java Server Pages, STRUTS, Ruby on Rails). Additional topics are multimedia on the internet (SMIL, SVG, Flash),	

usability and accessibility.

The practical project of this module consists of the design, implementation and presentation of a comprehensive web application. The topics of the lecture will be applied and deepened in practice. The project is based on the web framework Ruby on Rails.

Suggested reading:
Reserve shelf in the library; extensive list of links in e-learning platform StudIP covering course topics.

Comments:
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Weblink:
medien.informatik.uni-oldenburg.de/lehre

Prerequisites for admission:
-

Helpful previous knowledge:
HTML, objectoriented programming

Associated with the module(s):
Complements with inf005 Softwaretechnik, inf007 Informationssysteme I, inf008 Informationssysteme II

Maximum number of students / selection criteria:
unlimited

Types of examinations:
Project and oral exam or project and written exam

Examination periods:
The practical projects will all be presented on a single project day, which will take place at the end of the lecture period. The oral exam takes place during the last two weeks of the lecture period. If necessary, re-examinations will take place at the end of the term. Find out more about the schedule on the websites of the department and in StudIP.

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf017 - Interaktive Systeme*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 3rd semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Susanne Boll-Westermann
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden
Objective of the module / skills: Professional competence The students: - Name the basic concepts and characteristics of usable user interfaces - Characterise the basic elements of the user-centered design of interactive systems Methodological competence The students: - Characterise the basic approaches to analyse context of use and user requirements - Explain methods for the design and prototypical implementation of interactive systems - Characterise established evaluation techniques and are able to use them Social competence The students: -Develop and present solutions for Human-Computer-Interaction related problems	
Content of the module: The field of interactive systems deals with the tasks, concepts and technologies of human-computer interaction and its user-friendly and suitable design. The lecture is based on the so-called Human Centred Design Process and includes models of interaction between humans and their environment, iterative design, prototyping techniques, study and evaluation processes. Basic design principles, methods and tools are presented. Practical tasks complete the lecture.	
Suggested reading: Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale: Human Computer Interaction.	

Bernhard Preim, Raimund Dachselt: Interaktive Systeme Further articles and papers that are presented in the lecture	
Comments: - *Weblink:* - *Prerequisites for admission:* -	*Helpful previous knowledge:* - *Associated with the module(s):* -
Maximum number of students / selection criteria: unrestrained *Types of examinations:* Practical tasks and oral exam *Examination periods:* Individually arranged at the end of the lecture period *Registration procedure:* Stud.IP	

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: *- inf018 - Medienverarbeitung*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 6th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Susanne Boll-Westermann
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden
Objective of the module / skills: - Name the basic concepts and characteristics of digital media - Name the core concepts of encoding and compressing images, videos and audio files - Characterise the complexity of the analysis, classification and processing of unstructured media, using the examples of image analysis - Apply concepts of encoding, compression and image analysis independently	
Content of the module: Media processing technologies are presented in the lecture. One focus of the lecture is the encoding of digital images and the compression of an image, image enhancement and image processing. The lecture also deals with encoding and analysis of video and audio. This lecture is accompanied by simple practical tasks.	
Suggested reading: Wilhelm Burger und Mark James Burge. Digitale Bildverarbeitung: Eine Einführung mit Java und Image, J. Springer, 2006. Reserve shelf in the library; extensive list of links in e-learning platform StudIP covering course topics.	
Comments: - *Weblink:* medien.informatik.uni-oldenburg.de/lehre *Prerequisites for admission:*	*Helpful previous knowledge:* Solid programming skills in Java and/or C++, praktical informatics. Interest in media processing *Associated with the module(s):* -

-	

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Project and oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
StudIP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf019 - Compilerbau*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 4th semester	*Type of program:* V (2 semester hours), Ü (1 semester hours), PR (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Michael Sonnenschein
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden
Objective of the module / skills: Professional competence The students: - Name the structure of a compiler and each part of the compiling process of a programming language - Describe the standards of each phase of a compiling process - Understand and evaluate typical characteristics as well as advantages and disadvantages of different methods of the compilation stages - Practically apply the learned methods of the compilation stages - Evaluate the use of a compilation generator Methodological competence The students: - Link the automata theory and the formal language concepts regarding the compiler construction Social competence The students: - Develop and present solutions of given problems in small teams	
Content of the module: The module provides all steps of a compiler: scanner, parser, semantic analysis, intermediate code generation, code optimisation and machine code generation. Each step is introduced by its current methods. For the parsing step LL-Parser and LR-Parser are presented. The code optimisation step is introduced by different procedures with different conditions for the register optimisation. The lecture essentially follows the book of Aho, Lam, Sethi, Ullman which can validly be described as a compiler construction classic.	

During practice the introduced methods are practically deepened by small examples and tasks, which the students must carry out independently. A compiler generator (typically ANTLR) is used to demonstrate the practical use of such a tool to the students.

Suggested reading:
essential: Handout

recommented: Aho, Lam, Sethi, Ullman: Compilers. Principles, Techniques, and Tools, 2nd ed., Addison Wesley, 2006

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
Theoretische Informatik II

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
StudIP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf020 - Maschinennahe Programmierung*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 3rd semester und/oder 5th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Oliver Theel
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden
Objective of the module / skills: Professional competence The students: - Comprehend special concepts and methods of low-level programming of tightly-coupled computer systems in C and their translation into NASM assembly language - Design and implement programs in C independently and systematically translate them into a computer architecture-specific assembly language - Implement machine-oriented software with appropriate programming and compilation techniques and concepts - Recognize the relation of technical and practical computer science as well as the relations of high- and low-level programming Methodological competence The students: - understand aspects of the practical and theoretical computer science - understand the connection between high level language constructs and low level language constructs - translate C programs into NASM programs Social competence The students: - Solve problems in small teams - Present their solutions to the members of the tutorial - Discuss their different solutions with members of the tutorial	

Self-competence
The students:
- Accept criticism
- Question their initial solutions in the light of newly learned methods

Content of the module:
- Application areas of machine-oriented programming
- Concepts of the programming language C
- Programming in C
- Setup and structure of tightly-coupled computer systems
- Intel processor architecture
- Assembly languages, in particular NASM assembly language
- Systematical translation of programs from C to NASM assembly language

This module builds a bridge between technical and practical computer science aspects and high-level and machine-oriented programming. The knowledge and skills learned in this module are relevant for machine-oriented system programming, e.g. in realising operating systems and translations of programming languages.

Suggested reading:
- D. Patterson und J. Hennessy (2007). Computer Organization and Design, 3rd Edition, Elsevier Inc.
- B. Kernighan und D. Ritchie (1988) The C Programming Language, Second Edition, Prentice Hall, Inc.
- Jeff Duntemann (2009): Assembly Language Step by Step, 3rd edition, Wiley Publishing

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
First year courses of the Bachelor of computer science or business informatics

Associated with the module(s):
Betriebssysteme I und II (as possible prerequisites), Verteilte Betriebssysteme (as possible specialisation), Betriebssysteme-Praktikum

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written or oral exam

Examination periods:
at the end of the lecture periode

Registration procedure:
StudIP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik
Module reference number/Title: - *inf021 - Praktikum Fortgeschrittene Java-Technologien*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 2nd semester und/oder 3rd semester	*Type of program:* PR (4 semester hours) PR *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Dr. Dietrich Boles
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden
Objective of the module / skills: The objective of this practical course is to introduce advanced concepts and technologies of the Java Standard Edition. The students will be able to use the technologies to implement large-scale applications. Professional competence The students: - Name the essential packages of the JDK class library - Structure large-scale programs properly and implement them extensively - Set up own Java class libraries - Look up required classes in the JDK-Library and solve problems with these classes - Structure their programs properly - Understand and interpret large-scale programs - Evaluate the quality of large-scale programs related to their maintainability, reuseability and expandability Methodological competence The students: - Search for solutions on the internet Social competence The students: - Discuss own and someone else's solutions Self-competence	

The students:
- Reflect their problem-solving behaviour and take up new solutions, e.g. from the internet

Content of the module:
A selection of the following subjects is presented during the practical course:

- GUI (AWT, Swing, JavaFX)
- Java-Basics and Collection-API
- Graphics and multimedia
- Events
- Model-View-Control (MVC)
- Threads
- Internationalisation, localization
- Reflection
- IO, Files
- Tools (compiler, classloader, printer, ...)
- Storage technologies (XML and serialisation)
- Distributed programming (sockets and RMI)
- Databases (JDBC)
- Compression
- Security concepts

The pratical-course is based on a large-scale project. This project is developed step-by-step relating to the subjects of the course.

Suggested reading:
-

Comments:
-

Weblink:
http://www.boles.de/teaching/javapraktikum/index.html

Prerequisites for admission:
-

Helpful previous knowledge:
inf003 Programmierkurs

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
hands-on training

Examination periods:
At the end of the lecture period

Registration procedure:
StudIP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Technische Informatik
Module reference number/Title: - *inf203 - Eingebettete Systeme I*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 3rd semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Wolfgang Nebel, Prof. Dr. Werner Damm, Prof. Dr. Martin Georg Fränzle
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

This module provides an introduction to the design of digital embedded systems.

Professional competence
The students:
- name functional and non-functional requirements to specify embedded systems
- discuss design space and associated embedded systems design methods
- name control and feedback control systems' core concepts
- characterise the fundamental digital signal processing algorithms

Methodological competence
The students:
- design and develop embedded feedback control systems with modelling tools
- implement an embedded hardware-/software system according to a given specification
- analyze various specification languages according to different properties

Social competence
The students:
- implement solutions to given problems in teams
- present results of computer science problems to groups
- organize themselves as a team to solve a larger problem using project management methods

Self-competence
The students:
- acknowledge the limits of their ability to cope with pressure during the implementation process of systems
- solve excercises self-responsibly

Content of the module:
Embedded systems support complex feedback problems, control problems and data processing tasks. They have an important value creation potential for telecommunications, production management, transport and electronics. The functionality of embedded systems is realised by the integration of processors, special hardware and software. The embedded systems design is influenced by the heterogeneity of system architectures, the complexity of systems and technical and economic requirements.

