Modulhandbuch

Computing Science - Bachelor's Programme

im Wintersemester 2022/2023

erstellt am 24/08/22
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Programming is one of the basic activities of computer scientists and a prerequisite for many other courses in computer science studies. The aim of the module “Programming, Data Structures and Algorithms” is to learn the basic concepts of imperative, procedural and object-oriented programming using the Java programming language and to present known, efficient algorithms and data structures for various, frequently occurring problems.

After completing the module, the students should be able to independently develop imperative and simple object-oriented programs based on Java for solving smaller problems and assess the efficiency of their programs. They should also be able to apply important algorithms and select them based on their complexity.

**Professional competence**
The students:

- describe basic concepts of imperative programming with Java
- recognise imperative programming terminology and use the appropriate terms accurately in discussions
- recognise basic terminology of object-oriented programming
- describe what programs presented to them do
- independently develop programs to solve small problems
- systematically examine their own and other people's programmes for errors
- use modern programme development environments to develop and test programmes
- create algorithms with general design concepts (e.g. Greedy method, divide-and-conquer method)
- name algorithms and data structures for solving common problems and evaluate their applicability
- name problems of efficiency of algorithmic solutions of concrete problems and evaluate them
- make a well-founded choice of an algorithm and a data structure for solving a concrete problem
- apply the learned algorithms and data structures sensibly to given and concrete problems

**Methodological competence**
The students:

- solve given problems from the point of view of imperative or object-oriented programming
- transfer practical experience in programme development to new tasks

Social competence
The students:

- communicate the structure and mode of operation of self-developed programmes to others
- present solutions to small tasks in front of groups

Self-competence
The students:

- organise themselves in finding algorithmic solutions to small and medium-sized problems in computer science
- incorporate the concepts of general programme design in their actions

Module contents

In the first part, general basic concepts of programming are introduced:
- Algorithm, programming languages, computer
- development tools, development phases
- compilers
- grammars
- logic
The second part deals with basic programming concepts:
- data types
- variables
- Expressions, statements
- control structures
- Methods, parameters
- recursion
- Reference data types, arrays
- Classes, objects
- Documentation
- Testing

The third part contains an introduction to data structures and algorithms as well as a discussion of their efficiency, i.e. the computational effort or memory requirements depending on the amount of data to be processed. The module introduces known, efficient algorithms and data structures for various, frequently occurring problems. These include in particular:

- Methods for searching for keys, as well as insertion and deletion in dynamic data sets, e.g. lists, trees, AVL trees or hash methods,
- Methods for searching for text patterns,
- Methods for sorting data by key values, e.g. QuickSort and HeapSort,
- Graph-based applications, e.g. for finding shortest paths in graphs.

The lecture part is supplemented by a comprehensive exercise part, in which in particular the taught programming contents are implemented in practical examples.
Reader's advisory

Essential:

- Lecture Notes (made available either in printed form or via Stud.IP during the course of the lecture)

Good secondary literature:

- 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
- Siege: Einführung in die Informatik. Shaker Verlag, 2013

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Total time of attendance for the module 84 h
Object orientation represents the state of the art in software development today. Given problems are first transformed into an object-oriented model and then into an object-oriented program with the help of object-oriented analysis and design methods. Aim of the module "Object-Oriented Modelling and Programming" is to learn basic concepts of object-oriented modelling using UML as the modelling notation and object-oriented programming using the Java programming language. After completing the module, students should be able to independently develop object-oriented programs based on Java for solving medium-sized problems.

Professional competence:
The students:
- know basic concepts of object-oriented modelling and UML as modelling notation
- know basic concepts of object-oriented programming with Java
- know the terminology of object-oriented modelling and programming and use the appropriate terms precisely in discussions
- can describe what object-oriented programmes presented to them do
- independently develop models and programmes for solving medium-sized problems
- systematically examine their own and other people's models and programmes for errors
- use modern development environments for modelling and developing programmes
- know the differences between the imperative, object-oriented, functional, logical and rule-based programming paradigms

Methodological competence:
The students:
- independently develop programmes for given problems by consistently applying the concepts of object-oriented modelling and programming
- transfer practical experience in programme development to new tasks
- independently develop programmes with concurrency
- can independently apply known solution methods to complex problems

Social competence:
The students:
- communicate the structure and mode of action of self-developed models and programmes to others
- present independently developed solutions to groups

Self-competence:
The students:
- organise themselves when developing programmes for small and medium-sized problems in computer science
- incorporate the concepts of object-oriented programme design in their actions
Module contents

In the first part, basic concepts of object-oriented modelling and programming are taught:
- Models and modelling
- UML class diagrams
- Classes and objects
- data encapsulation
- inheritance
- Polymorphism and dynamic binding
- Exception handling
- Genericity

In the second part, important concepts and classes of the JDK class library are introduced and the classes are used in solving medium-sized problems:
- Java Collection API
- IO and Streams
- GUI applications with JavaFX
- Parallel programming with threads

In the third part, advanced solution strategies are presented and other programming paradigms are introduced and compared with the object-oriented paradigm:
- Backtracking, Branch and Bound, Greedy
- Local Search, Evolutionary Algorithms
- Functional programming (e.g. Java-Lamdas, Standard ML)
- Logical programming (e.g. Prolog)
- Rule-based programming (e.g. Drools)

The lecture part is supplemented by a comprehensive exercise part, in which in particular the taught contents are implemented in practical examples.

Reader's advisory

Essential:
Lecture Notes (made available either in printed form or via Stud.IP during the course of the lecture)

Good secondary literature:
- Heide Balzert: Lehrbuch der Objektmodellierung: Analyse und Entwurf mit der UML 2, Spektrum Akademischer Verlag
- Dietmar Ratz, Jens Scheffler, Detlev Seese, Jan Wiesenberger: Grundkurs Programmieren in Java, Carl Hanser Verlag.
- Christian Ullenboom: Java ist auch eine Insel: Programmieren lernen mit dem Standardwerk für Java-Entwickler, Rheinwerk Computing
- Christian Ullenboom: Java SE 8 Standard-Bibliothek: Das Handbuch für Entwickler, Rheinwerk Computing

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### Total time of attendance for the module

84 h
inf200 - Computer Engineering I

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<td>Nebel, Wolfgang (Module responsibility)</td>
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<td>Lehrenden, Die im Modul (Authorized examiners)</td>
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<td>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.</td>
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<td>Professional competence</td>
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<td>The students:</td>
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<td>• identify the fundamental components of digital circuitry and digital computers,</td>
</tr>
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<td>• are aware of the virtues of hierarchical and abstract descriptions of hardware systems,</td>
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<tr>
<td>• name the fundamental parameters, criteria, conditions, and development trends of current and future hardware design</td>
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<tr>
<td>• describe the basic concepts of current computer architectures and the execution of machine programs</td>
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| 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 |

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<td>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.</td>
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<td>• Patterson, D.A.; Hennessy, J.L. (1997): Computer Organization and Design:</td>
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<td>• The Hardware/Software Interface; 2. Edition; Morgan Kaufmann Publishers.</td>
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### Modullevel / module level

BC (Basiscurriculum / Base curriculum)

### Modulart / typ of module

V+Ü

### Vorkenntnisse / Previous knowledge

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### Total time of attendance for the module

56 h
inf400 - Theoretical Computer Science: Logic

Module label: Theoretical Computer Science: Logic
Module code: inf400
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Computing Science (Bachelor) > Basismodule
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Theoretische Informatik (30 KP)

Responsible persons:
Olderog, Ernst-Rüdiger (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites:

Skills to be acquired in this module:
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

Module contents:
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 calculus 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

Reader's advisory:
Essential:
• Script "Logik" (in German), in its current edition

Recommended:


Good secondary reading:


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<td>Modullevel / module level</td>
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</table>

| Total time of attendance for the module | 56 h |
Aufbaumodule

inf005 - Software Engineering I

Module label
Software Engineering I

Module code
inf005

Credit points
6.0 KP

Workload
180 h

Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum - Pflichtbereich
- Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule
- Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule (60 KP)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Pflichtbereich
- Master's Programme Environmental Modelling (Master) > Mastermodule

Responsible persons
Winter, Andreas (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module
The objective of the module is to convey the development and maintenance 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

Module contents
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.

Reader's advisory
Helmut Balzert: Lehrbuch der Software-Technik, Spektrum Akademischer Verlag, 3. Auflage 2009

Links
Language of instruction
German
Duration (semesters)
1 Semester
Module frequency
jährlich
Module capacity
unlimited
Modulelevel / module level
AC (Aufbaucurriculum / Composition)
Modulart / typ of module
Pflicht / Mandatory
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| Vorkenntnisse / Previous knowledge      | - inf030  
|                                         | - inf031 |
| Examination                             | Time of examination | Type of examination |
| Final exam of module                    | At the end of the lecture period or during the lecture period (portfolio) | Written exam or oral exam or portfolio (? 3 services) |
| Course type                             | Comment | SWS | Frequency | Workload of compulsory attendance |
| Lecture                                 |         | 3   | WSe       | 42          |
| Exercises                               |         | 2   | WSe       | 28          |
| **Total time of attendance for the module** |               |   |           | **70 h**    |
inf007 - Information Systems I

Module label: Information Systems I
Module code: inf007
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum - Pflichtbereich
- Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule (60 KP)
- Master Applied Economics and Data Science (Master) > Specialization
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Pflichtbereich

Responsible persons:
Lehrenden, Die im Modul (Authorized examiners)
Wingerath, Wolfram (Module responsibility)

Prerequisites

Skills to be acquired in this module:
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

Module contents:
- 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

Reader's advisory:

Links:
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited
- Module level / module level: AC (Aufbaucurriculum / Composition)
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Total time of attendance for the module: 56 h
**inf201 - Computer Engineering II**

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<td>&gt; Wahlpflichtmodule (Technische Informatik)</td>
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<td>Nebel, Wolfgang (Module responsibility)</td>
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<td></td>
<td>Lehrenden, Die im Modul (Authorized examiners)</td>
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</table>

**Prerequisites**

**Skills to be acquired in this module**

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**
- describe computer components
- design and optimise computer components
- understand manufacturing processes for VLSI circuits

**Methodological competence**
- analyse computer architectures

**Social competence**
- 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**
- are able to assess their own competences in relation to qualified personnel from related domains

**Module contents**

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 in 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.

**Reader's advisory**

- Lecture notes - Oberschelp, W., Vossen, G.: Rechneraufbau und Rechnerstrukturen; Oldenbourg Verlag

**Links**

**Language of instruction**

German

**Duration (semesters)**

1 Semester

**Module frequency**

jährlich

**Module capacity**

unlimited

**Modulelevel / module level**

AC (Aufbaucurriculum / Composition)

**Modulart / typ of module**

je nach Studiengang Pflicht oder Wahlpflicht

**Lehr-/Lernform / Teaching/Learning method**

V+Ü

**Vorkenntnisse / Previous knowledge**

**Final exam of module**

At the end of the lecture period

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**Total time of attendance for the module**

56 h
inf401 - Foundations of Theoretical Computer Science

Module label          Foundations of Theoretical Computer Science
Module code           inf401
Credit points         6.0 KP
Workload              180 h

Applicability of the module
- Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule
- Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Theoretische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Pflichtmodule

Responsible persons
Olderog, Ernst-Rüdiger (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module
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

Module contents
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.

Reader's advisory
- essentiell: Skript "Grundbegriffe der Theoretischen Informatik", jeweils in aktueller Ausgabe
- Gute Sekundärliteratur: Hopcroft, Motwani, Ullman: "Einführung in die Automatentheorie, Formale Sprachen und Komplexitätstheorie", Pearson, 2002 (ein Klassiker...)

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| Total time of attendance for the module    | 56 h     |
**inf800 - Proseminar in Computer Science**

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**Applicability of the module**
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum - Pflichtbereich
- Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praktische Vertiefung (60 KP)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

**Responsible persons**

- Diethelm, Ira (Module responsibility)
- Niese, Astrid (Module responsibility)
- Sauer, Jürgen (Module responsibility)
- Lehrenden, Die im Modul (Module counselling)

**Prerequisites**

- Studierende im den Bachelor-Studiengängen der Informatik sowie Master of Education Informatik

**Skills to be acquired in this module**

- 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 and describe essential mathematical, logical and physical basics of computer science
  - Define and illustrate the core disciplines of computer science (theoretical, 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 informatical actions independently
  - Reflect their contributions critically and discuss them with users and experts
  - Collect and update their knowledge independently

**Module contents**

- according to the assigned task

**Reader's advisory**

- according to the assigned task

**Links**

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**Reference text**

Choose one of the seminaire courses of the module.

**Modullevel / module level**

- je nach Studiengang Pflicht oder Wahlpflicht

**Lehr-/Lernform / Teaching/Learning method**

- S

**Vorkenntnisse / Previous knowledge**

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<td>Am Ende des Semesters und nach Absprache</td>
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**Course type**

- Seminar

<p>| SWS | 2 |</p>
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mat950 - Discrete Mathematics

Module label | Discrete Mathematics
Module code | mat950
Credit points | 6.0 KP
Workload | 180 h

Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum - Pflichtbereich
- Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Basismodule

Responsible persons
Heß, Florian (Module responsibility)
Stein, Andreas (Module responsibility)
Stein, Sandra (Module responsibility)

Prerequisites

Skills to be acquired in this module
- Getting to know and to understand the axiomatic structure of mathematics and the importance of mathematical reasoning
- Mastering basic mathematical proof techniques and their logical structure
- Recognizing the relevance of premises in mathematical theorems: Localization of premises within proofs and possible consequences if premises are not met
- Exemplary acquaintance with further mathematical areas and thus expansion of the student's mathematical knowledge
- Getting to know applications
- Integration and crosslinking of the student's mathematical knowledge by establishing relationships between different mathematical areas
- Learning the essential ideas and methods for discrete structures in mathematics
- Knowledge of the fundamental concepts and methods of graph theory
- Knowledge of the fundamental concepts and methods of algebra and number theory, such as groups, rings, fields, residue class rings, Euclidean algorithm, Chinese remainder theorem, polynomials.
- Knowledge of further concepts and methods for discrete structures, e.g. primality tests, RSA, graph-theoretical algorithms

Module contents
Elements of propositional logic, proof techniques, sets, relations and maps, combinatorics, graphs and applications, the ring of integers and residue class rings, groups and semi groups

Reader's advisory
Graham, Knuth, Patashnik: Concrete Mathematics, Addison-Wesley 1994.
Hartmann: Mathematik für Informatiker, Vieweg 2014.
Teschl, Teschl: Mathematik für Informatiker, Band 1, Springer 2013.
Further reading will be announced in the lecture.