This module gives an overview of embedded systems and their design. The process of digital signals is especially important for telecommunications and multimedia. For this purpose, the module introduces digital signal processing algorithms. The principles of feedback control are introduced by exemplary transport applications. Subsequently, the module provides the specifications and language characteristics of the embedded system design. For this purpose, graphical data-flow modelling languages (for instance Simulink) and control-flow specifications (for instance State Charts) are presented. The module closes with the concepts of possible architectures and communication models.

Hands-on exercises with the tools Matlab/Simulink/StateFlow support the module contents.

Suggested reading:
Slides and

- Harel, D.: STATECHARTS: A Visual Formalism for Complex Systems. Science of Computer Programming, 8, North-Holland, 1987, page(231-274)
- Harel D.: Naamad, A. The STATEMATE Semantics of Statecharts. ACM Trans. Software Engineering Methods, Oct 1996
- Harel, D.; Politi, M.: Modeling Reactive Systems with Statecharts: The Statemate Approach
- Josef Hoffmann: Matlab und Simulink: Beispielorientierte Einführung in die Simulation dynamischer Systeme, Addison-Wesley, 1998, ISBN 3-8273-1077-6
- Staunstrup, J., Wolf, W. (eds.): Hardware/Software Co-Design: Principles and Practice. Kluwer Academic Publishers, 1997, ISBN 0-7923-8013-4, chapters 1, 2, (3), 4, 6, (7), (8-10)
- U. Reimers. Digitale Fernsehtechnik. 2. Aufl., Springer, 1997, ISBN 3-540-60945-8

Secundary literature:
- Debardelaben, J.A.; Gadient, A.J.: Incorporating Cost Modeling in Embedded-System Design. IEEE Design & Test, vol 13, no. 3, 1997
- De Micheli, G.; Sami, M.: Hardware-Software Co-Design. Kluwer, 1996, ISBN 0-7923-3883-9
- Gajski, D.; Vahid, F.; Narayan, S.; Gong, J.: Specification and Design of Embedded Systems. Prentice Hall, 1994, ISBN 0-13-150731-1
- T. Painter, A. Spanias. Perceptual Coding of Digital Audio. Proceedings of the IEEE, vol 88, no 4, April 2000.
- U. Freyer. DVB - Digitales Fernsehen. Verlag Technik, 1997, ISBN 3-341-01192-7
- B. Friedrichs. Kanalcodierung: Grundlagen und Anwendungen in modernen Kommunikationssystemen. Springer, 1995, ISBN 3-540-58232-0

<table>
<tr><td colspan="2">- G.C. Clark. Error-correction coding for digital communications. 3rd printing, Plenum Press, 1988, ISBN 0-306-40615-2
- Artikelserie zum MPEG-2-Standard 3/94 - 10/94 und das Tutorial "Digitale Bildcodierung" 1/92 - 1/93, beides in "Fernseh- und Kinotechnik" (BIS: Z elt ZA 1536)</td></tr>
<tr><td>Comments:
This module is compulsory for students who are specialising in "Eingebettete Systeme und Mikrorobotik".

Weblink:
-

Prerequisites for admission:
-</td><td>Helpful previous knowledge:
- Grundlagen der technischen Informatik
- Technische Informatik

Associated with the module(s):
In the module "Eingebettete Systeme II" additonal relevant topics such as design processes, HW/SW-Partitioning, High-Level-Synthesis and Hardware discription languages are discussed. The modules Eingebettete Systeme I und II offer cross-references to the module "Rechnerarchitektur", "Realzeitbetriebssysteme" and semantic orientated modules of theoretical computer science. It is possible to enhance the knowledge of embedded systems design by attending the modules "System Level Design" and "Low energy System Design".</td></tr>
<tr><td colspan="2">Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Written or oral exam

Examination periods:
At the end of the semester

Registration procedure:
Stud.IP</td></tr>
</table>

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Technische Informatik
Module reference number/Title: - *inf204 - Eingebettete Systeme II*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 4th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Werner Damm, Prof. Dr. Wolfgang Nebel, Prof. Dr. Martin Georg Fränzle
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The module provides an introduction to digital embedded systems design.

Professional competence
The students:
- name embedded systems architectures
- name specific hardware components and -architecture designs, particularly processor designs
- characterise the design spaces and associated embedded systems design techniques
- decompose subcomponents of feedback control systems and implement their tasks in different design spaces
- develop software-/hardware components
- describe fault-tolerance architecture principles
- describe real-time and safety requirements analysing techniques
- characterise hardware synthesis

Methodological competence
The students:
- estimate the consequences of design decisions in terms of energy usage, performance and reliability component allocations, and designs
- implement an embedded hardware-/software system according to a given specification
- model hardware with a hardware description languages

- analyze Hardware-/Software systems using event-bases simulation

Social competence
The students:
- implement solutions to given problems in teams
- present results of computer science problems to groups
- organize themselves as a team to solve a larger problem using project management methods

Self-competence
The students:
- acknowledge the limits of their ability to cope with pressure during the implementation process of systems
- deal self responsibly with exercises

Content of the module:
Embedded systems support complex feedback problems, control problems and data processing tasks. They have an important value creation potential for telecommunications, production management, transport and electronics. The functionality of embedded systems is realised by the integration of processors, special hardware and software. The embedded systems design is influenced by the heterogeneity of system architectures, the complexity of systems and technical and economic requirements.

This module is the continuation of the module “Eingebettete Systeme I” and deals with different architectures of embedded systems and processors.
The module provides system partitioning methods and the synthesis of hardware components.

Hands-on exercises with development tools, hardware description languages and simulation support the module contents.

Suggested reading:
Slides and

- Staunstrup, J.: Wolf, W. (eds.): Hardware/Software Co-Design: Principles and Practice. Kluwer Academic Publishers, 1997, ISBN 0-7923-8013-4, chapters 1, 2, (3), 4, 6, (7), (8-10)
- Yen, Ti-Yen; Wolf, W.: Hardware-Software Co-Synthesis of Distributed Embedded Systems. Kluwer, 1996, ISBN 0-7923-9797-5

Secondary literature:

- Peter J. Ashenden: The Designer's Guide to VHDL. Morgan Kaufmann Publishers, 2002, ISBN 1-55860-674-2
- Lehmann, G.; Wunder, B.; Selz, M.: Schaltungsdesign mit VHDL. Franzis Verlag, 1994, ISBN 3-7723-6163-3
- J. Reichardt, B. Schwarz: VHDL-Synthese, Entwurf digitaler Schaltungen und Systeme. Oldenbourg Wissenschaftsverlag, 2000, ISBN 3-486-25128-7
- Mermet, J. (ed.): Fundamentals and Standards in Hardware Description Languages. Kluwer, 1993, ISBN 0-7923-2513-3
- De Micheli, G.; Sami, M.: Hardware-Software Co-Design. Kluwer, 1996, ISBN 0-7923-3883-9
- Gajski, D.; Vahid, F.; Narayan, S.; Gong, J.: Specification and Design of Embedded Systems. Prentice

Hall, 1994, ISBN 0-13-150731-1	
Comments: This module is supposed to be a compulsory module for students who are specialising in "Eingebettete Systeme und Mikrorobotik". *Weblink:* - *Prerequisites for admission:* -	*Helpful previous knowledge:* Modul "Eingebettete Systeme I" *Associated with the module(s):* This module is compulsory for students who are specialising in "Eingebettete Systeme und Mikrorobotik".
Maximum number of students / selection criteria: unlimited *Types of examinations:* Written or oral Exam *Examination periods:* at the end of the lecture times *Registration procedure:* Stud.IP	

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Technische Informatik
Module reference number/Title: - *inf205 - Formale Methoden Eingebetteter Systeme*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 4th semester und/oder 6th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Martin Georg Fränzle
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Embedded computer systems sustain a permanent interaction with their environment. This interaction may lead to hardly predictable stimuli and reponse sequences, which complicates the design and validation of such systems tremendously.
As in more mature enigneering disciplines, formal analytical models have been proposed as a remedy. Their role in the design flow is equivalent to the use of structural analysis and material science within, e.g., building statics. Pertinent formal methods for and formal models of embedded systems cover, for instance, execution time, power demand, and possible system dynamics.
As they represent relevant aspects of a system in a formal, mathematical way, they often permit automatic anaylsis - i.e., to derive characteristic data - and automatic certificate generation. The distinguishing factor to more traditional forms of analysis like testing and profiling is the exhaustive form of analysis achieved by mathematical methods, which guarantee that the results apply for any environmental interaction. This is in stark contrast to the inherently incomplete coverage provided by test-based methods.

The lectures explain a series of increasingly more expressive formal models and the related automatic analysis techniques. The exercise classes complement these theoretical insights by hands-on experience with state of the art formal analysis tools and offer the possibility to build such tools oneself.

Professional competence

The students:
- Evaluate the consequences of certificates applied by formal methods
- Evaluate the suitability of available verification tools for a partial aspect and system class
- Use these tools and interpret their results and improve the examined system
- Prepare system models for automatic analysis methods and abstract or encode the systems symbolically (or otherwise) accordingly
- Design and implement verification algorithms

Methodological competence
The students:
- Are able to model complex and heterogeneous systems by adequate mathematical modelling techniques
- Know pertinent mathematical models for system dynamics and are able to transfer them to other problem domains.

Social competence
The students:
- Develop and implement fundamental verification algorithms in teams
- Discuss the relative merits of alternative algorithms and formalisms

Self-competence
The students:

Content of the module:
The module explains semantic models for reactive, real-time, and hybrid discrete-continuous systems and gives examples for pertinent specification logics. It gradually develops state-exploratory verification algorithms, both of explicit-state and symbolic shape, as relevant to the development of reliable hardware and software systems.

The lectures present the semantic, logical, and algorithmic foundations of the automatic analysis for embedded software systems. The exrcise classes complement this by providing space for experimenting with formalisms and tools in teams. The second half of the semester is dedicated to the semester project, which either deals with implementing an automatic verifier or with in-depth usage of existing tools on examples of indsutrially relevant size

Suggested reading:
- Michael Huth, Mark Ryan: Logic in Computer Science: Modelling and Reasoning About Systems. Cambridge University Press, 2004.
- Christel Baier, Joost-Pieter Katoen: Principles of Model Checking. MIT Press, 2008.
- Edmund M. Clarke, Orna Grumberg, Doron A. Peled: Model Checking. MIT Press, 2000.

Comments:
-

Weblink:
-

Prerequisites for admission:
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Helpful previous knowledge:
Basic knowledge of logics, discrete mathematics, automata theory and computability theory taught in the modules "Diskrete Strukturen" and "Theoretische Informatik I + II".
Programming skills as taught in the "Programmierkurs" are also helpful.

Reason: The methods introduced in the module are based on mechnaizing semantic reasoning by

	reduction to logical encodings and by mechanical proof of logical statements. An understanding of these fundamentals, as taught in the previously named modules, thus is essential to both the theoretical understanding and the practical implementation of the course contents. *Associated with the module(s):* -
Maximum number of students / selection criteria: unrestrained *Types of examinations:* Semester project *Examination periods:* at the end of the semester *Registration procedure:* Stud.IP	

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Praktische Informatik - Technische Informatik
Module reference number/Title: - *inf206 - Realzeitbetriebssysteme*	
Duration: 1 semester *Cycle:* irregularly *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Die im Modul Lehrenden
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -
Objective of the module / skills: -	
Content of the module: -	
Suggested reading: -	
Comments: - *Weblink:* - *Prerequisites for admission:* -	*Helpful previous knowledge:* - *Associated with the module(s):* -
Maximum number of students / selection criteria: unrestrained *Types of examinations:* - *Examination periods:* -	

Registration procedure:

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Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Technische Informatik -
Module reference number/Title: - *inf207 - Grundlagen der Elektrotechnik*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 4th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Andreas Hein
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden
Objective of the module / skills: Professional competence The students: - Analyse linear electrical networks (direct current and alternating current) - Name basic concepts to calculate and to use electrical and magnetic fields - List the characteristics of simple electrical elements (two terminal networks) - Calculate the parameters of simple electrical networks/wirings - Apply computer based analysing tools - Design and implement simple networks/wirings Methodological competence The students: - Transfer calculation methods onto complex dynamic systems - Implement electrical system models Social competence The students: - Present solutions for specific questions Self-competence The students: - Reflect their solutions by using methods learned in this course	

Content of the module:
- Basic concepts (electric dimensions and units)
- Network elements
- Calculation of linear direct current networks (Ohms law, Kirchhoff's circuit law, superposition principle)
- Characteristics, calculations and representations of electric and magnetic fields
- Construction elements (capacitor and coil)
- Extensions of periodical dimensions dependent on time, pointer representation, calculations with complex root-mean-square value pointers

Suggested reading:
essential:
- slides
- Albach: Grundlagen der Elektrotechnik 1 und 2. Pearson Studium, 2004.

recommended:
- Hagmann, G.: Grundlagen der Elektrotechnik. AULA-Verlag, 2002.
- Hagmann, G.: Aufgabensammlung zu den Grundlagen der Elektrotechnik. AULA-Verlag, 2002.

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
Modul Analysis II oder Numerik

Associated with the module(s):
Modul Analysis II oder Numerik

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Hands-on exercises / written exam or oral exam

Examination periods:
At the End of the Semester

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Technische Informatik -
Module reference number/Title: - *inf208 - Mikrorobotik und Mikrosystemtechnik*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Sergej Fatikow
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Prof. Dr. Sergej Fatikow, Die im Modul Lehrenden

Objective of the module / skills:

Within the last few years, microrobotics and microsystem technology (MST) have become a focus of interest to industry and evolved into an important field with great application potential. It plays a decisive role for industry to be competitive in many areas such as medicine, production engineering, biotechnology, environmental technology, automotive products, etc. Despite of the growing interest in this new technology, there is hardly any book or lecture course that treats microrobotics and MST in a coherent and comprehensive way. This course is an attempt of the Microrobotics and Control Engineering Division (AMiR) to give students a systematic introduction to microrobotics and MST. It discusses all important aspects of this rapidly expanding technology, its diversity of products and fields of application. The course contains an overview of numerous ideas of new devices and the problems of manufacturing them.

Professional competence
The students:
- Name the ideas, challenges and activities of microrobotics and microsystem technology
- Describe the microrobotics and MST applications
- Characterise MST methods
- Name microsensor functionality
- Characterise microsensor examples
- Discuss MST terms of information technology
- Classify microrobotics

Content of the module:

Ideas and problems of microrobotics and MST; applications; techniques of MST; silicon-based micromechanics; LIGA technology; microactuators: principles and examples (electrostatic, piezoelectric, magnetostrictive, electromagnetic, SMA-based, thermomechanical, electrorheological and other actuators); microsensors: principles and examples (force and pressure, position and speed, acceleration, biological and chemical, temperature and other sensors); MST and information processing; microsystem design and simulation; classification of microrobots; coarse positioning of a microrobot; fine positioning of a microrobot; handling of microparts: problems and solutions; micro grasp techniques; microassembly; process automation by microrobots; desktop robot cell in SEM

Suggested reading:

Essential:

- Lecture notes (can be obtained for € 10,- in our secretariate)

Recommended:

- Fatikow, S.: Mikroroboter und Mikromontage, Teubner, Stuttgart Leipzig, 2000
- Fatikow, S./Rembold, U.: Microsystem Technology and Microrobotics, Springer, Berlin Heidelberg New York, 1997

Secondary Literature (only available for some subareas!):

- Brück, A. und Schmidt, A.: Angewandte Mikrotechnik, Hanser, München Wien, 2001
- Ehrfeld, W. (Hrsg.): Handbuch Mikrotechnik, Hanser, München Wien, 2000
- Elbel, Th.: Mikrosensorik, Vieweg, Wiesbaden, 1996
- Fukuda, T. and Menz, W. (Eds.): Micro Mechanical Systems, Elsevier, Amsterdam, 1998
- Gardner, J.W.: Microsensors, Wiley, Chichester, 1994
- Gerlach, G. und Dötzel, W.: Grundlagen der Mikrosystemtechnik, Hanser, München Wien, 1997
- Krause, W.: Fertigung in der Feinwerk- und Mikrotechnik, Hanser, 1995
- Menz, W. und Mohr, J.: Mikrosystemtechnik für Ingenieure, VCH, Weinheim, 1997
- Mescheder, U.: Mikrosystemtechnik, Teubner, Stuttgart Leipzig, 2000
- Tränkler, H.-R. und Obermeier, E. (Hrsg.): Sensortechnik, Springer, Berlin Heidelberg, 1998
- Völklein, F. und Zetterer, Th.: Einführung in die Mikrosystemtechnik, Vieweg, Wiesbaden, 2000

Comments:

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Weblink:

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Prerequisites for admission:

-

Helpful previous knowledge:

-

Associated with the module(s):

Embedded Systems and Microrobotics

Maximum number of students / selection criteria:

unrestrained

Types of examinations:

oral exam in German

Examination periods:

At the end of the semester

Registration procedure:

StudIP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Technische Informatik -
Module reference number/Title: - *inf209 - Regelungstechnik*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Sergej Fatikow, Prof. Dr. Andreas Hein
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Instruction on theoretical and mathematical basics of control engineering

Professional competence
The students:
- Describe the core principles of steering and control of technical systems
- Discuss the modelling core concepts of systems and their controllers
- Name methods to determine the quality of controlled systems
- Model technical systems with differential equations and their transfer functions
- Develop control structures, evaluate their stabilty and determine their optimal control parameters

Methodological competence
The students:
- Are aware of the technical challenges and solve them by including the implementations of other disciplines and methods

Social competence
The students:
- Present solutions for specific questions

Self-competence
The students:
- Get used to the specific challenges of the development of controlled systems

Content of the module: Basics; analog transfer elements: linear time invariant (LTI-) systems; simulation and modeling; step response; frequency response; frequency response locus; differential equations and transfer function; control loop stability; types of controlled systems; types of linear controllers; linear control loops: reference and disturbance reaction of the controlled system; rules for control loop optimization; methods of analysis and synthesis, implementation; computerbased control MATLAB/Simulink	
Suggested reading: - Unbehauen, H.:Regelungstechnik I, Klassische Verfahren zur Analyse und Synthese linearer kontinuierlicher Regelsysteme - Lutz, H. und Wendt, W.:Taschenbuch der Regelungstechnik - further reading will be announced at lecture	
Comments: - *Weblink:* - *Prerequisites for admission:* - Module Differential Equations - Module Basics Electrical Engeneering	*Helpful previous knowledge:* - *Associated with the module(s):* -
Maximum number of students / selection criteria: unrestrained *Types of examinations:* Hands-on exercises and written or oral exam *Examination periods:* At the end of the lecture period *Registration procedure:* Stud.IP	

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Technische Informatik
Module reference number/Title: *- inf210 - Signal- und Bildverarbeitung*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Martin Georg Fränzle, Prof. Dr. Andreas Hein
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden
Objective of the module / skills: Professional competence The students: - Name the concepts of signal and image processing in technical systems - Name the methods/algorithms of preprocessing, filtering, classification, interpretation and visualisation of signals and pictures - Select algorithms appropriately - Evaluate the effectiveness of algorithms - Design algorithms and processing chains and evaluate their quality Methodological competence The students: - Get used to specific subjects of signal and image processing Social competence The students: - Present solutions for specific questions in signal and image processing Self-competence The students: - Reflect their solutions by using methods learned in this course	
Content of the module:	

- Basic Concepts
- Signal Processing
- Signal Spaces and Signal Processing Systems
- Discrete and Constant Signals
- Labelling of Signal Transmitters with Test Signals
- Representations Areas and Transformations
- Time-Discrete Systems and Scanning
- Estimation and Filtering
- Construction with MATLAB
- Image Processing
- Introduction / Range of Applications
- Functional Transformation
- Image Enhancement/Filtering
- Segmentation
- 3D Reconstruction an Visualization

Suggested reading:

essential:

Slides

recommended:

-Meyer, M.; Signalverarbeitung: Analoge und digitale Signale, Systeme und Filter
-Grüningen, D. C. v.; Digitale Signalverarbeitung: mit einer Einführung in die kontinuierlichen Signale und Systeme
-Tönnies, K.; Grundlagen der Bildverarbeitung; Pearson Studium 2005
-Lehmann, Th.; Oberschelp, W.; Pelinak, E.; Pepges, R.; Bildverarbeitung in der Medizin; Springer Verlag 1997
-Handels. H.; Medizinische Bildverarbeitung; Teubner Verlag, Stuttgart - Leipzig 2000

Comments:
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Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
Modul math040 Analysis II b: Differenzialgleichung mehrerer Variablen

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Hands-on exercises and written or oral exam

Examination periods:
At the end of the semester

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Theoretische Informatik
Module reference number/Title: - *inf402 - Graphersetzungssysteme*	
Duration: 1 semester *Cycle:* every 2 years *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Annegret Habel
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Modelling of systems, introduction to graph transformation systems, sequential and parallel independence, termination and confluence.