Links
Language of instruction | German
Duration (semesters) | 1 Semester
Module frequency | annual
Module capacity | unlimited
Reference text | Im Zwei-Fächer Bachelor Informatik ist dieses Modul im Basiscurriculum zu studieren.
Modullevel / module level | AC (Aufbaucurriculum / Composition)
Modulart / type of module | Pflicht / Mandatory

Vorkenntnisse / Previous knowledge

Examination
| Time of examination | Type of examination
|---------------------|---------------------
| after the end of the lecture period | Written exam or oral exam.

Course type | Comment | SWS | Frequency | Workload of compulsory attendance
|-------------|---------|-----|-----------|---------------------------
<p>| Lecture     |         | 3   | WiSe     | 42                        |</p>
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<th>Workload of compulsory attendance</th>
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**Total time of attendance for the module**: 56 h
### mat955 - Mathematics of Computer Science (Linear Algebra)

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<td>Responsible persons</td>
<td>Frühbis-Krüger, Anne (Module responsibility)</td>
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<td></td>
<td>Heß, Florian (Module responsibility)</td>
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<td>Stein, Andreas (Module responsibility)</td>
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<td>Prerequisites</td>
<td>• Getting to know and to understand the axiomatic structure of mathematics and the importance of mathematical reasoning</td>
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<tr>
<td></td>
<td>• Mastering basic mathematical proof techniques and their logical structure</td>
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<td></td>
<td>• Recognizing the relevance of premises in mathematical theorems: Localization of premises within proofs and possible consequences if premises are not met</td>
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<tr>
<td></td>
<td>• Learning the significant ideas and methods of linear algebra</td>
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<td>• Mastering the fundamental concepts of algebra, such as groups, rings, fields</td>
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<td></td>
<td>• Mastering the fundamental concepts and significant methods of linear algebra, such as systems of linear equations, Gaussian algorithm, vector spaces, dimension, linear maps, matrices, determinants</td>
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<tr>
<td></td>
<td>• Mastering of further notions and methods of linear algebra, e.g. eigenvectors, eigenvalues, diagonalization</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>Significant techniques and structures, systems of linear equations, vector spaces, dimension, linear maps, determinants, eigenvalues, diagonalization</td>
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<tr>
<td>Module contents</td>
<td>Significant techniques and structures, systems of linear equations, vector spaces, dimension, linear maps, determinants, eigenvalues, diagonalization</td>
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<tr>
<td></td>
<td>G. Fischer: Lineare Algebra, Vieweg 2010 (17. Aufl.)</td>
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<td></td>
<td>F. Lorenz: Lineare Algebra Spektrum 2008 (4. Aufl.)</td>
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<td>S. Bosch: Lineare Algebra, Springer 2014</td>
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<td>G. Fischer: Lineare Algebra, Springer 2014</td>
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<td></td>
<td>B. Huppert, W. Willems: Lineare Algebra, Springer 2010</td>
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<td></td>
<td>M. Koecher: Lineare Algebra und analytische Geometrie, Springer 2003</td>
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<td></td>
<td>H.-J. Kowalsky, G. Michler: Lineare Algebra, de Gruyter 2003</td>
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<td>F. Lorenz: Lineare Algebra, Spektrum 2008</td>
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**mat960 - Mathematics of Computer Science (Analysis)**

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| Applicability of the module | Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum-Wahlbereich Mathematik  
Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule |
| Responsible persons | Schöpfer, Frank (Module responsibility) |
| Prerequisites |                                            |
| Skills to be acquired in this module | The students learn and apply basic notions and techniques of mathematical analysis. |
| Professional competence | The students:  
  · use rigorous mathematical proofs  
  · compute limit values and analyse the convergence behaviour of iterative methods  
  · apply differential and integral calculus to compute extreme values, to analyse the behaviour of functions and to develop numerical solution methods |
| Methodological competence | The students:  
  · analyse formal relations  
  · structure and justify solution methods |
| Social competence | The students:  
  · develop solutions to given problems in groups  
  · accept constructive criticism |
| Personal competence | The students:  
  · reflect their solution strategies  
  · deepen their understanding of the presented mathematical concepts with exercises and adopt the solution methods |
| Module contents | · Convergence of sequences, series and iterative methods  
  · Continuity, differential and integral calculus of functions of one variable  
  · Characterization and computation of extreme values  
  · Separable and linear ordinary differential equations |
| Reader's advisory | Peter Hartmann: Mathematik für Informatiker - ein praxisbezogenes Lehrbuch  
Dirk Hachenberger: Mathematik für Informatiker  
Otto Forster: Analysis I  
Harro Heuser: Lehrbuch der Analysis, Teil 1  
Konrad Königsberger: Analysis |
| Links | Language of instruction: German  
Duration (semesters): 1 Semester  
Module frequency: every year  
Module capacity: unlimited  
Modulelevel / module level: AC (Aufbaucurriculum / Composition)  
Modulart / typ of module: je nach Studiengang Pflicht oder Wahlpflicht  
Lehr-/Lernform / Teaching/Learning method:                                            |
| Vorkenntnisse / Previous knowledge |                                            |
| Examination | Time of examination | Type of examination |
| Final exam of module | At the end of the lecture period written exam | Final exam of module |
| Course type | Comment | SWS | Frequency | Workload of compulsory attendance |
| Lecture | 3 | SuSe | 42 |
| Exercises | 1 | SuSe | 14 |
| Total time of attendance for the module | 56 h |
# Computer Networks

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## Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum-Wahlbereich Praktische Informatik
- Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Praktische Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich

## Responsible persons
- Kramer, Oliver (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

## Prerequisites

## Skills to be acquired in this module

### Professional competence:
- 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:
- Administer small networks
- Characterise safety-critical aspects of networks

### Social competence:
- work on exercises in small teams

### Self-competence:
- accept criticism
- reflect on their proposed solutions, taking into account the methods taught

## Module contents

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 Shannons and Transmissions - CDMA
- Hamming & CRC
- Stop & wait, go back n, selective repeat
- Aloha & CSMA
- Ethernet technologies
- Wifi
- Paket switchen & Dijkstra
- IP Adressing & Header
- TCP
- UDP
- Buckets & TCP-Reno
- DNS
- Flask
- RSA & PGP
- Firewalls

|-------------------|------------------------------------------------------------------------------------------------|

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<td>Lehr-/Lernform / Teaching/Learning method</td>
<td>V+Ü</td>
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**Total time of attendance for the module** 56 h
## inf012 - Operating Systems I

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<td>Workload</td>
<td>180 h</td>
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| Applicability of the module  | • Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum-Wahlbereich Praktische Informatik  
• Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Praktische Informatik  
• Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik) |
| Responsible persons          | Theel, Oliver (Module responsibility)    |
|                              | Lehrenden, Die im Modul (Authorized examiners) |
| Prerequisites                |                                          |
| Skills to be acquired in this module | 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 |
| Module contents              | 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                       |
| Links                        |                                          |
| Language of instruction      | German                                   |
| Duration (semesters)         | 1 Semester                               |
| Module frequency             | jährlich                                 |
| Module capacity              | unlimited                                |
Verknüpft mit den Modulen:

- Betriebssysteme II (als mögliche Anschlussveranstaltung)
- Verteilte Betriebssysteme (als mögliche Spezialisierung)
- Betriebssysteme-Praktikum

<table>
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<th>Module / module level</th>
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<td>Lehr-/Lernform / Teaching/Learning method</td>
<td>V+Ü</td>
</tr>
<tr>
<td>Previous knowledge / Vorkenntnisse</td>
<td>Nützliche Vorkenntnisse: Studieninhalte des ersten Studienjahres des Fach-Bachelors Informatik oder Wirtschaftsinformatik</td>
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<table>
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<tr>
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<th>End of the lecture period</th>
<th>Written or oral exam</th>
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<table>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>2</td>
<td>SuSe</td>
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<td>Exercises</td>
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<td>2</td>
<td>SuSe</td>
<td>28</td>
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</table>

**Total time of attendance for the module**: 56 h
inf016 - Internet Technologies

Module label: Internet Technologies

Module code: inf016

Credit points: 6.0 KP

Workload: 180 h

Applicability of the module:
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum-Wahlbereich Praktische Informatik
- Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Praktische Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich

Responsible persons:
- Boles, Dietrich (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

Prerequisites:

Skills to be acquired in this module:

The graduates of the module know the basic concepts and technologies of Internet and web applications. They can evaluate the capability of the concepts and technologies 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 the techniques in projects

**Social competence**
The students:
- Implement web-based projects in a team

**Self-competence**
The students:
- Reflect their own capabilities to develop Internet-based applications

Module contents:
The module deals with the basic development concepts of Internet-based applications. It covers relevant client technologies of web applications (HTML, CSS, JavaScript), server technologies (forms, servlets, PHP, databases) and technologies for client server communication (AJAX, WebSockets, Web services, Social-Media-APIs). Additional topics are web design, Internet law, security and web search. The practical exercises of this module consist of the design, implementation and presentation of a comprehensive web application. The topics of the lecture will be applied and deepened in practice.

Reader's advisory:

Links:

Language of instruction: German

Duration (semesters): 1 Semester

Module frequency: every summer semester

Module capacity: unlimited

Reference text: Useful previous knowledge: object-oriented programming

Module level / module level: AS (Akzentsetzung / Accentuation)

Modulart / typ of module: je nach Studiengang Pflicht oder Wahlpflicht

Lehr-/Lernform / Teaching/Learning method: V+Ü

Vorkenntnisse / Previous knowledge: - Objektorientierte Programmierung

Examination:

Time of examination: Time of examination

Type of examination: Type of examination
### Examination

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<th>Type of examination</th>
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<td><strong>Final exam of module</strong></td>
<td>The presentation of partial results of the practical project takes place weekly during the exercises. Final delivery of the final project is one week after the end of the lecture period. The written exam or oral exam take place in the last week of the lecture period or the first week after the end of the lecture period. Any re-examinations take place at the end of the semester break. The exact timetable can be found in the learning management system.</td>
<td>project and written exam or project and oral exam</td>
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### Course type

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**Total time of attendance for the module**: 56 h
**inf019 - Compiler Construction**

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**Applicability of the module**
- Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Praktische Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)

**Responsible persons**
- Lehrenden, Die im Modul (Authorized examiners)
- Vogel-Sonnenschein, Ute (Module responsibility)

**Prerequisites**

**Skills to be acquired in this module**

**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

**Module contents**
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.

**Reader’s advisory**

**Essential:**
- Handout

**Recommended:**

**Links**

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**Total time of attendance for the module**  56 h
Wahlpflichtbereich Mathematik

mat030 - Analysis IIa: Integration in One Variable and Differential Equations

Module label: Analysis IIa: Integration in One Variable and Differential Equations
Module code: mat030
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Mathematik
- Bachelor's Programme Mathematics (Bachelor) > Basismodule
- Bachelor's Programme Physics (Bachelor) > Aufbaumodule
- Dual-Subject Bachelor's Programme Mathematics (Bachelor) > Basismodule

Responsible persons:
- Grieser, Daniel (Module responsibility)
- Pankrashkin, Konstantin (Module responsibility)
- Shestakov, Ivan (Module responsibility)
- Uecker, Hannes (Module responsibility)
- Vertman, Boris (Module responsibility)

Prerequisites:
- Kennenlernen und Verstehen des axiomatischen Aufbaus der Mathematik und der Bedeutung mathematischer Argumentation
- Beherrschen grundlegender mathematischer Beweistechniken und deren logischer Struktur
- Erkennen der Bedeutung von Voraussetzungen in mathematischen Sätzen: Lokalisierung der Voraussetzungen
- Kennenlernen von Anwendungen
- Vernetzung des eigenen mathematischen Wissens durch Herstellung von Bezügen zwischen verschiedenen mathematischen Bereichen
- Kennenlernen und Beherrschen von Grundlagen der Integrationstheorie von reellen Funktionen einer Variable sowie der Theorie gewöhnlicher Differentialgleichungen
- Ausbau und Vertiefung der in der Analysis I erworbenen Grundkenntnisse, wie etwa durch den Begriff eines metrischen Raumes
- Beherrschen wichtiger Rechentechniken zur Integration
- Beherrschen wichtiger Lösungsmethoden einiger klassischer Typen gewöhnlicher Differentialgleichungen
- Kennenlernen grundlegender Sätze über metrische Räume und gewöhnliche Differentialgleichungen, wie Banachscher Fixpunktsatz und Satz von Picard-Lindelöf
- Kennenlernen der Nützlichkeit von Abstraktion, etwa beim Beweis des Satzes von Picard-Lindelöf (Funktionen als Punkte eines Raumes)
- Kennenlernen einiger Methoden zur analytischen Modellierung durch gewöhnliche Differentialgleichungen
- Erkennen inhaltlicher Zusammenhänge mit den zentralen Konzepten der Analysis I und der linearen Algebra

Module contents:

Reader's advisory:
D. Grieser, Analysis I+II, Springer (ab 2018)
C. Forster, Analysis I+II, Vieweg
H. Heuser, Lehrbuch der Analysis, Teil 1+2, Teubner
W. Kaballo, Einführung in die Analysis I+II, Spektrum Verlag 2000
W. Königsberger, Analysis I+II, Springer
G. Schmieder, Analysis, Vieweg

Links:
Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Modullevel / module level: BC (Basiscurriculum / Base curriculum)
Modulart / typ of module: Pflicht / Mandatory
Lehr-/Lernform / Teaching/Learning method:
Vorkenntnisse / Previous knowledge: Analysis I; Lineare Algebra (kann auch gleichzeitig besucht werden)
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Total time of attendance for the module: 56 h
mat200 - Algebra I: Rings and Modules