Professional competence
The students:
- Know the basics of graph transformation systems and graph programs
- Describe graph transformation systems and graph programs
- Define the Turing completeness of graph programs
- Model systems and system changes
- Prove sequential and parallel independence of derivations
- Prove termination and confluence of graph transformation systems

Methodological competence
The students:
- Recognize graph transformation systems as a versatile tool for modelling in computer science

Social competence
The students:
- Work together in small groups to solve problems
- Present solutions to problems to groups of other students

Self-competence

The students:
- Learn persistence in pursuing difficult tasks
- Learn precision in writing down solutions

Content of the module:
Graphs are practically used in all areas of computer science to display complex structures. Some examples are flow charts, circuit diagrams, record structures, parse trees and functional and logical expressions. Such structures can be dynamically changed by graph rewriting systems. The changing process is represented by rewriting rules. This module gives an introduction to the field of graph transformation systems. It deals with reversibility, embedding and restriction of derivations, sequential and parallel independency, termination and confluence.

Suggested reading:
Handbook of Graph Grammars and Computing by Graph Transformation,
Vol. 1: Foundations, World Scientific, 1997.
Vol. 2: Applications, Languages and Tools, World Scientific, 1999.
Vol. 3: Concurrency, Parallelism, and Distribution, World Scientific, 1999.
H. Ehrig et al.: Fundamentals of Algebraic Graph Transformation. EATCS Monographs of Theoretical Computer Science, Springer, 2006

Comments:
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Weblink:
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Prerequisites for admission:
-

Helpful previous knowledge:
Theoretische Informatik II

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written exam or oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Theoretische Informatik
Module reference number/Title: - *inf403 - Kryptologie*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Priv.-Doz.Dr. Elke Wilkeit
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Cryptology is a key technology for the security of worldwide computer nets. Modern cryptographic techniques are used to keep data secret, sign electronic messages, control computer network access, secure electronic financial transactions, protect copyrights, among others. In view of these applications users should be able to assess the efficiency and security of these key technologies. For this purpose, it is important not only to know the function of cryptographic processes, it is also important to understand their mathematical basics. Both is explained in this module.

Professional competence
The students:
- identify basic concepts of cryptography and explain them by examples
- know relevant cryptosystems, apply them and assess their security
- are familiar in using mathematical basics of cryptographic algorithms
- implement cryptographic algorithms and prove their correctness and estimations of their complexity

Methodological competence
The students:
- assess the efficiency and security of cryptographic processes
- extend their knowledge about algorithms and their complexity
- develop their implementation skills in particular the handling of very large numbers
- analyze simple encryption using well-known and own techniques

Social competence
The students
- use the language of mathematics to discuss in groups with different knowledge about problems
- present their ideas in an understandable way
- expand and improve their own ideas through the proposals of their fellow students

Self-competence
The students:
- reflect their knowledge about security in IT systems
- reflect their knowledge about algorithms and their complexity
- experience the development of a new field of knowledge within a short amount of time
- discover new applications of mathematical contexts

Content of the module:
A) Mathematical Basics: Integers; Polynomials; Congruences; Residue Class Rings
B) Encryption
C) Probability and Perfect Security
D) Symmetric Encryption (DES, AES)
E) Generation of Prime Numbers
F) Public-Key-Encryption
G) Factorisation and Discrete Logarithms
H) Cryptographic Hash Functions and Digital Signatures
I) Identification and Certification

Suggested reading:
Lecture notes; further literature will be announced in the lecture.
For attunement: Singh, Simon: .The Code Book: Science of Secrecy from Ancient Egypt to Quantum Cryptography. Anchor, 2000.

Comments:
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Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
Mathematical and computer science basics

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written exam

Examination periods:
At the end of the lecture periode

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Theoretische Informatik
Module reference number/Title: - *inf404 - Petrinetze*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 4th semester und/oder 6th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Eike Best
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The behaviour of modern, highly parallel, digital systems may be extremely complex. Graphical and algorithmic support may be very valuable in facilitating their design, construction, and analysis. Petri nets are a basic, widely used graphical model for the specification of parallel systems. They also provide and support a range of flexible algorithmic methods for the analysis of such systems. This module teaches the basic theory and applications of Petri nets, for the purpose of specifying and visualising, as well as for constructing and analysing highly parallel systems.

Professional competence
The students:
- define basic concepts of Petri nets
- classify Petri nets according to their salient poperties
- analyse and synthesise Petri nets
- apply Petri nets in the context of well-defined problems

Methodological competence
The students:
- can apply specification and analysis methods based on Petri nets

Social competence
The students:
- present solutions to given problems to a wider audience

Content of the module: - Basic concepts of Petri net theory. - Petri net languages. - Reachability and coverability. - Marking equation. - Linear-algebraic and graph-theoretic structure of Petri nets. - Free-choice nets. - Program verification using traps. - Computing functions with nets. - Unfoldings. - High-level nets.	
Suggested reading: - Best/Wimmel: Skript Petrinetze (Oldenburg, 2015). - Secondary literature: Priese/Wimmel: Petri Netze (Springer-Verlag, 2001).	
Comments: - *Weblink:* - *Prerequisites for admission:* -	*Helpful previous knowledge:* - *Associated with the module(s):* -
Maximum number of students / selection criteria: unrestrained *Types of examinations:* written or oral exam *Examination periods:* at the end of the lecture period *Registration procedure:* Stud.IP	

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Theoretische Informatik
Module reference number/Title: - *inf405 - Algorithmische Graphentheorie*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Priv.-Doz.Dr. Elke Wilkeit
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Graphs are the most frequently used abstraction in computer science. Every system which consists of discrete states or objects and relations between these can be modelled as a graph. Most applications require efficient algorithms to process such graphs (Turau, 1996). This module provides typical graph theory problems and algorithmic solutions. They are discussed with regard to their efficiency and applicability and many of the algorithms will be implemented. An important aspect of this module is to consider different approaches to problems and learn different solution strategies.

Professional competence
The students:
- identify basic terms of graph theory and optimization and illustrate them with examples
- name typical graph theory problems and algorithmic solutions
- identify situations where graph algorithms can be applied
- discuss typical graph theory problems and algorithmic solutions with regard to their efficiency and applicability.
- implement graph algorithms
- know proof strategies and are able to apply them

Methodological competence
The students:
- extend their knowledge about algorithms and their complexity

- develop their programming skills
- expand their range of methods of mathematical modelling

Social competence
The students:
- use the language of mathematics to discuss problems in groups with different knowledge levels
- present their ideas in a comprehensible way
- Expand and improve their own ideas through the comments of their fellow students

Self-competence
The students:
- reflect their knowledge about algorithms and their complexity
- develop appropriate solutions for given problems
- challenge methods of resolution

Content of the module:
A) Trees
B) Search Algorithms
C) Graph Coloring
D) Flows in Networks
E) Applications of Network Algorithms
F) Shortest Paths
G) Approximation Algorithms
G) Approximation Algorithms

Suggested reading:
Jungnickel, Dieter: Graphs, Networks and Algorithms. Springer, Berlin, Heidelberg, 4th edition, 2013. Available as an E-Book in BIS.
A detailed bibliography is contained in the lecture notes of this module.

Comments:
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Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
Mathematical and computer science basics

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written exam

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Theoretische Informatik
Module reference number/Title: - *inf406 - Praktikum Realzeitsysteme*	
Duration: 1 semester *Cycle:* irregularly *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* PR (4 semester hours) PR *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Ernst-Rüdiger Olderog
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The students learn about methods and tools, and how to apply, specify, simulate, verify, and implement real-time systems (RTS). The students gain hands-on experience using tangible Mini-Robots (Lego Mindstorms).

Professional competence
The students:
- implement RTS with Lego Mindstorm Robots NXT
- simulate and verify RTS on the basis of real-time automata with the model checker UPPAAL
- apply the tool Moby/RT to specify and simulate RTS on the basis of PLC-Automata, and to translate them into Java-Code for Lego Mindstorms NXT and into UPPAAL

Methodological competence
The students:
- realise control tasks with Lego Mindstorms
- specify RTS as networks of real-time automata and verify them with UPPAAL
- design RTS using Moby/RT
- realise systematically sophisticated time-dependent control tasks with Moby/RT, Lego Mindstorms, and UPPAAL

Social competence
The students:

- solve tasks in a team
- present solutions and discuss them

Self-competence
The students:
- recognise (sub-)problems of RTS and are responsible for their realisation

Content of the module:
Real-time-systems are systems, where the time at which an output is generated or at which data are read is of importance. Compared to usual programming methods, RTS models are extended by the additional dimension of time. An example for a RTS is an airbag in a car, which needs to be triggered at the right moment of time, not too early and not too late, because the effect of the airbag is useful only for a few hundredths of seconds.

The course introduces methods and tools which are then practically applied to specify, verify, and implement RTS.
The students gain hands-on experience using Mini-Robots (Lego-Mindstorms) to implement RTS.

Suggested reading:
E.-R. Olderog, H. Dierks: Real-Time Systems: Formal Specification and Automatic Verification, Cambridge University Press, 2008

Comments:
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Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
inf400/401Theoretische Informatik I und II

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
exercises

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Theoretische Informatik
Module reference number/Title: *- inf407 - Programmverifikation*	
Duration: 1 semester *Cycle:* irregularly *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Ernst-Rüdiger Olderog
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Introduction to methods for proving the correctness of sequential, parallel, and distributed programs.

Professional competence
The students:
- Describe operational semantics of sequential, parallel, and distributed programs
- Know the concepts of partial and total correctness of programs
- Establish soundness and completeness of proof systems
- Construct input-output specifications of programs
- Conduct correctness proofs for programs of different classes with the help of proof rules
- Check interference and deadlock freedom of parallel programs
- Transform parallel and distributed programs into nondeterministic programs

Methodological competence
The students:
- Recognize correctness as an important aspect of programs and informatics systems

Social competence
The students:
- Work together in small groups to solve problems
- Present their solutions to groups of other students

Self-competence
The students:
- Learn persistence in pursuing difficult tasks
- Learn precision in specifying problems

Content of the module:
Program verification is a systematic approach to show the absence of errors in programs. For this purpose desirable behavioural properties of a given program are proven. For instance, a sorting program should only deliver sorted arrays.

Partial correctness, termination, and the absence of runtime errors are essential for sequential programs. Additional behavioural properties are of interest for parallel programs: absence of interference, absence of deadlocks, and fair behaviour.

The module focuses on the verification of parallel programs. For this purpose classic methods of Hoare's logic are combined with more recent techniques of program transformation. Sequential programs are covered in preparation for this.

Suggested reading:
essential:
- "K.R. Apt, E.-R. Olderog, Programmverifikation, Springer-Verlag, 1994'',
or the extended English version::
- "K.R. Apt, F.S. de Boer, E.-R. Olderog, Verfication of Sequential and Concurrent Programs, Third Edition, Springer-Verlag, 2008''.

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
inf400/401 Theoretische Informatik I und II

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written exam or oral exam

Examination periods:
at the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Theoretische Informatik
Module reference number/Title: - *inf408 - Algorithmen zur Software-Verifikation*	
Duration: 1 semester *Cycle:* irregularly *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Ernst-Rüdiger Olderog
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Algorithms are presented that enables an automatic analysis and verification of complex structures as used in software systems. In the exercises these algorithms will be implemented and applied to case studies.

Professional competence
The students:
- conduct CTL model checking using examples
- construct abstract Kripke structures on the basis of given data abstractions and apply abstraction refinement
  to examples
- characterise the concepts of simulation and bisimulation
- understand the concept of data and transition abstraction
- describe model checking methods as instances of fixed-point algorithms

Methodological competence
The students:
- specify reactive systems by means of Kripke structures and CTL formulas
- implement model checking methods using Java

Social competence
The students:

- work in small groups

Self-competence
The students:
- reflect their actions and use newly learned methods

Content of the module:
Software systems consist of complex data and control structures and growing state spaces, which makes testing their correctness difficult. The big challenge for computer science is the development of automatic methods to analyse and to verify software systems' properties. In this course, algorithms for program analysis and model checking are presented and applied. The algorithms process transition systems generated from software and use abstraction techniques for data and transitions to make the state spaces analysable.

Topics:
Kripke structures, transition systems, temporal logic CTL and CTL*, fixed-point algorithms for recursive CTL-operators, model checking algorithms for CTL, simulation and bisimulation of Kripke structures, theorems on
the preservation of properties under (bi-) simulations, existential und universal abstraction of Kripke structures, counterexample-guided abstraction refinement (CEGAR method)

Suggested reading:
E.M. Clarke, O. Grumberg, and D. Peled.
Model Checking.

MIT Press, 2000.

F. Nielson, H.R. Nielson, and C. Hankin.
Principles of Program Analysis,
Springer, 2005

E.M. Clarke, O. Grumberg, S. Jha, Y. Lu, and H. Veith,
Counterexample-guided abstraction refinement for symbolic model checking,

Journal of the ACM 50(5) 752-794 (2003)

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
Mathematical and computer science basics

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written exam or oral exam

Examination periods:

First week of lecture-free period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Theoretische Informatik
Module reference number/Title: *- inf409 - Formale Sprachen*	
Duration: 1 semester *Cycle:* every 2 years *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* - *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Annegret Habel
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Introduction to syntactic analysis and compiler construction.

Professional competence
The students:
- Know the fundamentals of syntactic analysis and compiler construction
- Describe the complexity of fundamental syntactic analysis algortihms
- Construct no-left-recursive-grammars and grammars in normal form
- Test LL(k) and LR(k) characteristics of context-free grammars
- Construct LL(k)-Parsing and LR(k)-Parsing-Action and GOTO tables
- Apply basic syntax analysis algorithms

Methodological competence
The students:
- Perceive syntax analysis algorithms as a essential tool in computer science

Social competence
The students:
- Work together in small groups to solve problems
- Present their solutions to groups of other students

Self-competence
The students:

- Learn persistence in pursuing difficult tasks
- Learn precision in writing down solutions

Content of the module:
The course introduces the fundamentals of syntax analysis and considers backtrack parsing (Top-Down & Bottom-Up Backtracking), tabular parsing methods (Cocke-Younger-Kasami & Earley) und One- Pass No Backtrack Parsing (LL(k) und LR(k)).

Suggested reading:
- J.E. Hopcroft, R. Motwani, J.D. Ullman: Formal Languages and Their Relation to Automata, Addison-Wesley, Boston, 2001.
- A.V. Aho, J.D. Ullman: The Theory of Parsing, Translation, and Compiling, Vol. I: Parsing, Prentice-Hall, Englewood-Cliffs, New Jersey, 1972.

Comments:
-

Weblink:
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Prerequisites for admission:
-

Helpful previous knowledge:
Theoretische Informatik II

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written exam or oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Angewandte Informatik
Module reference number/Title: - *inf521 - Medizinische Informatik*	
Duration: 1 semester *Cycle:* once a year *Type of module:* supplemental/professionalization *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr. Andreas Hein, Prof. Dr. Rainer Röhrig
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

This module provides an introduction to the medical informatics and medical technology.

Professional competence
The students:
- Know the medical and healthcare computer science applications
- Know typical IT solutions and infrastructures
- Know the legal framework to process care data
- Know medical classifications and nomenclatures and the DRG-System and are able to apply them

Methodological competence
The students:
- Know bio-medical research requirements and patient data privacy methods
- Know communication standards and apply them in small-scale scenarios
- Know and apply patient safety and risk management methods
- Know and apply biosignal and image processing methods

Social competence
The students:
- Realise the importance of communication during the software development process between developer, customer and user of a successful and secure system. Feedback, request, respectful cooperation and the empathy of other disciplines' working processes are of great importance.

Self-competence
The students:

- Realise their responsibility as a medical informatic and reflect their impact on patients, medical employers and hospitals (corporates)

Content of the module:
- Medical informatics introduction / medical documentation
- Medical documentation / progression of disease
- Healthcare information systems
- Terminology and classification / Medical controling
- Image processing / interoperability and communication standards
- Medical data privacy
- Medical research
- Analyses of information system data
- Decision making support and process management
- MI/MT patient safetiness (Regulatory Affairs)
- Telemedicine / Customer Health informatics
- Medical technology introduction, biomedical technology
- Biosignal processing, sensor technology
- Robotics, prosthetics

Suggested reading:
- Jan van Bemmel , M.A. Musen , Mark A. Musen (Hrsg.): Handbook of Medical Informatics. Springer, Heidelberg 1997
- Christian Johner und Peter Haas (Hrsg.): Praxishandbuch IT im Gesundheitswesen
- Carl Hanser Verlag München 2009
- Dugas, Schmidt: Medizinische Informatik und Bioinformatik. Springer Verlag, Berlin, 2003

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
-

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written or oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Angewandte Informatik
Module reference number/Title: - *inf530 - Künstliche Intelligenz*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AC (extended curriculum) *This module should be taken in* 4th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Prof. Dr.-Ing. Axel Hahn, Apl. Prof. Dr.-Ing. Jürgen Sauer
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The students are familiar with the basic concepts of artificial intelligence (AI). They know the concept of rational agents and their behavior. They know how to implement expert systems.They also know basic search and problem solving techniques as well as techniques of knowledge representation.
The students can compare different problem solving techniques and use them within other problem contexts.

Professional competence
The students:

- Describe the concept of rational agents and their behavior in an agent environemt
- Name and describe the basic search and problem solving techniques of Artificial Intelligence
- Describe and implement expert systems
- Describe basic techniques of knowledge representation

Methodological competence
The students:
- Acknowledge the basic methods of AI
- Transfer AI methods to other application areas
- Evaluate AI methods regarding their appropriateness for destinct problem areas

-Modify and adapt AI methods for specific application areas
Social competence
The students:
- Work in teams
- Present results to groups
Self-competence
The students:
- Reflect their results with regard to the methods of AI

Content of the module:
- Overview of AI
- Rational agents and agent based systems
- Search and other problem solving techniques
- Knowledge representation
- Planning

Suggested reading:
- Russel, S. J.: Norvig, Peter (2012): Artificial Intelligence: A modern Aproach, 3rd Ed.
- Winston, P.H. (1994): Artificial Intelligence, 3rd Edition

Comments:
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Weblink:
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Prerequisites for admission:
-

Helpful previous knowledge:
Basic knowledge in Informatics/ Business Informatics

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written or oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* -
Module reference number/Title: - *inf531 - KI und Wissensrepräsentation*	
Duration: - *Cycle:* - *Type of module:* - *Level:* - *This module should be taken in* -	*Type of program:* - *Language:* - *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* -
Person responsible for the programme: -	*Person responsible for this module:* -
Alternative person(s) responsible for this module: -	*Examiner(s):* -
Objective of the module / skills: -	
Content of the module: -	
Suggested reading: -	
Comments: - *Weblink:* - *Prerequisites for admission:* -	*Helpful previous knowledge:* - *Associated with the module(s):* -
Maximum number of students / selection criteria: - *Types of examinations:* - *Examination periods:* - *Registration procedure:* -	

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Angewandte Informatik
Module reference number/Title: - *inf600 - Wirtschaftsinformatik I*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 1st semester und/oder 5th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr.-Ing. Axel Hahn	*Person responsible for this module:* Prof. Dr.-Ing. Axel Hahn
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Business informatics regards itself as an interdisciplinary subject. It connects business administration with computer science. Business informatics also includes information technologies as well as technical subjects and research topics. It is more than just an intersection of research fields and offers e.g. special methods to coordinate corporate strategies and information processing.
The module introduces the entire scope of the field of business informatics.