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</tr>
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<td>Dual-Subject Bachelor's Programme Mathematics (Bachelor) &gt; Aufbaumodule</td>
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</tr>
<tr>
<td></td>
<td>Heß, Florian (Module responsibility)</td>
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<td>Stein, Andreas (Module responsibility)</td>
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<tr>
<td>Prerequisites</td>
<td></td>
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<tr>
<td></td>
<td>Exemplarisches Kennenlernen weiterer mathematischer Gebiete und damit Erweiterung des eigenen mathematischen Wissens</td>
</tr>
<tr>
<td></td>
<td>Kennenlernen von Anwendungen</td>
</tr>
<tr>
<td></td>
<td>Vertiefung, auch exemplarisch, der im Grundlagenbereich erworbenen Kenntnisse</td>
</tr>
<tr>
<td></td>
<td>Kennenlernen eines klassischen Gebietes der Mathematik, das mehr als hundert Jahre besteht ohne an Bedeutung zu verlieren</td>
</tr>
<tr>
<td></td>
<td>Beherrschen der grundlegenden algebraischen Strukturen wie Gruppe, Ringe und Körper</td>
</tr>
<tr>
<td></td>
<td>Beherrschen grundlegender und vertiefender Strukturtheorien in der Ringtheorie</td>
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<tr>
<td></td>
<td>Beherrschen grundlegender Strukturtheorien und ausgewählter Vertiefungen in der Körpertheorie</td>
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<td></td>
<td>Kennenlernen von arithmetischen Konzepten mit dem Schwerpunkt auf explizite Berechenbarkeit</td>
</tr>
<tr>
<td>Reader's advisory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S. Bosch: Lineare Algebra, Springer Spektrum 2014</td>
</tr>
<tr>
<td></td>
<td>S. Bosch: Algebra, Springer Spektrum 2013</td>
</tr>
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<td>German</td>
</tr>
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<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
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<td>AM (Aufbaumodul / Composition)</td>
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<td>Pflicht / Mandatory</td>
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<td>Time of examination</td>
</tr>
<tr>
<td></td>
<td>Type of examination</td>
</tr>
<tr>
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<td>nach Ende der Vorlesungszeit</td>
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<td>SWS</td>
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<td></td>
<td>Frequency</td>
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<td></td>
<td>Workload of compulsory</td>
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<td></td>
<td>attendance</td>
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<tr>
<td>Lecture</td>
<td>4</td>
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### mat310 - Statistics I - Introduction to Applied Statistics

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</thead>
<tbody>
<tr>
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<td>mat310</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
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</table>
| Applicability of the module | Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Mathematik  
Bachelor's Programme Mathematics (Bachelor) > Vertiefungsmodule |

**Responsible persons**
- Christiansen, Marcus (Module responsibility)
- May, Angelika (Module responsibility)
- Ruckdeschel, Peter (Module responsibility)

**Prerequisites**
- Exemplarisches Kennenlernen weiterer mathematischer Gebiete und damit Erweiterung des eigenen mathematischen Wissens
- Kennenlernen von Anwendungen
- Fähigkeit vorhandene Software zu verstehen, einzubinden und anzuwenden
- Vertiefung, auch exemplarisch, der im Grundlagenbereich erworbenen Kenntnisse
- Erwerb direkt berufsbezogener inhaltlicher und prozessorientierter Kompetenzen
- Erweiterung des mathematischen Wissens, vor allem aus der Stochastik
- Vertiefung der im Grundlagenbereich erworbenen Kenntnisse zur Analysis und Linearen Algebra
- Kennenlernen von Anwendungen der Statistik, auch mit umfangreichen Datenbeispielen
- Fähigkeit vorhandene Statistiksoftware und Anwendungspakete zu verstehen, einzubinden und anzuwenden
- Vertrautheit mit grundlegenden statistischen Kenngrößen
- Erwerb von Methoden zur professionellen explorativen Datenanalyse

**Module contents**
- Deskriptive und explorative Statistik: Häufigkeiten und Ihre grafische Darstellung, Lagemaße, Streuungsmaße, Quantile, Histogramm, Kerndichteschätzer, Kontingenztafel, Korrelationskoeffizient
- Parameterschätzungen: Punktenschätzung, Eigenschaften von Schätzstatistiken, Konstruktion von Schätzfunktionen, Intervallschätzungen, Konfidenzintervalle
- Statistische Tests: Prinzipien des Testens (Fehler, Gütefunktion, Zusammenhang mit Konfidenzintervallen), Spezielle Testprobleme (Gauß-Test, t-Test, Chi-Quadrat-Unabhängigkeits-Test, Chi-Quadrat-Homogenitätstest, verteilungsfreie Tests)
- Einführung in die Regressionsanalyse: Kleinste-Quadrate-Schätzung, Ausgleichsgerade, Residualanalyse, multiple lineare Regression, Varianzanalyse

**Reader's advisory**
- Fahrmeir, Künstler, Pigeot, Tutz: Statistik - Der Weg zur Datenanalyse, Springer.
- Fahrmeir, Künstler, Pigeot, Tutz, Caputo, Lang: Arbeitsbuch Statistik, Springer.

**Links**

**Language of instruction**
German

**Duration (semesters)**
1 Semester

**Module frequency**
jährlich

**Module capacity**
unlimited

**Modullevel / module level**
AC (Aufbaucurriculum / Composition)

**Modulart / typ of module**
Wahlpflicht / Elective

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
<thead>
<tr>
<th>Time of examination</th>
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**Final exam of module**

<table>
<thead>
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<th>SWS</th>
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<tbody>
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**Total time of attendance for the module**
56 h
mat995 - Special Topics in Mathematics

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<td>Workload</td>
<td>180 h</td>
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**Applicability of the module**
- Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Mathematik

**Responsible persons**
- Theel, Oliver (Module responsibility)
- Krug, Peter (Module responsibility)
- Chernov, Alexey (Module responsibility)
- Frühbis-Krüger, Anne (Module responsibility)
- Grieser, Daniel (Module responsibility)
- Heß, Florian (Module responsibility)
- Schöpfer, Frank (Module responsibility)
- Stein, Andreas (Module responsibility)
- Uecker, Hannes (Module responsibility)

**Prerequisites**

**Skills to be acquired in this module**

**Module contents**

**Reader's advisory**

**Links**
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited

**Reference text**
Als Modul "Mathematik speziell" muss aus dem Katalog der Mathematikmodule eines der Module "mat996 Einführung in die Numerik", "mat997 Einführung in die Stochastik", "mat030 Analysis II", "mat200 Algebra I" oder "mat310 Statistik I" ausgewählt werden.

**Modul level / module level**
- je nach Studiengang Pflicht oder Wahlpflicht

**Lehr-/Lernform / Teaching/Learning method**
- Vorlesung + Übung

**Vorkenntnisse / Previous knowledge**

**Examination**
- Time of examination: nach Ende der Veranstaltungen, Übungsaufgaben laufend
- Type of examination: KL

**Final exam of module**
- Course type: Lecture
  - Comment: 2
  - SWS: 2
  - Frequency: 28
  - Workload of compulsory attendance: 28
- Course type: Exercises
  - Comment: 2
  - SWS: 2
  - Frequency: 28
  - Workload of compulsory attendance: 28

**Total time of attendance for the module**: 56 h
### mat996 - Introduction to Numerical Analysis

<table>
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<tbody>
<tr>
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<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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| Applicability of the module | Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum-Wahlbereich Mathematik  
                        | Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Mathematik |
| Responsible persons   | Chernov, Alexey (Module responsibility)  
<pre><code>                    | Schöpfer, Frank (Module responsibility) |
</code></pre>
<p>| Prerequisites         | Analysis I, Lineare Algebra          |
| Skills to be acquired in this module | The students learn and analyze the basic numerical methods. The students learn to implement the basic numerical methods in a computer program. |
|                       | Professional competence               |
|                       | The students:                        |
|                       | · learn basic numerical methods and algorithms |
|                       | · analyze properties of the numerical methods using rigorous mathematical tools |
|                       | · implement the basic numerical methods in a computer program |
|                       | · interpret results of computer simulations |
|                       | Methodological competence            |
|                       | The students:                        |
|                       | · analyze algorithms with mathematical tools |
|                       | · implement numerical algorithms for concrete problems |
|                       | Social competence                    |
|                       | The students:                        |
|                       | · develop solutions to given problems in groups |
|                       | · accept constructive criticism      |
|                       | Personal competence                  |
|                       | The students:                        |
|                       | · reflect their solution strategies  |
|                       | · deepen their understanding of the presented mathematical and algorithmical concepts with exercises and adopt the solution methods |
| Module contents       | · Numerical methods for linear systems: LU-, Cholesky decompositions, iterative methods |
|                       | · Numerical methods for nonlinear equations: fix-point iterations, Newton's Method |
|                       | · Polynomials, spline and trigonometric interpolation |
|                       | · Numerical integration: Newton-Cotes, Gauss quadrature rules, adaptive quadrature and extrapolation methods |
|                       | · Stability and conditioning of algorithms and problems |
| Links                 |                                      |
| Language of instruction| German                              |
| Duration (semesters)  | 1 Semester                          |
| Module frequency      | every year                           |
| Module capacity       | unlimited                            |
| Reference text        | Als 6 KP Modul werden Vorlesung und Übungen nur in den ersten 2/3 des Semesters besucht. |
| Modul level / module level | AC (Aufbaucurriculum / Composition)  |
| Modulart / typ of module | Wahlpflicht / Elective               |
| Vorkenntnisse / Previous knowledge |                                      |
| Examination           | Time of examination                  |
| Final exam of module  | At the end of the lecture period written exam | Final exam of module |</p>
<table>
<thead>
<tr>
<th>Course type</th>
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<th>Frequency</th>
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<td>1.3</td>
<td>WiSe</td>
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**Total time of attendance for the module** 56 h
mat997 - Introduction to Probability and Statistics

Module label: Introduction to Probability and Statistics
Module code: mat997
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Mathematik

Responsible persons:
- Christiansen, Marcus (Module responsibility)
- May, Angelika (Module responsibility)
- Ruckdeschel, Peter (Module responsibility)

Prerequisites:

Skills to be acquired in this module:
- Exemplarisches Kennenlernen weiterer mathematischer Gebiete und damit Erweiterung des eigenen mathematischen Wissens
- Kennenlernen von schulrelevanten Anwendungen
- Vertiefung, auch exemplarisch, der im Grundlagenbereich erworbenen Kenntnisse
- Vernetzung des eigenen mathematischen Wissens durch Herstellung von Bezügen zwischen verschiedenen mathematischen Bereichen
- Aufbau von Grundkenntnissen in Wahrscheinlichkeitsstheorie und Statistik
- Vertiefung und Erweiterung der im Grundlagenbereich erworbenen Kenntnisse aus Analysis und Linearer Algebra
- Kennenlernen von schulrelevanten Anwendungen im Bereich diskreter Wahrscheinlichkeitsräume und statistischer Hypothesen
- Kennenlernen von mathematischen Grundlagen der Wahrscheinlichkeitsstheorie und Einblicke in die Statistik
- Vernetzung des eigenen mathematischen Wissens durch Verknüpfung Wahrscheinlichkeitsstheoretischer Konzepte mit Inhalten aus Analysis I und II sowie der Linearen Algebra

Module contents:
Grundzüge der Maß- und Integrationstheorie, Wahrscheinlichkeitsräume, Zufallsvariablen/-vektoren und ihre Verteilung, Dichte und Verteilungsfunktion, stochastische Unabhängigkeit, Erwartungswert, Varianz und Kovarianz, bedingte Wahrscheinlichkeiten/Erwartungen, multivariate Normalverteilung, Grenzwertsätze: Gesetz der großen Zahlen und Zentraler Grenzwertsatz

Reader's advisory:
Andreas Büchter, Hans-Wolfgang Henn: Elementare Stochastik, Springer
Herold Dehling, Beate Haupt: Einführung in die Wahrscheinlichkeitsstheorie und Statistik, Springer

Links:

Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Reference text:
Als 6 KP Modul werden Vorlesung und Übungen nur in den ersten 2/3 des Semesters besucht.

Module level / module level:
AC (Aufbaucurriculum / Composition)
Moduleart / typ of module:
Wahlpflicht / Elective

Vorkenntnisse / Previous knowledge:

Examination:
Time of examination:
Type of examination:

Final exam of module:
Klausur am Ende des Semesters
KL

Course type:
Comment:
SWS:
Frequency:
Workload of compulsory attendance:

Lecture:
2
SuSe
28

Exercises:
2
SuSe
28

Total time of attendance for the module:
56 h

44 / 167
# Akzentsetzungsbereich - Wahlbereich Informatik

## inf006 - Software Engineering II

<table>
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<tr>
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<tr>
<td>Workload</td>
<td>180 h</td>
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**Applicability of the module**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)
- Master's Programme Business Informatics (Master) > Akzentsetzungsmodul der Informatik
- Master's Programme Computing Science (Master) > Praktische Informatik
- Master's Programme Environmental Modelling (Master) > Mastermodule

**Responsible persons**
- Winter, Andreas (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

**Prerequisites**

**Skills to be acquired in this module**
- The objective of the module inf006 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

**Module contents**
- 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

**Reader's advisory**
- Helmut Balzert: Lehrbuch der Software-Technik, Spektrum Akademischer Verlag, 3. Auflage 2009
- and actual papers from IEEE Software, IEEE Transactions on Software-Engineering, Informatik-Spektrum and conferences (z.B. ICSE, ICSM, WCRE, CSMR, ICPDD, SLE, u.a.)

**Links**
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited
- Modullevel / module level: AS (Akzentsetzung / Accentuation)
<table>
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<th>Modulart / typ of module</th>
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<td>Vorkenntnisse / Previous knowledge</td>
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<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>At the end of the lecture period</td>
<td>Portfolio (30-minute presentation, 1 paper (4 pages, IEEE) and oral exam)</td>
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<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>Seminar</td>
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| Total time of attendance for the module | 56 h |
## inf008 - Information Systems II

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<tbody>
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<tr>
<td>Workload</td>
<td>180 h</td>
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### Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum-Wahlbereich Praktische Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Master Applied Economics and Data Science (Master) > Specialization
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)
- Master's Programme Business Informatics (Master) > Akzentsetzungsmodule der Informatik

### Responsible persons
- Grawunder, Marco (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

### Prerequisites

### Skills to be acquired in this module

#### 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

### Module contents
- 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

### Reader's advisory

Suggested reading:
- Härder, T., Rahm, E.: Datenbanksysteme - Konzepte und Techniken der Implementierung, Morgan Kaufmann
- U. Leser, F. Naumann: Informationsintegration: Architekturen und Methoden zur Integration verteilter und heterogener Datenquellen, dpunkt
- Bauer/Günzel: Data-Warehouse-Systeme, dpunkt
- Han/Kamber/Pel: Data Mining: Concepts and Techniques, Morgan Kaufmann
<table>
<thead>
<tr>
<th>Links</th>
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</thead>
<tbody>
<tr>
<td><strong>Language of instruction</strong></td>
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<tr>
<td><strong>Duration (semesters)</strong></td>
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<tr>
<td><strong>Module frequency</strong></td>
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<td><strong>Module capacity</strong></td>
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<td><strong>Modullevel / module level</strong></td>
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<td><strong>Modulart / typ of module</strong></td>
</tr>
<tr>
<td><strong>Lehr-/Lernform / Teaching/Learning method</strong></td>
</tr>
<tr>
<td><strong>Vorkenntnisse / Previous knowledge</strong></td>
</tr>
<tr>
<td><strong>Examination</strong></td>
</tr>
<tr>
<td><strong>Time of examination</strong></td>
</tr>
<tr>
<td><strong>Type of examination</strong></td>
</tr>
<tr>
<td><strong>Final exam of module</strong></td>
</tr>
<tr>
<td><strong>Course type</strong></td>
</tr>
<tr>
<td>Lecture</td>
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<tr>
<td>Exercises</td>
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<td><strong>Total time of attendance for the module</strong></td>
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inf009 - Database Practical