Professional competence
The students:
- Describe the key aspects of business informatics
- Differentiate business informatics as an interdisciplinary subject from other subjects
- Characterise the functionality of essential application systems and management structures, from the strategical to the tactical and operative level.
- Consider and evaluate case studies and layout options for the conception, development, implementation, usage and maintenance of operational sociotechnical applications systems

Methodological competence
The students:
- Model technical and sociotechnical processes using suitable tools
- Analyse business processes and the demands on their modification and their technical assistance
- Abstract from complex systems in a suitable way to improve the manageability of models

Social competence
The students:
- Present their solutions in front of other groups
- Discuss their outcomes
Self-competence
The students:
- Develop solutions for case studies in groups
- Construct an argument based on aquired knowledge

Content of the module:
The main topics of business informatics are the presentation and evaluation of configuration options to conceptualise, develop, implement, use and maintain operational sociotechnical application systems. The lecture focusses on information systems of the networked company. Technical, economic, organisational, and psychosocial aspects are considered. The understanding of these relations will be trained by means of case studies taken from Laudon et al. (cf. suggested reading). The lecture gives an overview of the following business informatics fields.

-Information systems, (object of BI)
-Application systems
-E-Commerce and E-Business
-Ethical, social and political aspects
-Business process integration
-Knowledge management
-Support of decision making
-Reorganisation of companies
-Economic evaluation
For a better understanding of each subject, it is recommended to take specific modules later in the course of studies.

Suggested reading:
Laudon, Laudon, Schoder (2006): Wirtschaftsinformatik. Eine Einführung. Pearson Verlag Krallmann, Frank, Gronau (2002), Systemanalyse im Unternehmen Oldenbourg (Gebundene Ausgabe - Juni 2002)

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
-

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
tasks and active partaking during the exercises / written exam or oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Angewandte Informatik
Module reference number/Title: *- inf601 - Wirtschaftsinformatik II*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 2nd semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr.-Ing. Axel Hahn	*Person responsible for this module:* Prof. Dr. Jorge Marx Gomez
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The module provides the fundamentals and tasks of information management to create an IT strategy. Tasks are especially considered from a strategic perspective and brought closer by methodological skills for each task.

Professional competence
The students:
- Name the strategic aspects of information management and identify their impact on technical and operational information management
- Examine the essential questions of enterprise reorganization in connection with an information system and recognize the influence of the Internet and its services on commercial processes and information systems by an exemplary system, e.g. SAP R/3
- Identify different approaches to information management (Information Ressource Management, Management approach, management approach, personal information management) and understand why determining the value of information management is necessary and how it is done
- Specify the objectives of information management, differentiate and classify its tasks appropriately
- Recognize the methodological characteristics of information management
- Transfer the concept of architecture to the information infrastructure
- Assess the importance to plan features for strategic IT-design oriented on IT-architecture
- Schedule the procedures concerning the strategical situation analysis of the competition analysis, the information infrastructure and the environmental analysis with the objective to transfer them to simple problems

- Name the key contents of strategical IT objectives and are aware of difficulties in determining the measurement category

Methodological competence

The students:

- Perform information management tasks using methods of Information Engineering and thereby learn how to transfer and employ the methods to other fields, e.g economy
- Practically learn about advantages and disadvantages of different methods and, based on the acquired knowledge, are able use them as part of the optimized IT strategy

Social competence

The students:

- Construct solutions to case studies given in the group, i.e. the development of an IT strategy
- Discuss the solutions on a technical level
- Present the solutions to case studies as part of the exercises

Content of the module:

The proportion of information technology in the investment budget of companies is rising continuously.

For instance, banks spend 25% of all investments for their information systems. Information is not just a production factor, it is also an element of competition. Information is increasingly important for business.

The business informatics deals with these economic tasks of information technology.

Information systems in businesses and organisations are of central concern.

The interdisciplinary nature of business informatics raises questions about proceedings, problems of models (modelling in a narrow sense) and the application in specific problem domains.

Contents of this module are:

- Information management principles and tasks
- IT architectures
- Infrastructure of information and communication technology
- Strategic, administrative and operative information engineering

Suggested reading:

- Heinrich, Stelzer (2011): Informationsmanagement - Grundlagen, Aufgaben, Methoden. Oldenbourg Verlag
- Laudon, Laudon, Schoder (2010): Wirtschaftsinformatik - Eine Einführung. Pearson Verlag
- Krcmar (2015): Informationsmanagement. Springer Verlag

Comments:

-

Weblink:

http://www.wi-ol.de

Prerequisites for admission:

-

Helpful previous knowledge:

-

Associated with the module(s):

-

Maximum number of students / selection criteria:

unrestrained

Types of examinations:

Written exam max. 120 minutes

Examination periods:

At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Angewandte Informatik
Module reference number/Title: - *inf602 - Electronic Commerce*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 4th semester	*Type of program:* V (3 semester hours), Ü (1 semester hours) E-learning Course *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr.-Ing. Axel Hahn	*Person responsible for this module:* Prof. Dr.-Ing. Axel Hahn
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The students are familiar with the conditions and requirements of a successful E-Commerce company. The students are able to evaluate the E-Commerce-Fitness of a real company and are able to develop enhancement strategies.

Professional competence
The students:
- Name the basic techniques and the development history of the internet and its relevant definitions.
- Differentiate commercial usage models on the internet and discuss their application in the E-Commerce-Areas (e.g. E-Marketing and E-Procurement)
- Relate the models with companies and business models

Methodological competence
The students:
- Are familiar with various information- and communication technologies
- Evaluate them together with their related E-Commerce application
- Structuring relationships with the help of models and link them in relation to case studies

Social competence
The students:
- Accept objective criticism in their own approach and the results

Self-competence

The students:
- Reflect their self-perception and act in terms of independent learning
- Can describe and apply suitable action areas of E-Commerce from various models

Content of the module:

- History and devlopment of the internet
- Basic technologies of networks, especially of the Internet
- Special commercial internet models
- Application of these models
- Information and communication technologies

Suggested reading:
- Heinrich (2007): Wirtschaftsinformatik. Einführung und Grundlegung. Oldenbourg Verlag
- Laudon, Laudon, Schoder (2010): Wirtschaftsinformatik - Eine Einführung. Pearson Verlag

Comments:
-

Weblink:
http://www.wi-ol.de

Prerequisites for admission:
-

Helpful previous knowledge:
-

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written exam

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Angewandte Informatik
Module reference number/Title: - *inf603 - Planung und Simulation in der Logistik*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr.-Ing. Axel Hahn	*Person responsible for this module:* Apl. Prof. Dr.-Ing. Jürgen Sauer
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Introduction to the problems/challenges of simulation and planning of applications in production and logistics. The students will learn the simulation with a tool in hands-on exercises.

Learning objectives:

The Students have knowledge of basic problems/challenges of simulating and planning in the field of production and logistic. They know approaches and algorithms to solve simulation and planning problems/challenges. They are able to model solutions for simple production problems/challenges with a simulation tool and are able to solve given tasks with it.

They are able:

- to identify, classify and associate solutions to problems/challenges
- to model and implement a production plan with the simulation tool

Professional competence

The students:

- Characterise basic problems/challenges of the production planning and logistic simulation
- Name approaches/concepts and algorithms to solve simulation and planning problems/challenges
- Identify, classify and assign solutions to planning problems/challenges
- Model and implement a given production process with a simulation tool

Methodological competence

The students:

- Model small production problems with a simulation tool and solve given tasks with the tool

Social competence
The students:
- Develop solutions to given simulation problems in small groups
- Present the solutions to other groups
Self-competence
The students:
- Reflect their own solutions in conjunction with other solutions

Content of the module:
This module provides the basic production and logistic planning and simulation approaches/concepts. Supply chain planning problems are introduced and simple algorithmic solutions are introduced and implemented. The hands-on simulation with a tool is provided by a case study from the production.

Suggested reading:
- selected material on the simulation tool
- others will be announced in the lecture

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
-

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Portfolio consisting of: Active involvement, presentation and documentation of results, hands-on achievements

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Angewandte Informatik
Module reference number/Title: - *inf608 - eBusiness*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 4th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr.-Ing. Axel Hahn	*Person responsible for this module:* Prof. Dr. Jorge Marx Gomez
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The module provides an introduction to the "Electronic Business“ (e-business). The graduates know the fundamental and current technologies, advanced concepts, applications and competitive strategies of the "Electronic-Commerce" (e-commerce).
The knowledge and abilities acquired in this module are directly applicable in study and business. They are deepening the basics from the module „Wirtschaftsinformatik II“. They provide a professional e-business consulting background and the skills to design software products for this area of business in practice.

Professional competence
The students:
- Name and discuss the eBusiness key challenges
- Discuss the chances of the added value and the changes of commercial models by the internet
- Define the concepts of e-business and e-commerce.
- Discuss the change of retail trade and the transactions between companiess in e-business
- Name current payment systems and communication technologies
- Discuss the possibilities of the internet in order to simplify the administration and the coordination of internal and external business processes
- Characterise the challenges for the management caused by e-business and e-commerce
- Differentiate the concepts and conceptualites of e-business
- Assess applications with regard to economic points of view

- Practically learn how to handle core technologies of e-business

Methodological competence
The students:
- Assess the core technologies of e-business and e-commerce
- Apply methods in case studies
Social competence
The students:
- Develop case studies on basis of given problems in groups
- Present their solutions
Self-competence
The students:
- Learn about their own limitations while planning and developing e-commerce applications

Content of the module:
The module provides the following contents:

- The definition of the core e-business concepts and the technical conditions for the implementation
- Introduction of the variations of e-commerce, especially the Business-to-Consumer (B2C) and Business-2-Business (B2B) concepts and the current research in this field
- Discussion on the economic aspects of e-business based on the theory of informational added value
- Technological basics of the web and current development technologies for e-commerce web applications and security mechanisms with focus on online-shops and applications (hands-on exercise topics: HTTP, JSP and SQLInjection, PHP, XML, XML-Security, data modelling, Online-Shop development and Online-Shop administration)

Suggested reading:
Meier, Andreas; Stormer, Henrik: eBusiness & eCommerce – Management der digitalen Wertschöpfungskette. Springer, 2. Auflage, 2008.

Wirtz, Bernd W.: Electronic Business. Spinger Gabler, 4. Auflage, 2013.

Kollmann, Tobias: E-Business: Grundlagen Elektronischer Geschäftsprozesse in der Net Economy. Gabler, 4. Auflage, 2010.

Comments:
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Weblink:
http://www.wi-ol.de/

Prerequisites for admission:
-

Helpful previous knowledge:
programming skills

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written or oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
Stud.IP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Angewandte Informatik
Module reference number/Title: - *inf700 - Didaktik der Informatik I*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 5th semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Ira Diethelm	*Person responsible for this module:* Prof. Dr. Ira Diethelm
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

Professional competence

The students:

- Characterise the different computer science education (CSE) concepts and approaches, e.g. the early approaches of CSE in school or the concept of computer science (CS) in contexts
- Select and discuss teaching subjects by analysing didactic approaches and concepts
- Describe the general education character of CS
- Compare the different approaches and concepts of CSE and are able to illustrate common features and contradictions
- Reflect lesson subjects by the approaches and topics of CSE

Methodological competence

The students:

- Link the concepts and approaches of CSE with the educational reconstruction
- Classify the similarities and differences of the concepts and approaches of CSE academically

Social competence

The students:

- Discuss the concepts and approaches of CSE with students and lectures academically
- Accept the thoughts of other students and lectures
- Give and accept criticism objectively

Self-competence
The students:

- Integrate the concepts and approaches of CSE into their planning and operations
- Reflect their self-perception with regard to the concepts and approaches of CSE

Content of the module:

The field of CSE is introduced by this module. Different CSE approaches and concepts are presented. These CSE approaches and concepts are, e.g.:

- early concepts of CS in schools
- general education character of CS
- idea oriented approach of CSE
- information centred approach of CSE
- CSE in elementary school
- system oriented approach

Subjects like „CS projects in class“ are also part of this module.

Suggested reading:

- Schwill, A.; Schubert, S.: Didaktik der Informatik. Berlin: Spektrum Akademischer Verlag, 2004.
- Hubwieser, P.: Didaktik der Informatik. Berlin: Springer Verlag, 2000.

Comments:

-

Weblink:

-

Prerequisites for admission:

-

Helpful previous knowledge:

CS basics

Associated with the module(s):

-

Maximum number of students / selection criteria:

unrestrained

Types of examinations:

oral exam

Examination periods:

At the end of the lecture period

Registration procedure:

Stud.IP or examinaton office

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* -
Module reference number/Title: *- inf803-inf808 - Spezielle Themen der Informatik I-V*	
Duration: 1 semester *Cycle:* every 6 months *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 4th semester und/oder 5th semester und/oder 6th semester	*Type of program:* - 2 courses out of VL, Ü, Tut, SE, PR *Language:* German, English *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Die im Modul Lehrenden
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

This module integrates current computer science developments within appropriate study courses.

Professional competence
The students:
- Know recent technological or scientific computer science developments
- Transfer computer science methods and development models to IT application area requirements
- Evaluate the possibilities and limitations of computer science methods and tools and apply them appropriately

Methodological competence
The students:
- Review problems, formulate them with formal models and explore them appropriately
- Identify and present (one or more) computer science problem solutions
- Select and evaluate appropriate tools and methods
- Examine problems with technical and scientific literature

Social competence
The students:
- Work in a team
Self-competence
The students:

Content of the module: according to the assigned task	
Suggested reading: according to the assigned task	
Comments: - *Weblink:* - *Prerequisites for admission:* -	*Helpful previous knowledge:* - *Associated with the module(s):* -
Maximum number of students / selection criteria: unrestrained *Types of examinations:* exercises or presentation or oral exam or written exam *Examination periods:* - *Registration procedure:* Stud.IP	

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* - Angewandte Informatik -
Module reference number/Title: - *inf852 - DV-Projektmanagement*	
Duration: 1 semester *Cycle:* once a year *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 3rd semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Apl. Prof. Dr.-Ing. Jürgen Sauer
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden

Objective of the module / skills:

The participants of this course are aware of problems, activities and tools of data processing project management (DP-Project-Management).
They are able to identify and select the corresponding tools in different project stages and are familiar with those tools.
They are able to describe the business informatics fields of actions.
The are competent to work in a team and organise and implement projects.

Professional competence
The students:
- Characterise problems, activities and tools of the data processing project management.
- Are able to identify the corresponding tools in different project stages
- Use specific DP-Project-Management tools
- Differentiate the business informatics field of actions

Methodological competence
The students:
- Perform projects with the tools of each phase

Social competence
The students:

- Work in small project-teams
- Make design decisions cooperatively
- Present solutions

Self-competence
The students:
- Acquire DP-Project-Management methods and use them
- Recognise and are responsible for working packages

Content of the module:
It is important to know different IT project management types and forms as well as corresponding methods and tools.
This course provides basic data-processing problems, activities and methods. The course is based on M. Burghardt's book. After an introduction, the course is divided as follows:
- Project management (Requirements Engineering, Profitability Analysis, Organisational Structure)
- Project Planning (Project Structure, Network Analysis, Project Plans)
- Project Control (Cost Evaluation, Quality Control)
- Project Completion

The participants get familiar with project management tools. Presentations drawn from practice are intended.

Suggested reading:
Burghardt, M.(2006): Projektmanagement, 7.Auflage, Publics Corporate Publishing.

Comments:
-

Weblink:
www.wi-ol.de

Prerequisites for admission:
-

Helpful previous knowledge:
Softwareprojekt

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
written or oral exam

Examination periods:
At the end of the lecture period

Registration procedure:
StudIP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Akzentsetzungsmodule *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* -
Module reference number/Title: *- inf853- inf857 - Anwendungen der Informatik I-V*	
Duration: 1 semester *Cycle:* irregularly *Type of module:* compulsory elective *Level:* AS (advanced curriculum) *This module should be taken in* 4th semester und/oder 5th semester und/oder 6th semester	*Type of program:* - 1 course out of VL, Ü, Tut, SE, PR *Language:* German, English *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Dr. Ute Vogel, Die im Modul Lehrenden
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden
Objective of the module / skills: The students are introduced into a different subject area and its methods. Professional competence The students: - Know a computer science application area - Transfer computer science methods and development models to/with IT application area requirements Methodological competence The students: - Know and name ways of thinking and methods of other subject areas Social competence The students: - Communicate considerately and appropriately with users and experts Self-competence The students: - Plan their professional actions independently - Reflect their contributions critically and discuss them with users and experts	
Content of the module:	

<table>
<tr><td colspan="2">according to the assigned task</td></tr>
<tr><td colspan="2">Suggested reading:
according to the assigned task</td></tr>
<tr><td>Comments:
-

Weblink:
-

Prerequisites for admission:
-</td><td>Helpful previous knowledge:
-

Associated with the module(s):
-</td></tr>
<tr><td colspan="2">Maximum number of students / selection criteria:
unrestrained

Types of examinations:
exercises or presentation or oral exam or written exam

Examination periods:
-

Registration procedure:
Stud.IP</td></tr>
</table>

Professionalization

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Bachelor: Modulangebot für Studierende mit außerschulischem Berufsziel Sommersemester 2016	*Kategorie:* - Fachnahe Angebote Informatik *Degree award:* - PB: Fach- und Zwei-Fächer-Bachelor
Emphases: -	*Sections:* -
Module reference number/Title: - *inf800 - Proseminar Informatik*	
Duration: 1 semester *Cycle:* every 6 months *Type of module:* mandatory *Level:* PB (professionalization) *This module should be taken in* 5th semester	*Type of program:* S (2 semester hours) S *Language:* German *Attainable credit points:* 3,00 CP *Workload:* 90 hours *Required attendance:* 28 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Die im Modul Lehrenden
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -
Objective of the module / skills: Supported by a lecturer the students familiarise with a given topic by literature research. They understand and evaluate the relevance of the literature. After this evaluation the students present and discuss their solutions academically. Professional competence The students: - Characterise and apply computer science basics (algorithms, data structures, programming, basics of practical, technical and theoretical computer science) - Define und describe essential mathematical, logical and physical basics of computer science - Define and illustrate the core disciplines of computer science (theoratical, practical and technical computer science) Methodological competence The students: - Examine problems, use formal methods to phrase them and analyze them appropriately - Evaluate problems by the use of technical and scientific literature - Reflect on a scientific topic and write a scientific seminar paper under guidance and present their findings	

Social competence
The students:
- Communicate considerately and appropriately with users and experts
- Use presentation methods

Self-competence
The students:
- Plan their professional actions independently
- Reflect their contributions critically and discuss them with users and experts
- Collect and update their knowledge independently

Content of the module:
according to the assigned task

Suggested reading:
according to the assigned task

Comments:
-

Weblink:
-

Prerequisites for admission:
-

Helpful previous knowledge:
-

Associated with the module(s):
-

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Presentation

Examination periods:
-

Registration procedure:
StudIP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Bachelor: Modulangebot für Studierende mit außerschulischem Berufsziel Sommersemester 2016	*Kategorie:* - Fachnahe Angebote Informatik *Degree award:* - PB: Fach- und Zwei-Fächer-Bachelor
Emphases: -	*Sections:* -
Module reference number/Title: - *inf851 - Informatik und Gesellschaft*	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* MM (master module) *This module should be taken in* 1st semester und/oder 4th semester und/oder 5th semester und/oder 7th semester	*Type of program:* S (2 semester hours), PR (2 semester hours) S + P *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Die im Modul Lehrenden
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

Graduates of the module Informatik und Gesellschaft know the history of the development of Information technology and its impact on society and are familiar with issues of data protection.