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<tr>
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<td>6.0 KP</td>
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<tr>
<td>Workload</td>
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**Applicability of the module**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praktische Vertiefung (60 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

**Responsible persons**
- Grawunder, Marco (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

**Prerequisites**

**Skills to be acquired in this module**
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

**Module contents**
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

**Reader's advisory**
Held Andrea (2005). Oracle 10g Hochverfügbarkeit Addison-Wesley.

**Links**
http://www-is.informatik.uni-oldenburg.de/227/

**Language of instruction**
German
<table>
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<th><strong>Duration (semesters)</strong></th>
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inf014 - Operating Systems Practical

Module label: Operating Systems Practical
Module code: inf014
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praktische Vertiefung (60 KP)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

Responsible persons:
Theel, Oliver (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites:
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

Module contents
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

Reader's advisory
<table>
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|                               | • Betriebssysteme II  
|                               | • Verteilte Systeme |

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|                                | - Betriebssysteme II  
|                                | - Programmiersprachen: C, Assembler |

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inf015 - Distributed Operating Systems

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</table>

**Skills to be acquired in this module**

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
- 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

**Module contents**

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 election
• Deadlocks

9) Naming and localisation of objects

10) Distributed file systems

11) Fault tolerance concepts

Reader's advisory


Links

- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: jährlich
- Module capacity: unlimited
- Reference text: Associated with the modules:
  - Betriebssysteme I
  - Betriebssysteme-Praktikum
  - Fehlertoleranz in verteilten Systemen (as a possible differentiation)

Modullevel / module level: AS (Akzentsetzung / Accentuation)

Modulart / typ of module: je nach Studiengang Pflicht oder Wahlpflicht

Lehr-/Lernform / Teaching/Learning method: V+Ü

Vorkenntnisse / Previous knowledge: Betriebssysteme I

Examination: Time of examination: End of the lecture period

Type of examination: Training tasks, written exam or oral exam

Course type: Comment: SWS Frequency Workload of compulsory attendance

Lecture: 2 SuSe 28
Exercises: 2 SuSe 28

Total time of attendance for the module: 56 h
inf017 - Interactive Systems

Module label: Interactive Systems
Module code: inf017
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:

- Bachelor's Programme Biology (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Business Administration and Law (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Business Informatics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Chemistry (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer" more...
- Bachelor's Programme Comparative and European Law (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Economics and Business Administration (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Education (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Engineering Physics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Environmental Science (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Intercultural Education and Counselling (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Mathematics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Physics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Physics, Engineering and Medicine (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Social Studies (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Sustainability Economics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Art and Media (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
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- Dual-Subject Bachelor's Programme English Studies (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme German Studies (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme General Education (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme History (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Material Culture: Textiles (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
**Dual-Subject Bachelor's Programme Mathematics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Dual-Subject Bachelor's Programme Music (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Dual-Subject Bachelor's Programme Philosophy / Values and Norms (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Dual-Subject Bachelor's Programme Physics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Dual-Subject Bachelor's Programme Politics-Economics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Dual-Subject Bachelor's Programme Protestant Theology and Religious Education (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Dual-Subject Bachelor's Programme Slavic Studies (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Dual-Subject Bachelor's Programme Social Studies (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Dual-Subject Bachelor's Programme Special Needs Education (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Dual-Subject Bachelor's Programme Sport Science (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Dual-Subject Bachelor's Programme Technology (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**
**Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"**

**Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)**

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### Responsible persons

Boll-Westermann, Susanne (Module responsibility)

Lehrenden, Die im Modul (Authorized examiners)

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### Prerequisites

**Skills to be acquired in this module**

**"Professional competence"** The students:
- can describe and explain an iterative process to develop interactive systems.
- can classify a method known from the lecture into that process
- name the basic concepts and characteristics of usable user interfaces
- name and explain established guidelines and heuristics of the user-centered design of interactive systems

**"Methodological competence:"** The students:
- can name and explain methods for context of use and/or user requirements analysis.
- can name methods for the design and prototypical implementation of interactive systems and discuss their advantages and disadvantage.
- can explain established methods for usability testing.
- can evaluate a given user interface with regard to potential usability problems.

**"Social competence"** The students:
- can present solutions to usability problems or results of an usability evaluation in the plenum.

**"Self competence"** The students:
- can accept criticisms by their peer group as valuable contributions to their solutions.

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### Module contents

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.

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### Reader's advisory

Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale: Human Computer Interaction.
Bernhard Preim, Raimund Dachselt: Interaktive Systeme
Don Norman: The design of everyday things

Weitere Fachartikel, die in der Vorlesung vorgestellt werden

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### Links

http://medien.informatik.uni-oldenburg.de/lehre/
<table>
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**Vorkenntnisse / Previous knowledge**
- Examination
  - Time of examination
  - Type of examination
    - Final exam of module
      - The presentation of the practical exercises takes place during the semester at tutorial times. The first written short test concerns contents of the first five lectures and takes place in the weeks after the fifth lecture. The second short test concerns the contents of the remaining lectures and follows shortly after the end of the lecture period. The exact dates will be announced in the first lecture as well as in the teaching management system.

**Course type**
- Lecture
  - SWS: 2
  - Frequency: WiSe
  - Workload of compulsory attendance: 28
- Project
  - SWS: 2
  - Frequency: WiSe
  - Workload of compulsory attendance: 28

**Total time of attendance for the module**
- 56 h
inf018 - Media Processing

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Applicability of the module

- Bachelor's Programme Biology (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Business Administration and Law (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Business Informatics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Chemistry (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer" more...
- Bachelor's Programme Comparative and European Law (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Computing Science (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
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- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Computer Science (Bachelor) > Praktische Vertiefung (60 KP)
- Dual-Subject Bachelor's Programme Dutch Linguistics and Literary Studies (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Economic Education (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
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- Dual-Subject Bachelor's Programme Material Culture: Textiles (Bachelor) > PP "Medieninformatik für
Studierende musisch-künstlerischer Fächer

- Dual-Subject Bachelor's Programme Mathematics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Music (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
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- Dual-Subject Bachelor's Programme Technology (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"

Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"

Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)

Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

Master's Programme Business Informatics (Master) > Akzentsetzungsmodul der Informatik

Responsible persons

Boll-Westermann, Susanne (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module

The students can explain the basics of image processing and know which algorithms exist for the basic tasks in image processing and how these are applied.

The students can apply basic methods of image processing they learned in the lecture to solve simple problems.

**Professional competence:**

The students

- can name basic characteristics of digital media
- can explain the most common methods for encoding and compressing images, video and audio
- can describe basic procedures for image enhancement, feature extraction, feature description, image analysis and image comprehension

**Methodological competence:**

The students

- can recognize and evaluate image properties and decide for suitable image processing methods
- can select existing software packages for simple image processing problems, as well as use and customize them for their specific task
- can implement simple image and media processing functions in a higher programming language (e.g., C++)

**Social competence**

The students:

- can plan, implement, and document a software project in team work
- can present the results of their work to an audience and adequately respond to criticism and questions

**Self competence**

The students:

- can accept and learn from mistakes made during the process of implementation
Module contents

The lecture covers the technologies of media processing. In particular, the lecture focuses on image processing chain from digital imaging, through image pre-/and postprocessing, and image storage to image analysis. In addition to compression techniques and color space theory (RGB, HSV, YUV, CIEXYZ, ...), the topics of the lecture include image enhancement, feature extraction, feature description, image analysis and image comprehension. The lecture furthermore discusses the encoding and analysis of video and audio.

Reader's advisory


Literatur im Handapparat der Abteilung in der Bibliothek. Linkliste im Lernmanagementsystem zu den einzelnen Themen der Vorlesung.

Links

http://medien.informatik.uni-oldenburg.de/lehre

Language of instruction

German

Duration (semesters)

1 Semester

Module frequency

Annually

Module capacity

unlimited

Reference text

Useful previous knowledge: Solid programming skills in Java and/or C++, practical informatics. Interest in media processing

Modullevel / module level

AS (Akzentsetzung / Accentuation)

Modulart / typ of module

je nach Studiengang Pflicht oder Wahlpflicht

Lehr-/Lernform / Teaching/Learning method

1V + 1Ü

Vorkenntnisse / Previous knowledge

Gute Programmierkenntnisse in PythonJava und/oder JavaC++, Interesse an Medienverarbeitung.

Examination

Time of examination

Type of examination

Final exam of module


Project and oral exam

The portfolio comprises two graded submodules:

• Practical group project which progress has to be presented regularly during the tutorials.
• Oral exam on the topics of the lecture.

Practical project and oral exam count 50% each to the final grade. Both practical project and oral exam must be passed individually.

Course type

Comment

SWS

Frequency

Workload of compulsory attendance

Lecture

2

WiSe

28

Project

2

WiSe

28

Total time of attendance for the module

56 h
inf020 - Machine-oriented Programming

Module label: Machine-oriented Programming
Module code: inf020
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)

Responsible persons:
Theel, Oliver (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module

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

Module contents

- 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.

Reader's advisory


Links

Language of instruction: German
<table>
<thead>
<tr>
<th>Duration (semesters)</th>
<th>1 Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module frequency</td>
<td>jährlich</td>
</tr>
<tr>
<td>Module capacity</td>
<td>unlimited</td>
</tr>
</tbody>
</table>
| Reference text       | Associated with the modules:  
  - Betriebssysteme I und II (as possible prerequisites)  
  - Verteilte Betriebssysteme (as possible specialisation)  
  - Betriebssysteme-Praktikum |
| Modullevel / module level | AS (Akzentsetzung / Accentuation) |
| Modulart / typ of module | je nach Studiengang Pflicht oder Wahlpflicht |
| Lehr-/Lernform / Teaching/Learning method | V+Ü |
| Vorkenntnisse / Previous knowledge | Studieninhalte des ersten Studienjahres des Fach-Bachelors Informatik oder Wirtschaftsinformatik |
| Examination | Time of examination | Type of examination |
| Final exam of module | At the end of the lecture periode | Written or oral exam |
| Course type | Comment | SWS | Frequency | Workload of compulsory attendance |
| Lecture | | 2 | WiSe | 28 |
| Exercises | | 2 | WiSe | 28 |
| Total time of attendance for the module | 56 h |
inf021 - Advanced Java Technologies

Module label: Advanced Java Technologies
Module code: inf021
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praktische Vertiefung (60 KP)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

Responsible persons
Boles, Dietrich (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module
The objective of this module is to introduce advanced concepts and technologies of the Java Standard Edition. The students will be able to use the technologies to implement large applications.

Professional competence:
The students:
- name the essential packages of the JDK class library
- structure large programs properly and implement them extensively
- look up required classes in the JDK-Library and solve problems with these classes
- structure their programs properly
- understand and interpret large programs of other students
- evaluate the quality of large programs related to their maintainability, reusability and expandability

Methodological competence:
The students:
- search for solutions to specific problems in the internet independently

Social competence:
The students:
- discuss own and solutions of other students

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

Module contents
A selection of the following subjects is presented during the lectures:
- GUI (AWT, Swing, JavaFX)
- Java-Basics and Collection-API
- Graphics and multimedia
- Events
- Model-View-Control (MVC)
- Threads
- Internationalization, localization
- Reflection
- IO, Files
- Tools (compiler, classloader, printer, ...)
- Storage technologies (XML and serialization)
- Distributed programming (sockets and RMI)
- Databases (JDBC)
- Compression
- Security concepts

Alternatively, a single topic is explored in depth.
As part of the exercises, individual programming tasks or a larger programming task will be worked on. The tasks are related to the topic of the individual lecture contents.
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<thead>
<tr>
<th>Reader's advisory</th>
<th>list of links in the learning management system</th>
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<tbody>
<tr>
<td><strong>Links</strong></td>
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<tr>
<td>Language of instruction</td>
<td>German</td>
</tr>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
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<tr>
<td>Module frequency</td>
<td>every Semester</td>
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<tr>
<td>Module capacity</td>
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<tr>
<td><strong>Reference text</strong></td>
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<tr>
<td>Modul level / module level</td>
<td>AS (Akzentsetzung / Accentuation)</td>
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<tr>
<td>Modulart / typ of module</td>
<td>Wahlpflicht / Elective</td>
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<tr>
<td>Lehre-/Lernform / Teaching/Learning method</td>
<td>VL + Ü</td>
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<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td>Objektorientierte Programmierung</td>
</tr>
<tr>
<td><strong>Examination</strong></td>
<td></td>
</tr>
<tr>
<td>Final exam of module</td>
<td>throughout the semester</td>
</tr>
<tr>
<td>Time of examination</td>
<td>practical exercises</td>
</tr>
<tr>
<td>Type of examination</td>
<td>As part of the exercises, the students work on practical programming tasks. For this purpose, new subtasks with reference to the respective lecture content have to be worked on weekly.</td>
</tr>
<tr>
<td><strong>Course type</strong></td>
<td></td>
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<tr>
<td>Comment</td>
<td>SWS</td>
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<tr>
<td>Lecture</td>
<td>2</td>
</tr>
<tr>
<td>Exercises</td>
<td>2</td>
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<tr>
<td><strong>Total time of attendance for the module</strong></td>
<td>84 h</td>
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</table>
inf203 - Embedded Systems I

Module label | Embedded Systems I
---|---
Module code | inf203
Credit points | 6.0 KP
Workload | 180 h

Applicability of the module

- Bachelor's Programme Computing Science (Bachelor) > Akzentrsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Technische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Technische Informatik)

Responsible persons

- Nebel, Wolfgang (Module responsibility)
- Fränzle, Martin Georg (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module

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 exercises self-responsibly

Module contents

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.

Reader's advisory

Slides and:

Secondary literature:

- 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 eit ZA 1536)

Links

<table>
<thead>
<tr>
<th>Language of instruction</th>
<th>German</th>
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</thead>
<tbody>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Module frequency</td>
<td>jährlich</td>
</tr>
<tr>
<td>Module capacity</td>
<td>unlimited</td>
</tr>
<tr>
<td>Reference text</td>
<td>This module is compulsory for students who are specialising in &quot;Eingebettete Systeme und Mikrorobotik&quot;.</td>
</tr>
</tbody>
</table>

Assosciates with the modules:
In the module "Eingebettete Systeme II" additional 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".

<table>
<thead>
<tr>
<th>Modullevel / module level</th>
<th>AS (Akzentsetzung / Accentuation)</th>
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</thead>
<tbody>
<tr>
<td>Modulart / typ of module</td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
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<tr>
<td>Lehr-/Lernform / Teaching/Learning method</td>
<td>V+Ü</td>
</tr>
</tbody>
</table>
| Vorkenntnisse / Previous knowledge | - Grundlagen der technischen Informatik  
- Technische Informatik |
| Examination                | Time of examination  
Type of examination | Written or oral exam |
| Final exam of module      | At the end of the semester  
Workload of compulsory attendance |

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>3</td>
<td>WiSe</td>
<td>42</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>1</td>
<td>WiSe</td>
<td>14</td>
</tr>
</tbody>
</table>

Total time of attendance for the module | 56 h
inf204 - Embedded Systems II

<table>
<thead>
<tr>
<th>Module label</th>
<th>Embedded Systems II</th>
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</thead>
<tbody>
<tr>
<td>Module code</td>
<td>inf204</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
</tbody>
</table>

Applicability of the module
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Technische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Technische Informatik)

Responsible persons
- Nebel, Wolfgang (Module responsibility)
- Fränzle, Martin Georg (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module
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

Module contents
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.

**Reader's advisory**

- Slides and:

**Secondary literature:**


**Links**

- **Language of instruction**: German
- **Duration (semesters)**: 1 Semester
- **Module frequency**: jährlich
- **Module capacity**: unlimited
- **Reference text**: This module is supposed to be a compulsory module for students who are specialising in "Eingebettete Systeme und Mikrorobotik".
- **Modullevel / module level**: AS (Akzentsetzung / Accentuation)
- **Modulart / typ of module**: je nach Studiengang Pflicht oder Wahlpflicht
- **Lehr-/Lernform / Teaching/Learning method**: V+Ü
- **Vorkenntnisse / Previous knowledge**
- **Final exam of module**: At the end of the lecture times
- **Course type** | **Comment** | **SWS** | **Frequency** | **Workload of compulsory attendance**
--- | --- | --- | --- | ---
Lecture |  | 3 | SuSe | 42
Exercises |  | 1 | SuSe | 14
**Total time of attendance for the module**: 56 h
inf205 - Formal Methods in Embedded System Design

<table>
<thead>
<tr>
<th>Module label</th>
<th>Formal Methods in Embedded System Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module code</td>
<td>inf205</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
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</tbody>
</table>

**Applicability of the module**
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Technische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Technische Informatik)

**Responsible persons**
- Fränzle, Martin Georg (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

**Prerequisites**
- Embedded computer systems sustain a permanent interaction with their environment. This interaction may lead to hardly predictable stimuli and responses, which complicates the design and validation of such systems tremendously. As in more mature engineering 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 analysis - 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:
- can assess their technical and methodological understanding
- reflect on their problem-solving competence with reference to the procedures and methods presented

**Module contents**
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 exercise 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 industrially relevant size.

**Reader's advisory**

**Links**

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**
- jährlich

**Module capacity**
- unlimited

**Modullevel / module level**
- AS (Akzentsetzung / Accentuation)

**Modulart / typ of module**
- je nach Studiengang Pflicht oder Wahlpflicht
**Lehr-/Lernform / Teaching/Learning method**  
V+Ü

**Vorkenntnisse / Previous knowledge**  


<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tbody>
<tr>
<td><strong>Final exam of module</strong></td>
<td>at the end of the semester</td>
<td>Semester project</td>
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</table>

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>3</td>
<td>WiSe</td>
<td>42</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>1</td>
<td>WiSe</td>
<td>14</td>
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</tbody>
</table>

**Total time of attendance for the module**  
56 h
inf207 - Electrical Engineering

<table>
<thead>
<tr>
<th>Module label</th>
<th>Electrical Engineering</th>
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<tbody>
<tr>
<td>Module code</td>
<td>inf207</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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<tr>
<td>Applicability of the module</td>
<td></td>
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<tr>
<td></td>
<td>Bachelor's Programme Computing Science (Bachelor) &gt; Akzentsetzungsbereich - Wahlbereich Informatik</td>
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<td></td>
<td>Dual-Subject Bachelor's Programme Computing Science (Bachelor) &gt; Wahlpflicht Technische Informatik (30 KP)</td>
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<td>Master of Education Programme (Gymnasium) Computing Science (Master of Education) &gt; Wahlpflichtmodule (Technische Informatik)</td>
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<tr>
<td></td>
<td>Master's Programme Computing Science (Master) &gt; Nicht Informatik</td>
</tr>
<tr>
<td>Responsible persons</td>
<td>Hein, Andreas (Module responsibility)</td>
</tr>
<tr>
<td></td>
<td>Lehrenden, Die im Modul (Authorized examiners)</td>
</tr>
<tr>
<td>Prerequisites</td>
<td></td>
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<tr>
<td>Skills to be acquired in this module</td>
<td></td>
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<tr>
<td>Professional competence:</td>
<td></td>
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<tr>
<td>The students:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analyse linear electrical networks (direct current and alternating current)</td>
</tr>
<tr>
<td></td>
<td>Name basic concepts to calculate and to use electrical and magnetic fields</td>
</tr>
<tr>
<td></td>
<td>List the characteristics of simple electrical elements (two terminal networks)</td>
</tr>
<tr>
<td></td>
<td>Calculate the parameters of simple electrical networks/wirings</td>
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<tr>
<td></td>
<td>Apply computer based analysing tools</td>
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<tr>
<td></td>
<td>Design and implement simple networks/wirings</td>
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<tr>
<td>Methodological competence:</td>
<td></td>
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<tr>
<td>The students:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transfer calculation methods onto complex dynamic systems</td>
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<tr>
<td></td>
<td>Implement electrical system models</td>
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<tr>
<td>Social competence:</td>
<td></td>
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<tr>
<td>The students:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Present solutions for specific questions</td>
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<tr>
<td>Self-competence:</td>
<td></td>
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<tr>
<td>The students:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reflect their solutions by using methods learned in this course</td>
</tr>
<tr>
<td>Module contents</td>
<td></td>
</tr>
<tr>
<td>Basic concepts (electric dimensions and units)</td>
<td></td>
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<tr>
<td>Network elements</td>
<td></td>
</tr>
<tr>
<td>Calculation of linear direct current networks (Ohms law, Kirchhoff's circuit law, superposition principle)</td>
<td></td>
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<tr>
<td>Characteristics, calculations and representations of electric and magnetic fields</td>
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<td>Construction elements (capacitor and coil)</td>
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<tr>
<td>Extensions of periodical dimensions dependent on time, pointer representation, calculations with complex root-mean-square value pointers</td>
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<tr>
<td>Reader's advisory</td>
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### Examination
- **Final exam of module**
  - At the End of the Semester
  - Hands-on exercises / written exam or oral exam

### Course type
- **Lecture**
  - Comment:  
  - SWS: 3
  - SuSe:  
  - Frequency: SuSe
  - Workload of compulsory attendance: 42
- **Exercises**
  - Comment:  
  - SWS: 1
  - SuSe:  
  - Frequency: SuSe
  - Workload of compulsory attendance: 14

### Total time of attendance for the module
- 56 h
inf208 - Microrobotics and Microsystems Technology

Module label: Microrobotics and Microsystems Technology
Module code: inf208
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Technische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Technische Informatik)
- Master's Programme Computing Science (Master) > Nicht Informatik

Responsible persons:
Fatikow, Sergej (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites
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

Methodological competence:
The students:
- discover interdisciplinary connections and links between scientific and technical fields of research and development
- learn technical abstraction of complex contexts

Social competence:
The students:
- solving problems partially as group
- present their solutions and approaches to the group

Self-competence:
The students:
- reflect their knowledge of technical computer science
- learn to expand on their professional competence independently

Module contents:
Ideas and problems of microrobotics and MST; applications; techniques of MST; silicon-based micromechanics; LIGA technology; microactuators: principles and examples (electrostatic, piezoelectric, magnetoostrictive, 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; micromechanism 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

Reader's advisory:
Essential:
Lecture notes

Recommended:


Secondary Literature (only available for some subareas):

- Elbel, Th.: Mikrosensorik, Vieweg, Wiesbaden, 1996
- Völklein, F. und Zetterer, Th.: Einführung in die Mikrosystemtechnik, Vieweg, Wiesbaden, 2000

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inf209 - Control Theory

Module label: Control Theory
Module code: inf209
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Technische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Technische Informatik)
- Master's Programme Computing Science (Master) > Nicht Informatik

Responsible persons:
- Fatikow, Sergej (Module responsibility)
- Hein, Andreas (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

Prerequisites:
- Module Differential Equations
- Module Basics Electrical Engineering

Skills to be acquired in this module:

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 stability 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

Module contents:
Basics; analog transfer elements: linear time invariant (LTI-) systems; simulation and modelling; 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

Reader's advisory:
- 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

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**Total time of attendance for the module** 56 h
inf210 - Signal and Image Processing

Module label: Signal and Image Processing
Module code: inf210
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Technische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Technische Informatik)
- Master's Programme Computing Science (Master) > Nicht Informatik

Responsible persons:
- Hein, Andreas (Module responsibility)
- Fränzle, Martin Georg (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

Prerequisites:

Skills to be acquired in this module:

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

Module contents:
- 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

Reader's advisory:

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

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| Total time of attendance for the module | 56 h |
inf402 - Graph Transformation Systems

- **Module label**: Graph Transformation Systems
- **Module code**: inf402
- **Credit points**: 6.0 KP
- **Workload**: 180 h

**Applicability of the module**
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Theoretische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodul (Theoretische Informatik)

**Responsible persons**
- Lehrende, Die im Modul (Authorized examiners)
- Lehrende, Die im Modul (Module responsibility)

**Prerequisites**

**Skills to be acquired in this module**
- Modelling of systems, introduction to graph transformation systems, sequential and parallel independence, termination and confluence.

**Professional competence**

- 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**

- Recognize graph transformation systems as a versatile tool for modelling in computer science

**Social competence**

- Work together in small groups to solve problems
- Present solutions to problems to groups of other students

**Self-competence**

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

**Module contents**

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.

**Reader's advisory**


**Links**

- **Language of instruction**: German
- **Duration (semesters)**: 1 Semester
- **Module frequency**: im 2-Jahres-Zyklus
- **Module capacity**: unlimited
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| Total time of attendance for the module | 56 h |
inf403 - Cryptology

Module label: Cryptology
Module code: inf403
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Theoretische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Theoretische Informatik)

Responsible persons:
Lehrenden, Die im Modul (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites:

Skills to be acquired in this module:
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

Module contents:
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

Reader's advisory:
Lecture notes; further literature will be announced in the lecture.
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**inf404 - Petri Nets**

**Module code**
inf404

**Credit points**
6.0 KP

**Workload**
180 h

**Applicability of the module**
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Theoretische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Theoretische Informatik)

**Responsible persons**
Lehrenden, Die im Modul (Authorized examiners)
Lehrenden, Die im Modul (Module responsibility)

**Prerequisites**

**Skills to be acquired in this module**
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 properties
- 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

**Module contents**
- 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.

**Reader's advisory**

**Links**

**Languages of instruction**
German, English

**Duration (semesters)**
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inf405 - Algorithmic Graph Theory

Module label Algorithmic Graph Theory
Module code inf405
Credit points 6.0 KP
Workload 180 h

Applicability of the module
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Theoretische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Theoretische Informatik)

Responsible persons
Lehrende, Die im Modul (Authorized examiners)
Lehrende, Die im Modul (Module responsibility)

Prerequisites

Skills to be acquired in this module
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

Module contents
A) Trees
B) Search Algorithms
C) Graph Coloring
D) Flows in Networks
E) Applications of Network Algorithms
F) Shortest Paths
G) Approximation Algorithms

Reader's advisory
A detailed bibliography is contained in the lecture notes of this module.
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inf406 - Laboratory Real-Time Systems

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**Applicability of the module**
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praktische Vertiefung (60 KP)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

**Responsible persons**
Olderog, Ernst-Rüdiger (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

**Prerequisites**
Theoretische Informatik I und II

**Skills to be acquired in this module**
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

**Module contents**
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.

**Reader's advisory**

**Links**
- Language of instruction: German
- Duration (semesters): 1 Semester
- Module frequency: unregelmäßi
- Module capacity: unlimited
- Modullevel / module level: AS (Akzentsetzung / Accentuation)
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inf407 - Program Verification

Module label  
Program Verification

Module code  
inf407

Credit points  
6.0 KP

Workload  
180 h

Applicability of the module
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Theoretische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Theoretische Informatik)

Responsible persons
Olderog, Ernst-Rüdiger (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module
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

Module contents
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.

Reader's advisory
essential:

Or the extended English version:
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**Total time of attendance for the module**: 56 h
**inf408 - Algorithms for Software Verification**

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**Applicability of the module**

- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Theoretische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Theoretische Informatik)

**Responsible persons**

Olderog, Ernst-Rüdiger (Module responsibility)

Lehrenden, Die im Modul (Authorized examiners)

**Prerequisites**

Skills to be acquired in this module

Algorithms are presented that enable 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

**Module contents**

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)

**Reader's advisory**

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

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| Vorkenntnisse / Previous knowledge | Grundveranstaltungen in Informatik und Mathematik |
| Examination                      | Time of examination | Type of examination |
| Final exam of module             | First week of lecture-free period | Written exam or oral exam |

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| Total time of attendance for the module | 56 h |
inf409 - Formal Languages

Module label: Formal Languages
Module code: inf409
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Theoretische Informatik (30 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Theoretische Informatik)

Responsible persons:
Lehrenden, Die im Modul (Authorized examiners)
Lehrenden, Die im Modul (Module responsibility)

Prerequisites:

Skills to be acquired in this module:
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 algorithms
- 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

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

Reader's advisory:

Links:
Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: im 2-Jahres-Zyklus
Module capacity: unlimited
Modullevel / module level: AS (Akzentsetzung / Accentuation)
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inf517 - Introduction to Energy Informatics

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**Applicability of the module**
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

**Responsible persons**
- Nieße, Astrid (Module responsibility)
- Lehrenden, Die im Modul (Module responsibility)

**Prerequisites**

**Skills to be acquired in this module**
- The students learn to identify the borders of their disciplinary background when going to the field. Additionally, they learn to identify research questions and how to approach them.
  - **Professional competence**
    - The students learn to identify the borders of their disciplinary background when going to the field. Additionally, they learn to identify research questions and how to approach them.
  - **Methodological competence**
    - The students will know how computer science methods can be applied to energy systems and energy research.
  - **Social competence**
    - The students discuss in an interdisciplinary context in an appreciative manner.
  - **Self-competence**

**Module contents**
- This module gives an overview about different topics in the field of energy informatics.

In the lecture, the role of computer science in the energy domain is presented on the base of different topics to illustrate the links between energy technology and management and computer science. Some examples are:
- Energy markets
- Network planning & operations management
- Demand side management and flexibility
- Virtual power plants

**Reader's advisory**

**Links**
https://elearning.uni-oldenburg.de/dispatch.php/search/module/index/9e704dec6675f3883775288a849ef867?stterm=inf517

**Language of instruction**
German

**Duration (semesters)**
1 Semester

**Module frequency**
unlimited

**Module level / module level**
BW (Bereichswahlimodul / Range selection)

**Modular / typ of module**
Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**
Grundlagenwissen im Bereich der Energietechnik bzw. der Informatik kann eingebracht werden, stellt aber keine Vorbedingung dar.