They will be able, individually or in a team, to analyze the ethical and socio-political implications of different areas and applications of computer science and develop a reasoned own position on this, in particular concerning their professional responsibilities as computer scientists.

They have learned to present the results of their work convincingly and suitable for their target group using appropriate media and they are able to organize events such as workshops or small conferences for that purpose.

Professional competence
The students:
- reflect on the ethical and societal aspects of selected areas of computer science
- create and design websites
- create and manage documents in a team

Methodological competence
The students:

- explore methods of structured teamwork
- organize project work
- make presentations with different media

Social competence

The students:

- develop a subject area as a team
- teach a bigger audience to appreciate their knowledge
- discuss their observations and opinions with others

Self-competence

The students:

- reflect their role in a team
- reflect their role as computer scientists in society

Content of the module:

In brief, topics like the following are covered:

- Computer Crime
- Computer Games
- Data Protection
- Electronic Democracy
- Ethics in Computer Science
- History of Information Technology
- Use of information technology at school
- Internet - integration or division of society?
- Artificial Intelligence
- Manipulation by War Games
- Open Source Software
- Robots in Society
- Trustworthy Systems

Suggested reading:

See reference books Informatik und Gesellschaft in BIS.

Joseph Weizenbaum, 2001: Die Macht der Computer und die Ohnmacht der Vernunft.

H. Klaeren u.a., (Eds.), 1999: Tübinger Studientexte Informatik und Gesellschaft. Universität Tübingen.

J. Friedrich, Th. Herrmann, M. Peschek, A. Rolf (Hrsg.),1995: Informatik und Gesellschaft. Spektrum.

Comments:

The topics for the teams are assigned during the first week of the semester.

Weblink:

http://www.informatik.uni-oldenburg.de/~iug

Prerequisites for admission:

-

Helpful previous knowledge:

-

Associated with the module(s):

Soft Skills

Maximum number of students / selection criteria:

unrestrained

Types of examinations:

Portfolio (5-6 partial performances)

Examination periods:

during semester and at the end

Registration procedure:
StudIP

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Bachelor: Modulangebot für Studierende mit außerschulischem Berufsziel Sommersemester 2016	*Kategorie:* - Fachnahe Angebote Informatik *Degree award:* - PB: Fach- und Zwei-Fächer-Bachelor
Emphases: -	*Sections:* -
Module reference number/Title: *- pb085 - Soft Skills*	
Duration: 1 semester *Cycle:* once a year *Type of module:* mandatory *Level:* PB (professionalization) *This module should be taken in* 2nd semester	*Type of program:* V (2 semester hours), Ü (2 semester hours) *Language:* German *Attainable credit points:* 6,00 CP *Workload:* 180 hours *Required attendance:* 56 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Priv.-Doz.Dr. Elke Wilkeit
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

In this module, students have the opportunity to become more concious of their general skills, attitudes and knowledge elements, so-called key skills competences and to develop them in a targeted manner. While expert knowledge is constantly changing, key competences are of lasting value for solving problems and acquiring new competences, even expert knowledge.

During the lecture methods of Soft Skills are underpinned and justified by relevant scientific insights from
e. g. psychology, education, and social sciences. The students collect and reflect practical experience with selected subjects during the exercises.

Professional competence
The students:
- identify characteristic properties of scientific texts
- reflect aspects of the use of media

Methodological competence
The students:
- moderate teamwork using the moderation method
- practise to receive and to give constructive feedback
- plan and realize little projects
- create presentations and reflect the presentations of others
- try methods of rhetoric

- reflect methods of project management
- apply and compare creativity techniques

Social competence
The students:
- check out feedback and meta-communication
- reflect the opportunities of teamwork
- gain basic knowledge about conflict management

Self-competence
The students:
- use methods of time management
- reflect their dealing with criticism and that of others
- learn about the challenge of assessment centers and reflect their possible roles within

Content of the module:
Communication, Metacommunication, Feedback, Rhetoric, Writing of Scientific Texts, Teamwork, Moderation, Creativity Techniques, Conflict Management, Presentation, Use of Media, Time Management, Project Management

Suggested reading:
Lecture Notes for this module including an extensive bibliographic reference list, e. g. Uwe Vigenschow, Björn Schneider: Soft Skills für Softwareentwickler. Dpunkt.Verlag, Heidelberg, 2007.

Comments:
Participation in the exercises is mandatory since they are part of the examinations.

Weblink:
http://www.informatik.uni-oldenburg.de/~sos

Prerequisites for admission:
-

Helpful previous knowledge:
-

Associated with the module(s):
Informatik und Gesellschaft

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
Practical Exercises during the semester, written exam at the end.

Examination periods:
Practical: during semester, theoretical: End of semester.

Registration procedure:
StudIP and for the exercises: https://igel.informatik.uni-oldenburg.de/sos/

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Bachelor: Modulangebot für Studierende mit außerschulischem Berufsziel Sommersemester 2016	*Kategorie:* - Fachnahe Angebote Informatik *Degree award:* - PB: Fach- und Zwei-Fächer-Bachelor
Emphases: -	*Sections:* -
Module reference number/Title: *- pb216 - Forschungsseminar Informatik*	
Duration: 1 semester *Cycle:* every 6 months *Type of module:* supplemental/professionalization *Level:* PB (professionalization) *This module should be taken in* 6th semester	*Type of program:* S (2 semester hours) *Language:* German *Attainable credit points:* 3,00 CP *Workload:* 90 hours *Required attendance:* 28 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Die im Modul Lehrenden
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* -

Objective of the module / skills:

Supported by a lecturer the students get familiar with literature of a topic. They understand and evaluate the relevance of the literature. After this evaluation the students present and discuss their solutions academically.

Professional competence
The students:
- Characterise and apply computer science basics (algorithms, data structures, programming, basics of practical, technical and theoretical computer science)
- Reflect a scientific topic and present their solutions

Methodological competence
The students:
- Examine problems, use formal methods to phrase them and analyze them appropriately
- Evaluate problems by the use of technical and scientific literature
- Reflect on a scientific topic and write a scientific seminar paper under guidance and present their findings
- Work scientifically

Social competence
The students:
- Communicate considerately and appropriately with users and experts
- Use presentation methods

Self-competence The students: - Plan their professional actions independently - Reflect their contributions critically and discuss them with users and experts - Collect and update their knowledge independently	
Content of the module: according to the assigned task	
Suggested reading: according to the assigned task	
Comments: - *Weblink:* - *Prerequisites for admission:* -	*Helpful previous knowledge:* - *Associated with the module(s):* -
Maximum number of students / selection criteria: unrestrained *Types of examinations:* Presentation *Examination periods:* - *Registration procedure:* StudIP	

Thesis

Fakultät 2: Informatik, Wirtschafts- und Rechtswissenschaften Department für Informatik *Subject:* Informatik Sommersemester 2016	*Kategorie:* - Abschlussmodul *Degree award:* - Fach-Bachelor
Emphases: -	*Sections:* -
Module reference number/Title: *- bam - Bachelorarbeitsmodul*	
Duration: 1 semester *Cycle:* every 6 months *Type of module:* mandatory *Level:* TM (thesis module) *This module should be taken in* 6th semester	*Type of program:* S (2 semester hours) SE *Language:* German *Attainable credit points:* 15,00 CP *Workload:* 450 hours *Required attendance:* 28 hours
Person responsible for the programme: Prof. Dr. Oliver Theel	*Person responsible for this module:* Die im Modul Lehrenden
Alternative person(s) responsible for this module: Die im Modul Lehrenden	*Examiner(s):* Die Modulverantwortlichen, Die im Modul Lehrenden
Objective of the module / skills: The students are able to process and write on a scientifically oriented computer science topic. Professional competence The students: - Evaluate the possibilities and limits of computer science methods and tools and apply them appropriately Methodological competence The students: - Select appropriate methods and tools and evaluate them - Analyse problems using the latest technical and scientific literature - Implement software projects and design hardware with the latest computer science tools - Reflect a (computer) science topic under guidance, write an article (seminar paper or thesis) and present their results scientifically Social competence The students: - Recognise conflicts and solve them in a team - Use presentation and project management methods appropriately	

- Identify and assume responsibility for tasks
- Are aware of the social impact of their professional actions, as well as the consequences of information technologies

Self-competence
The students:
- Select priorities appropriately, also their own
- Plan their computer science actions independently
- Complement and deepen their knowledge and adapt it to the latest developments in IT independently
- Evaluate their results and discuss them with users and experts

Content of the module:
A state-of-the-art computer science topic is processed theoretically, scientifically and practically. The student presents the results.

Suggested reading:
According to the topic

Comments:
-

Weblink:
https://www.uni-oldenburg.de/informatik/studium-lehre/infos-zum-studium/abschlussarbeiten/

Prerequisites for admission:
-

Helpful previous knowledge:
Compulsory modules of Computer Science / Business Informatics
inf800 Proseminar

Associated with the module(s):
pb216 Forschungsseminar

Maximum number of students / selection criteria:
unrestrained

Types of examinations:
thesis, seminar paper

Examination periods:
varying

Registration procedure:
Examination office form