**Examination**

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**Course type**
Lecture

**SWS**
2

**Frequency**
SuSe or WiSe
| Workload attendance | 28 h |
inf521 - Medical Informatics

Module label: Medical Informatics
Module code: inf521
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Angewandte Informatik)

Responsible persons:
Kaspar, Mathias (Module responsibility)
Lehrende, Die im Modul (Authorized examiners)

Prerequisites:

Skills to be acquired in this module:
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)

Module contents:
- Medical informatics introduction / medical documentation
- Medical documentation / progression of disease - Healthcare information systems
- Terminology and classification / Medical controlling
- 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 - Roboticics, prosthetics

Reader's advisory:

Links:

Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Modulelevel / module level: AS (Akzentsetzung / Accentuation)
Modulart / typ of module: je nach Studiengang Pflicht oder Wahlpflicht
Lehr-/Lernform / Teaching/Learning method: V+Ü

Vorkenntnisse / Previous knowledge:

Examination:
- Time of examination
- Type of examination
Final exam of module:
- At the end of the lecture period
- Written or oral exam
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**Total time of attendance for the module** 56 h
### inf530 - Artificial Intelligence

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#### Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Angewandte Informatik)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich

#### Responsible persons
- Sauer, Jürgen (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

#### Prerequisites

#### Skills to be acquired in this module

**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 environment
- 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 distinct 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

#### Module contents

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

#### Reader's advisory

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**inf540 - Applications in Artificial Intelligence**

**Module label**  Applications in Artificial Intelligence

**Module code**  inf540

**Credit points**  6.0 KP

**Workload**  180 h

**Applicability of the module**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

**Responsible persons**
Sauer, Jürgen (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

**Prerequisites**

**Skills to be acquired in this module**

**Professional competence**
The students know about
- Construction and handling of robotics systems
- 3D orientation (SLAM – self orientation and mapping)
- Route Planning
- Route optimization and general optimization procedures
- Handling and testing of autonomous systems
- Handling of hardware
- Application of known libraries of machine perception
  - OpenCV
  - TensorFlow

**Methodological competence**
The students
- Discuss critical solution approaches and method selection
- Deepen programming skills
- Learn how to handle hardware systems

**Social competence**
The students
- Develop the solutions independently in small groups
- Evaluate their own solutions and compare them with those of your fellow students

**Self-competence**
The students
- Develop your own solution approaches
- Reflect other approaches
- Create your own project and timetables
- Recognize your own limits

**Module contents**
In the module "Applications of Artificial Intelligence" the students should gain practical experience in the field of artificial intelligence. The learning objectives should be developed by the students in working groups of 4-5 participants. Simple Robotics systems e.g. in the area of autonomous driving or software simulating AI methods will be developed

**Reader's advisory**
wissenschaftlichen Veröffentlichungen mit den Tags:
Autonomous drone, robotics, ai, deep drone racing
Siehe: https://scholar.google.de/scholar?hl=de&as_sdt=0%2C5&q=deep+drone+racing&btnG=

**Links**
https://www.iros2019.org/

**Language of instruction**
German

**Duration (semesters)**
1 Semester

**Module frequency**
unlimited

**Module level / module level**
AC (Aufbaucurriculum / Composition)

**Modulart / typ of module**
Wahlmodul / Opportunity

**Lehr-/Lernform / Teaching/Learning method**
VL mit selbstständigen Praktikumsteil

**Vorkenntnisse / Previous knowledge**
Einführung in die Künstliche Intelligenz (inf530)
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inf600 - Business Informatics I

Module label | Business Informatics I
Module code | inf600
Credit points | 6.0 KP
Workload | 180 h

Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Basiccurriculum
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlpflichtbereich
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Angewandte Informatik)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Pflichtbereich

Responsible persons
Sauer, Jürgen (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module
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 acquired knowledge

Module contents
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 focuses 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.

**Reader's advisory**

- Frank, Gronau (2002), Systemanalyse im Unternehmen Oldenbourg (Gebundene Ausgabe - Juni 2002)

**Links**

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**Total time of attendance for the module**

56 h
inf601 - Business Informatics II

Module label | Business Informatics II
---|---
Module code | inf601
Credit points | 6.0 KP
Workload | 180 h

Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaurriculum - Pflichtbereich
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlpflichtbereich
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Angewandte Informatik)

Responsible persons
Marx Gomez, Jorge (Module responsibility)

Prerequisites

Skills to be acquired in this module

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 Resource 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
- identify and learn the scope and central tasks of business process and environmental management (as excursion) and the significance for information management

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
- learn by practice advantages and disadvantages of different methods and can use them as part of the optimized IT strategy based on the acquired knowledge.

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

Self-competences
The Students:
accept criticism and understand it as a precondition for the further development of one's own actions

Module contents
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

Reader's advisory

- Heinrich, Stelzer (2011): Informationsmanagement - Grundlagen, Aufgaben, Methoden. Oldenbourg Verlag
- Krcmar (2015): Informationsmanagement. Springer Verlag

Links

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Vorkenntnisse / Previous knowledge

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Total time of attendance for the module: 56 h
inf603 - Planning and Simulation in Logistics

Module label: Planning and Simulation in Logistics
Module code: inf603
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Angewandte Informatik)

Responsible persons
Sauer, Jürgen (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module
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

Module contents
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.

Reader's advisory
- selected material on the simulation tool
- others will be announced in the lecture

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| **Total time of attendance for the module** | 56 h |
inf608 - eBusiness

Module label  eBusiness
Module code  inf608
Credit points  6.0 KP
Workload  180 h

Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum - Pflichtbereich
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Angewandte Informatik)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich

Responsible persons
Marx Gomez, Jorge (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module
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 companies 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

Module contents
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)

Reader's advisory


Links

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

Language of instruction

German

Duration (semesters)

1 Semester

Module frequency

jährlich

Module capacity

unlimited

Modullevel / module level

AS (Akzentsetzung / Accentuation)

Modulart / typ of module

je nach Studiengang Pflicht oder Wahlpflicht

Lehr-/Lernform / Teaching/Learning method

V+Ü

Vorkenntnisse / Previous knowledge

Examination

Time of examination

At the end of the lecture period

Type of examination

Written or oral exam

Course type

Comment

SWS

Frequency

Workload of compulsory attendance

Lecture

2

SuSe

28

Exercises

2

SuSe

28

Total time of attendance for the module

56 h
inf610 - Enterprise Architecture Management

Module label: Enterprise Architecture Management
Module code: inf610
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

Responsible persons:
- Sauer, Jürgen (Module responsibility)
- Lehrende, Die im Modul (Authorized examiners)

Prerequisites:
This module addresses basic elements of enterprise architectures and their management as well as concepts and methodologies used to describe and develop enterprise architectures.

Skills to be acquired in this module:

Professional competences:
The students:
- Have knowledge of components of enterprise architectures and used enterprise architecture frameworks
- Choose Enterprise Architecture Frameworks based on requirements and needs

Methodological competences:
The students:
- Identify business goals and describe the resulting business processes
- Design fitting IT-architectures
- Analyze and harmonize different architectures into an enterprise architecture

Social competences:
The students:
- Extend their ability to work as a team
- Create, present and discuss exercises using EAM methods
- Identify and solve problems and challenges in the harmonization of enterprise architectures using EAM methods

Self-competences:
The students:
- Reflect their actions in identifying possible solutions using EAM methods
- Learn methodical and scientific procedures in the processing of accompanying exercises
- Develop the ability to look at different aspects of systems in a superordinate and common (company) context, including the methods of EAM.

Module contents:
Enterprise Architecture Management (EAM) is an interdisciplinary approach for the integration of information systems in enterprises and enterprise-like structures to support their business objectives and business processes. EAM addresses the harmonization of these aspects on the basis of the respective IT-architecture and business architectures to a holistic enterprise architecture. The description and development of such architectures is structured by Enterprise Architecture Frameworks like TOGAF and ZACHMAN. In general, the following architectural perspectives are taken into account: business architecture, information and data architecture, application architecture and technology architecture.

Reader's advisory:
- Strategisches Management der IT-Landschaft Ein praktischer Leitfaden für das Enterprise Architecture Management – Inge Hanschke - 978-3-446-43509-4

Links:
Language of instruction: German
Duration (semesters): 1 Semester
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inf612 - Re-engineering of business processes

Module label | Re-engineering of business processes
---|---
Module code | inf612
Credit points | 6.0 KP
Workload | 180 h

**Applicability of the module**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

**Responsible persons**
Marx Gomez, Jorge (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

**Skills to be acquired in this module**

- **Professional Competence**
  - are able to classify, explain and model business processes.
  - are able to explain business process management and re-engineering of business processes as well as their differences.
  - have practical knowledge in the field of business process modeling, partly based on scenarios from the topics industry 4.0, sustainability and data science

- **Methological Competence**
  - learn the pros and cons of different methods by applying them to model business processes.

- **Social Competence**
  - are supposed to work in teams and therefore have to identify working packages and have to take on responsibility for the jobs assigned to them.
  - present and discuss their own results with the team and the other members of the course

- **Self-competence**
  - learn about their own limitations and learn to accept criticism in order to strengthen their own abilities.

**Module contents**

This course starts with an introduction to business process modeling with a focus on event-driven process chains and BPMN. Second, business process management will be discussed, focusing on discovering, modeling, documenting, implementing, managing and optimizing business processes. Third, business process reengineering will be elaborated, with a focus on driving forces such as industry 4.0, sustainability and data science.

The course will implement different research oriented aspects, e.g. the students will elaborate a number of real world examples and present their results within the course.

**Reader's advisory**


**Links**

https://uol.de/vlba/

**Language of instruction**

German

**Duration (semesters)**

1 Semester

**Module frequency**

annually in winterterm

**Module capacity**

30

**Module level / module level**

AS (Akzentsetzung / Accentuation)

**Modulart / typ of module**

Wahlmodul / Opportunity

**Lehr-/Lernform / Teaching/Learning method**

V+Ü

**Vorkenntnisse / Previous knowledge**

Wirtschaftsinformatik II
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**Total time of attendance for the module** 56 h
inf700 - Computer Science Education I

Module label: Computer Science Education I
Module code: inf700
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule (60 KP)
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Basismodule

Responsible persons:
- Diethelm, Ira (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module:

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

Module contents
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.

Reader's advisory

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**Examination**
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- Type of examination: Oral exam

**Final exam of module**

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**Total time of attendance for the module**: 56 h
inf803 - Special Topics in Computer Science I

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**Applicability of the module**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praktische Vertiefung (60 KP)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

**Responsible persons**
Lehrenden, Die im Modul (Authorized examiners)

**Prerequisites**

**Skills to be acquired in this module**
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:
- Plan their informatical actions independently

**Module contents**
According to the assigned task

**Links**

**Languages of instruction**
German, English

**Duration (semesters)**
1 Semester

**Module frequency**
halbjährlich

**Module capacity**
unlimited

**Modullevel / module level**
ASI (Akzentsetzung / Accentuation)

**Modulart / typ of module**
je nach Studiengang Pflicht oder Wahlpflicht

**Lehr-/Lernform / Teaching/Learning method**
2 Veranstaltungen aus V, Ü, S, P, PR

**Vorkenntnisse / Previous knowledge**

**Examination**

**Time of examination**

**Type of examination**
Exercises or presentation or oral or written exam

**Course type**
Course selection
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inf804 - Special Topics in Computer Science II

Module label  Special Topics in Computer Science II

Module code  inf804

Credit points  6.0 KP

Workload  180 h

Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praktische Vertiefung (60 KP)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

Responsible persons
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module
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:

- Plan their informatical actions independently

Module contents
According to the assigned task

Reader's advisory
According to the assigned task

Links

Languages of instruction
German, English

Duration (semesters)
1 Semester

Module frequency
halbjährlich

Module capacity
unlimited

Modullevel / module level
AS (Akzentsetzung / Accentuation)

Modulart / typ of module
je nach Studiengang Pflicht oder Wahlpflicht

Lehr-/Lernform / Teaching/Learning method
2 Veranstaltungen aus V, Ü, S, P, PR

Vorkenntnisse / Previous knowledge

Examination

Time of examination

Type of examination

Final exam of module

Exercises or presentation or oral exam or written exam

Course type
Course selection
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inf806 - Special Topics in Computer Science IV

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• Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Pflichtmodule |
| Responsible persons | Lehrenden, Die im Modul (Authorized examiners) |
| Prerequisites       | This module integrates current computer science developments within appropriate study courses. |
| Skills to be acquired in this module | 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:  
• Plan their informatical actions independently |
| Module contents     | According to the assigned task          |
| Reader's advisory   | According to the assigned task          |
| Languages of instruction | German, English                        |
| Duration (semesters)| 1 Semester                              |
| Module frequency    | halbjährlich                            |
| Module capacity     | unlimited                               |
| Modulelevel / module level | AS (Akzentsetzung / Accentuation)  
je nach Studiengang Pflicht oder Wahlpflicht |
| Lehr-/Lernform / Teaching/Learning method | 2 Veranstaltungen aus V, Ü, S, P, PR |
| Vorkenntnisse / Previous knowledge | Examination  
Time of examination  
Type of examination  
Final exam of module  
Exercises or presentation or oral exam or written exam  
Course type  
Course selection  
SWS | 4 |

123 / 167
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inf807 - Special Topics in Computer Science V

Module label: Special Topics in Computer Science V
Module code: inf807
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

Responsible persons:
Lehrende, Die im Modul (Authorized examiners)

Prerequisites:

Skills to be acquired in this module:
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: - Plan their informational actions independently

Module contents:
According to the assigned task

Reader's advisory:
According to the assigned task

Links:
Languages of instruction: German, English
Duration (semesters): 1 Semester
Module frequency: halbjährlich
Module capacity: unlimited
Modulelevel / module level: AS (Akzentsetzung / Accentuation)
Modulart / typ of module: je nach Studiengang Pflicht oder Wahlpflicht
Lehr-/Lernform / Teaching/Learning method: 2 Veranstaltungen aus V, Ü, S, P, PR

Vorkenntnisse / Previous knowledge:

Examination:
Time of examination:
Type of examination:
Final exam of module:
Exercises or presentation or oral exam or written exam

Course type:
Course selection

SWS: 4
Frequency: SuSe or WiSe
Workload attendance: 56 h
inf808 - Current Topics in Computer Science

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**Applicability of the module**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praktische Vertiefung (60 KP)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

**Responsible persons**
Lehrenden, Die im Modul (Authorized examiners)

**Prerequisites**

**Skills to be acquired in this module**
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 limits 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
- Reflect on a scientific topic and write a scientific seminar paper under guidance and present their findings

**Social competence**
The students:
- Use presentation methods purposefully

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

**Module contents**
According to the assigned task

**Reader's advisory**
According to the assigned task

**Links**

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**Vorkenntnisse / Previous knowledge**

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**inf809 - Current Topics in Computer Science II**

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| Applicability of the module         | Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik  
                                        Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik |
| Responsible persons                 | Theel, Oliver (Module responsibility)  
                                        Hahn, Axel (Module responsibility)  
                                        der Informatik, Lehrende (Authorized examiners) |
| Prerequisites                       |                                        |
| Skills to be acquired in this module| 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 limits 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
  - reflect on a scientific topic and write a scientific seminar paper under guidance and present their findings

**Social competence**

- The students use presentation methods purposefully

**Self competence**

- The students
  - plan their informatical actions independently
  - reflect their contributions critically and discuss them with users and experts
  - collect and update their knowledge independently

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**Applicability of the module**

- Bachelor's Programme Biology (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Business Administration and Law (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Business Informatics (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Chemistry (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Comparative and European Law (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Computing Science (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Economics and Business Administration (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Bachelor's Programme Education (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Engineering Physics (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Environmental Science (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Intercultural Education and Counselling (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Mathematics (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Physics (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Physics, Engineering and Medicine (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Social Studies (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Bachelor's Programme Sustainability Economics (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme Art and Media (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme Biology (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme Chemistry (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme Dutch Linguistics and Literary Studies (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme Economic Education (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme English Studies (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme Gender Studies (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme General Education (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme German Studies (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme History (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme Material Culture: Textiles (Bachelor) > Praxismodule für Studierende mit außerschulpischem Berufsziel
- Dual-Subject Bachelor's Programme Mathematics (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Music (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Philosophy / Values and Norms (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Physics (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Politics-Economics (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Protestant Theology and Religious Education (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Slavic Studies (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Social Studies (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Sport Science (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Technology (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Master's Programme Computing Science (Master) > Nicht Informatik

**Responsible persons**

Sauer, Jürgen (Authorized examiners)

Lehrenden, Die im Modul (Authorized examiners)

Sauer, Jürgen (Module responsibility)

**Prerequisites**

**Skills to be acquired in this module**

- 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.
- They 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

**Module contents**

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

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inf853 - Application Fields of Computer Science I

### Module label
Application Fields of Computer Science I

### Module code
inf853

### Credit points
6.0 KP

### Workload
180 h

### Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

### Responsible persons
Lehrende, Die im Modul (Authorized examiners)

### Prerequisites

### Skills to be acquired in this module
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 informatical actions independently
- Reflect their contributions critically and discuss them with users and experts

### Module contents
According to the assigned task

### Reader's advisory
According to the assigned task

### Languages of instruction
German, English

### Duration (semesters)
1 Semester

### Module frequency
unregelmäßig

### Module capacity
unlimited

### Modullevel / module level
AS (Akzentsetzung / Accentuation)

### Modulart / typ of module
je nach Studiengang Pflicht oder Wahlpflicht

### Lehr-/Lernform / Teaching/Learning method
2 Veranstaltungen aus V, Ü, S, P, PR

### Vorkenntnisse / Previous knowledge

### Examination

#### Time of examination
Type of examination
- Final exam of module: Exercises or presentation or oral exam or written exam

### Course type
Course selection

### SWS
4

### Frequency
SuSe or WiSe

### Workload attendance
56 h
Inf854 - Application Fields of Computer Science II

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| Applicability of the module           | • Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik  
• Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik |
| Responsible persons                   | Lehrenden, Die im Modul (Authorized examiners) |
| Prerequisites                         |                                          |
| Skills to be acquired in this module  | 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 informatical actions independently |
|                                       | • Reflect their contributions critically and discuss them with users and experts |
| Module contents                       | According to the assigned task           |
| Reader's advisory                     | According to the assigned task           |
| Links                                 |                                          |
| Languages of instruction              | German, English                          |
| Duration (semesters)                  | 1 Semester                               |
| Module frequency                      | halbjährlich                             |
| Module capacity                       | unlimited                                |
| Modulelevel / module level            | AS (Akzentsetzung / Accentuation)        |
| Modulart / typ of module              | je nach Studiengang Pflicht oder Wahlpflicht |
| Lehr-/Lernform / Teaching/Learning method |                                         |
| Vorkenntnisse / Previous knowledge    | 2 Veranstaltungen aus V, Ü, S, P, PR     |
| Examination                           |                                          |
| Final exam of module                  | Exercises or presentation or oral exam or written exam |
| Course type                           | Course selection                        |
| SWS                                   | 4                                        |
| Frequency                             | SuSe or WiSe                             |
| Workload attendance                   | 56 h                                     |
inf855 - Application Fields of Computer Science III

Module label: Application Fields of Computer Science III
Module code: inf855
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsheader: Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

Responsible persons:
Lehrende, Die im Modul (Authorized examiners)

Prerequisites:
The students are introduced into a different subject area and its methods.

Skills to be acquired in this module:
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 informatical actions independently
- Reflect their contributions critically and discuss them with users and experts

Module contents:
According to the assigned task

Reader's advisory:
According to the assigned task

Links:
Languages of instruction: German, English
Duration (semesters): 1 Semester
Module frequency: halbjährlich
Module capacity: unlimited
Modulelevel / module level: AS (Akzentsetzung / Accentuation)
Modulart / typ of module: je nach Studiengang Pflicht oder Wahlpflicht
Lehr-/Lernform / Teaching/Learning method: 2 Veranstaltungen aus V, Ü, S, P, PR

Vorkenntnisse / Previous knowledge:

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Course type:
Course selection

SWS:
4
Frequency:
SuSe and WiSe

Workload attendance:
56 h
inf856 - Application Fields of Computer Science IV

Module label: Application Fields of Computer Science IV
Module code: inf856
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

Responsible persons:
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites:

Skills to be acquired in this module:
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 informatical actions independently
- Reflect their contributions critically and discuss them with users and experts

Module contents:
According to the assigned task

Readers advisory:
According to the assigned task

Links:
Languages of instruction: German, English
Duration (semesters): 1 Semester
Module frequency: halbjährlich
Module capacity: unlimited
Modulelevel / module level: AS (Akzentsetzung / Accentuation)
Modulart / typ of module: je nach Studiengang Pflicht oder Wahlpflicht
Lehr-/Lernform / Teaching/Learning method: 2 Veranstaltungen aus V, Ü, S, P, PR

Vorkenntnisse / Previous knowledge:

Examination:
Type of examination: Exercises or presentation or oral exam or written exam

Course type:
Course selection

SWS:
4
Frequency:
SuSe and WiSe

Workload attendance:
56 h
**inf857 - Application Fields of Computer Science V**

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**Applicability of the module**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

**Responsible persons**
Lehrenden, Die im Modul (Authorized examiners)

**Prerequisites**

**Skills to be acquired in this module**
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 informatical actions independently
- Reflect their contributions critically and discuss them with users and experts

**Module contents**
According to the assigned task

**Reader's advisory**
According to the assigned task

**Links**

**Languages of instruction**
German, English

**Duration (semesters)**
1 Semester

**Module frequency**
halbjährlich

**Module capacity**
unlimited

**Modullevel / module level**
AS (Akzentsetzung / Accentuation)

**Modulart / typ of module**
je nach Studiengang Pflicht oder Wahlpflicht

**Lehr-/Lernform / Teaching/Learning method**
2 Veranstaltungen aus V, Ü, S, P, PR

**Vorkenntnisse / Previous knowledge**

**Examination**

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**Course type**
Course selection

**SWS**
4

**Frequency**
WiSe

**Workload attendance**
56 h
inf609 - Business Process Management

Module label: Business Process Management
Module code: inf609
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlpflicht Informatik

Responsible persons:
Sauer, Jürgen (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites:
Wirtschaftsinformatik I

Skills to be acquired in this module:
Teaching of the basics of process management. They understand the importance of models for the analysis and design of business processes.

Professional competence:
After attending the module, students will be able to model and classify business processes and to optimize them for given goals.

Methodological competence:
The students can map and evaluate processes in structure models, process chains, and costing models.

Social competence:
The students recognize the importance of employee empowerment for simple, flexible management of processes and design processes on case studies interactively with the intended process participants.

Self competence:
The students are able to independently acquire knowledge and skills within the framework of an eLearning module.

Module contents:
- The basics of process management
- Strategic Process Management / Strategic Process Planning
- Process design (procedure, actual and target modeling)
- Process implementation (process types, process integration using the example SAP ERP)
- Quality and Change Management (ISO 9000, Total Quality Management)
- Process Controlling
- Process management in service companies

Reader's advisory:
- Stöger, R. (2009); Prozessmanagement, 2 Aufl., Stuttgart

Links:
Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: Winterterm and Summerterm
Module capacity: unlimited
Reference text: Es handelt sich um ein e-Learning Modul, welches von der Universität Osnabrück als Lehrimport angeboten wird (ATLANTIS-Projekt)
Modulelevel / module level: AM (Aufbaumodul / Composition)
Moduleart / typ of module: je nach Studiengang Pflicht oder Wahlpflicht
Lehr-/Lernform / Teaching/Learning method: V+Ü
Vorkenntnisse / Previous knowledge:
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inf801 - Research Seminar in Computer Science

**Module label** | Research Seminar in Computer Science
---|---
**Module code** | inf801
**Credit points** | 3.0 KP
**Workload** | 90 h

**Applicability of the module**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

**Responsible persons**
- Nieße, Astrid (Module responsibility)
- Sauer, Jürgen (Module responsibility)
- Lehrenden, Die im Modul (Authorized examiners)

**Prerequisites**

**Skills to be acquired in this module**
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 informatical actions independently
- Reflect their contributions critically and discuss them with users and experts
- Collect and update their knowledge independently

**Module contents**
according to the assigned task

**Reader's advisory**
according to the assigned task

**Language of instruction** | German
**Duration (semesters)** | 1 Semester
**Module frequency** | halbjährlich
**Module capacity** | unlimited

**Modullevel / module level**

**Modulart / typ of module** | S

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
<thead>
<tr>
<th>Time of examination</th>
<th>Type of examination</th>
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<tbody>
<tr>
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<td>Presentation</td>
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</table>

**Course type** | Seminar

**SWS** | 2
**Frequency**

**Workload attendance** | 28 h
### inf860 - Study Abroad

<table>
<thead>
<tr>
<th><strong>Module label</strong></th>
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<tbody>
<tr>
<td><strong>Module code</strong></td>
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</tr>
<tr>
<td><strong>Credit points</strong></td>
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</tr>
<tr>
<td><strong>Workload</strong></td>
<td>180 h</td>
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</table>
| **Applicability of the module** | Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik  
|                        | Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik  
|                        | Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft |

**Responsible persons**

**Prerequisites**

**Skills to be acquired in this module**

**Module contents**

**Reader's advisory**

**Links**

**Language of instruction** | German |

**Duration (semesters)** | 1 Semester |

**Module frequency**

**Module capacity** | unlimited |

**Module level / module level** | EB (Ergänzungsbereich / Complementary) |

**Moduleart / typ of module** | Wahlmodul / Opportunity |

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**

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<th>Type of examination</th>
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<td><strong>Final exam of module</strong></td>
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<td>Vorgabe der ausländischen Hochschule</td>
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**Course type**

<table>
<thead>
<tr>
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<tbody>
<tr>
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<td>Vorgabe der ausländischen Hochschule</td>
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</table>

**SWS** | 4 |

**Frequency** | SuSe or WiSe |

**Workload attendance** | 56 h |
inf861 - Study Abroad

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<tr>
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| Applicability of the module |  • Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik  
|                     |  • Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik  
|                     |  • Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft |

Responsible persons

Prerequisites

Skills to be acquired in this module

Module contents

Reader's advisory

Links

Language of instruction | German |
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<td>Duration (semesters)</td>
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Module frequency

Module capacity | unlimited |

Modullevel / module level | EB (Ergänzungsbereich / Complementary) |

Modulart / typ of module | Wahlmodul / Opportunity |

Lehr-/Lernform / Teaching/Learning method

Vorkenntnisse / Previous knowledge

Examination | Time of examination | Type of examination
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</table>

Course type

Course selection (Vorgabe der ausländischen Hochschule)

SWS | 6 |

Frequency | SuSe or WiSe |

Workload attendance | 84 h |
Formal Methods are mathematically well-defined languages for the modelling of systems. The students get to know different formal methods and learn about their usage for the modelling and analysis of systems. For a given task, they choose adequate formalisms and their corresponding analysis technique, apply these and interpret the outcome of the analysis.

**Professional competence**
The students:
- apply mathematical formalisms to the modelling of systems,
- choose an adequate modelling formalism for some given task,
- formally specify systems,
- choose suitable analysis techniques,
- interpret results of analysis runs.

**Methodological competence**
The students:
- carry out formal correctness proofs,
- employ analysis tools,
- define the semantics of formal specification languages.

**Social competence**
The students:
- work in groups on tasks and explain solutions to each other,

- discuss the advantages and disadvantages of modelling formalisms.

**Self-competence**
The students:
- organise themselves for the work in the module.

- Short recap of predicate logic, use of predicate logic in program verification,
- Petri nets,
- Process algebra CCS,
- Timed automata,
- Z.
<table>
<thead>
<tr>
<th>Modullevel / module level</th>
<th>MM (Mastermodul / Master module)</th>
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<tbody>
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<td>Wahlpflicht / Elective</td>
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<td>Lehr-/Lernform / Teaching/Learning method</td>
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<table>
<thead>
<tr>
<th>Vorkenntnisse / Previous knowledge</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>Time of examination</td>
</tr>
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<td>Weekly assignments, oral examination at the end</td>
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<table>
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<th>Comment</th>
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<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>SuSe or WiSe</td>
<td>28</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>2</td>
<td>SuSe or WiSe</td>
<td>28</td>
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**Total time of attendance for the module** 56 h
Wahlbereich Informatik, Kultur und Gesellschaft

inf700 - Computer Science Education I

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Applicability of the module

- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule (60 KP)
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Basismodule

Responsible persons

Diethelm, Ira (Module responsibility)
Lehrenden, Die im Modul (Authorized examiners)

Prerequisites

Skills to be acquired in this module

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

Module contents

- 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.

Reader's advisory
Links

Language of instruction | German
Duration (semesters) | 1 Semester
Module frequency | jährlich
Module capacity | unlimited
Modullevel / module level | AS (Akzentsetzung / Accentuation)
Modulart / typ of module | je nach Studiengang Pflicht oder Wahlpflicht
Lehr-/Lernform / Teaching/Learning method | V+Ü

Vorkenntnisse / Previous knowledge | Fachliche Grundkenntnisse der Informatik

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<td>Oral exam</td>
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<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>Lecture</td>
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<td>Exercises</td>
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Total time of attendance for the module | 56 h
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<tr>
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</table>

**Applicability of the module**

- Bachelor's Programme Biology (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Business Administration and Law (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Business Informatics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Chemistry (Bachelor) > Säule "Überfachliche Professionalisierung" more...
- Bachelor's Programme Comparative and European Law (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Computing Science (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Economics and Business Administration (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Bachelor's Programme Education (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Engineering Physics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Environmental Science (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Intercultural Education and Counselling (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Mathematics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Mathematics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Physics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Physics, Engineering and Medicine (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Social Studies (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Sustainability Economics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Art and Media (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Biology (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Business Administration and Law (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Chemistry (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Dutch Linguistics and Literary Studies (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Elementary Mathematics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme English Studies (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Gender Studies (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme General Education (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme History (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Material Culture: Textiles (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Mathematics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Music (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Philosophy / Values and Norms (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Politics-Economics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Protestant Theology and Religious Education (Bachelor) > Säule...
"Überfachliche Professionalisierung"

- Dual-Subject Bachelor's Programme Slavic Studies (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Social Studies (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Special Needs Education (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Sport Science (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Technology (Bachelor) > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft (Bachelor) > Säule "Überfachliche Professionalisierung"
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Pflichtmodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Recht und Gesellschaft

Responsible persons

Lehrenden, Die im Modul (Authorized examiners)
Lehrenden, Die im Modul (Module responsibility)

Prerequisites

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

Module contents

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

Reader's advisory
- See reference books Informatik und Gesellschaft in BIS.
  - H. Klaeren u.a., (Eds.), 1999: Tübinger Studientexte Informatik und Gesellschaft. Universität Tübingen.

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

Language of instruction
- German

Duration (semesters)
- 1 Semester

Module frequency
- jährlich

Module capacity
- unlimited

Reference text
- The topics for the teams are assigned during the first week of the semester

Modulart / typ of module
- Ergänzung/Professionalisierung

Lehr-/Lernform / Teaching/Learning method
- S+P

Previous knowledge

<table>
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<th>Time of examination</th>
<th>Type of examination</th>
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<tbody>
<tr>
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<td>During semester and at the end</td>
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Course type | Comment | SWS | Frequency | Workload of compulsory attendance |
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<td>Practical training</td>
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Total time of attendance for the module
- 56 h
inf860 - Study Abroad

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<tr>
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<tr>
<td>Workload</td>
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| Applicability of the module  | • Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik  
  • Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik  
  • Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft |

| Responsible persons          |                                        |
| Prerequisites                |                                        |

| Skills to be acquired in this module |                                        |
| Module contents               |                                        |
| Reader's advisory             |                                        |
| Links                         |                                        |
| Language of instruction       | German                                 |
| Duration (semesters)          | 1 Semester                             |
| Module frequency              |                                        |
| Module capacity               | unlimited                              |
| Modullevel / module level     | EB (Ergänzungsbereich / Complementary) |
| Modulart / typ of module      | Wahlmodul / Opportunity                |
| Lehr-/Lernform / Teaching/Learning method |                                        |

| Vorkenntnisse / Previous knowledge |                                        |
| Examination                      | Time of examination                   |
| Final exam of module             | Type of examination                   |
| Course type                      | Vorgabe der ausländischen Hochschule  |
| Time of examination              |                                        |
| Type of examination              |                                        |
| Course type                      | Course selection (Vorgabe der ausländischen Hochschule) |
| Final exam of module             |                                        |
| Examination                      |                                        |
| Time of examination              |                                        |
| Type of examination              |                                        |
| Course type                      | Course selection (Vorgabe der ausländischen Hochschule) |
| Frequency                        | SuSe or WiSe                           |
| Workload attendance              | 56 h                                   |

| SWS                             | 4                                      |
| Frequency                       | SuSe or WiSe                           |
| Workload attendance             | 56 h                                   |
### inf861 - Study Abroad

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#### Applicability of the module

- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft

#### Responsible persons

#### Prerequisites

#### Skills to be acquired in this module

#### Module contents

#### Reader's advisory

#### Links

#### Language of instruction

- German

#### Duration (semesters)

- 1 Semester

#### Module frequency

#### Module capacity

- unlimited

#### Modullevel / module level

- EB (Ergänzungsbereich / Complementary)

#### Modulart / typ of module

- Wahlmodul / Opportunity

#### Lehr-/Lernform / Teaching/Learning method

#### Vorkenntnisse / Previous knowledge

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<th>Time of examination</th>
<th>Type of examination</th>
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<tbody>
<tr>
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<td>Vorgabe der ausländischen Hochschule</td>
</tr>
</tbody>
</table>

#### Course type

- Course selection (Vorgabe der ausländischen Hochschule)

#### SWS

- 6

#### Frequency

- SuSe or WiSe

#### Workload attendance

- 84 h
## wir041 - Introduction to economics

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<tr>
<td><strong>Applicability of the module</strong></td>
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<tr>
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<td>Bachelor's Programme Business Informatics (Bachelor) &gt; Wahlbereich Informatik, Kultur und Gesellschaft</td>
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<td>Bachelor's Programme Economics and Business Administration (Bachelor) &gt; Basismodule</td>
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<td>Bachelor's Programme Mathematics (Bachelor) &gt; Nebenfachmodule</td>
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<tr>
<td>Bachelor's Programme Sustainability Economics (Bachelor) &gt; Grundlagen-/Basismodule</td>
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<tr>
<td>Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) &gt; Basismodule</td>
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<tr>
<td>Master's Programme Business Informatics (Master) &gt; Module der Wirtschafts- und Rechtswissenschaften (Master)</td>
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</tbody>
</table>

### Responsible persons

- Rahmeier Seyffarth, Anelise (Module counselling)
- Böhringer, Christoph (Module responsibility)

### Prerequisites

none

### Skills to be acquired in this module

- be aware of the fundamental principles of economics
- be able to approach basic questions of economic policy by applying concise economic reasoning and graphical intuition.

### Module contents

The course introduces students to economic thinking and gives an elementary overview of the fundamental themes in economics. Key causal relationships will be verbally, analytically and graphically elucidated and underpinned with real-world examples.

Main contents:

- Introduction to economic thinking;
- Explanation of basic concepts of economic theory;
- Economic cycle and national product;
- Interdependence and trade;
- Functioning and efficiency of markets;
- Market failures and government activity;
- Firms behavior in markets with diverse structures;
- Foundations of game theory.

### Reader's advisory


### Links

- [http://www.vwl.uni-oldenburg.de/](http://www.vwl.uni-oldenburg.de/)

### Language of instruction

German

### Duration (semesters)

1 Semester

### Module frequency

jährlich

### Module capacity

unlimited

### Reference text

The module consists of lectures and tutorials. The contents of the course will be taught in the lecture. The tutorial sessions are aimed at solving problem sets or exercises to deepen students understanding. Lecture notes and other relevant materials will be uploaded to the learning management system (Stud IP).

### Modullevel / module level

---

### Modulart / typ of module

je nach Studiengang Pflicht oder Wahlpflicht

### Lehr-/Lernform / Teaching/Learning method
### Vorkenntnisse / Previous knowledge

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tr>
<td>Final exam of module</td>
<td>end of semester</td>
<td>written exam; voluntary contributions that improve grades may undertaken as ‘portfolio-presentations’ during tutorials</td>
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**Total time of attendance for the module**  
56 h
**wir070 - Principles of Marketing**

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<tr>
<td>Bachelor's Programme Business Informatics (Bachelor) &gt; Akzentsetzungsbereich Wirtschaftswissenschaften</td>
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<tr>
<td>Bachelor's Programme Business Informatics (Bachelor) &gt; Wahlbereich Informatik, Kultur und Gesellschaft</td>
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<tr>
<td>Bachelor's Programme Computing Science (Bachelor) &gt; Wahlbereich Informatik, Kultur und Gesellschaft</td>
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<tr>
<td>Bachelor's Programme Economics and Business Administration (Bachelor) &gt; Aufbaumodule</td>
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<tr>
<td>Bachelor's Programme Sustainability Economics (Bachelor) &gt; Wahlzielbereich</td>
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<td>Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) &gt; Aufbaumodule</td>
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<tr>
<td>Master of Education Programme (Vocational and Business Education) Economics and Business Administration (Master of Education) &gt; Mastermodule</td>
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<tr>
<td>Master's Programme Business Informatics (Master) &gt; Module der Wirtschafts- und Rechtswissenschaften (Master)</td>
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<tr>
<td>Responsible persons</td>
<td></td>
</tr>
<tr>
<td>Raabe, Thorsten (Module responsibility)</td>
<td></td>
</tr>
<tr>
<td>Lehrenden, Die im Modul (Authorized examiners)</td>
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<tr>
<td>Prerequisites</td>
<td>keine</td>
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<tr>
<td>Skills to be acquired in this module</td>
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<tr>
<td>Upon completion of the module, students will be able to:</td>
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</tr>
<tr>
<td>• recognize and provide solutions to challenges in market-oriented business management</td>
<td></td>
</tr>
<tr>
<td>• reflect on market-oriented business management with regard to practise, as well as related societal and ethical implications</td>
<td></td>
</tr>
<tr>
<td>• actively participate in scholarly marketing discourse</td>
<td></td>
</tr>
<tr>
<td>• build their own capacities to acquire knowledge and skills within the discipline</td>
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<tr>
<td>Module contents</td>
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<tr>
<td>The module focuses on the fundamentals of marketing in the sense of market-oriented management by linking philosophy and theoretical connections, as well as the necessary analytical and methodical knowledge with concrete case studies.</td>
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<tr>
<td>Reader's advisory</td>
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<td><a href="http://www.uni-oldenburg.de/marketing">www.uni-oldenburg.de/marketing</a></td>
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<td>Module frequency</td>
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<td>Module capacity</td>
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<td>Modullevel / module level</td>
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<td>written exam; voluntary contributions that improve grades may undertaken as 'portfolio-presentations' during tutorials</td>
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<td>SWS</td>
<td>Frequency</td>
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<td>Workload of compulsory attendance</td>
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<td>Seminar and tutorial</td>
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<td>WiSe</td>
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<tr>
<td>end of term</td>
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wir090 - Human Resource Management

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Applicability of the module

- Bachelor's Programme Business Administration and Law (Bachelor) > Aufbaubereich Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Economics and Business Administration (Bachelor) > Akzentsetzungsmoduls more...
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlpflichtbereich
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > Aufbaumodule
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > Schwerpunkt Management und Ökonomie
- Master of Education Programme (Vocational and Business Education) Economics and Business Administration (Master of Education) > Mastermodule
- Master's Programme Business Informatics (Master) > Module der Wirtschafts- und Rechtswissenschaften (Master)

Responsible persons

Junker-Michel, Mareike (Module counselling)
Breisig, Thomas (Module counselling)
Lehrenden, Die im Modul (Authorized examiners)
Breisig, Thomas (Module responsibility)

Prerequisites

keine

Skills to be acquired in this module

Upon completion of the module (two complementary lectures), students will be able to:

- understand the complex issues, challenges and fields of action in organisational Human Resource (HR) Management;
- analyse, interpret and manage HR issues within heterogeneous fields of stakeholders and environments;
- effectively analyse and apply HR instruments according to the specific practical context;
- develop skills to self-reflection by dealing with theoretical as well as practical issues in HR Management and are able to press their point within the scientific discussion;
- are able to locate a specific research question within the scientific discussion in the field of Human Resource Management and to interlink, reflect and evaluate it accordingly.

By attending the non-compulsory tutorials and participating in lecture discussions, students can develop their own position on the inter-linkages between theoretical approaches and practical courses of action. Students will thus be able to identify problems, analyse them critically, and develop solutions. As they have the opportunity to work in small groups within the tutorials and to participate during lecture discussions, students may also learn to handle different points of view and discuss constructively. Overall they will be prepared for the specific requirements faced in the field of HR Management.

Module contents

Students develop theoretical as well as practical insights into the backgrounds and specific characteristics of “Human Resource” Management, in particular the following:
- origins and theoretical basis
- development and framework requirements
- workforce planning
- recruitment and selection
- work organisation
- working time organisation
- leadership
- performance reviews
- training and development
- compensation
- staff reduction

Reader's advisory

Further literature will be announced during the semester according to the particular lecture/seminar content.

<table>
<thead>
<tr>
<th>Links</th>
<th><a href="http://www.uol.de/orgpers">www.uol.de/orgpers</a></th>
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</thead>
<tbody>
<tr>
<td>Language of instruction</td>
<td>German</td>
</tr>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
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<td>Module frequency</td>
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<td>Module capacity</td>
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<tr>
<td>Modullevel / module level</td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
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<td>Modulart / type of module</td>
<td>Vorlesung</td>
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<tr>
<td>Lehr-/Lernform / Teaching/Learning method</td>
<td>Praktische Erfahrungen im Personalbereich; Grundkenntnisse der Betriebswirtschaftslehre</td>
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<td>WiSe</td>
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Total time of attendance for the module 84 h
## wir160 - Entrepreneurship

<table>
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<tr>
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<tr>
<td>Module code</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
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<td>Workload</td>
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### Applicability of the module

- Bachelor's Programme Business Administration and Law (Bachelor) > Aufbaubereich Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Betriebswirtschaftslehre
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlpflichtbereich
- Master of Education Programme (Vocational and Business Education) Economics and Business Administration (Master of Education) > Mastermodule
- Master's Programme Business Informatics (Master) > Module der Wirtschafts- und Rechtswissenschaften (Master)
- Master's Programme Computing Science (Master) > Nicht Informatik

### Responsible persons

Lehrenden, Die im Modul (Authorized examiners)

Nicolai, Alexander (Module responsibility)

### Prerequisites

none

### Skills to be acquired in this module

The module introduces to the basics of Entrepreneurship

- understand the challenges of launching an enterprise,
- strategically analyse the structure of market
- understand how employees are able to behave like an entrepreneur in established enterprises
- develop innovative business ideas
- shape the key factors for realizing a business idea
- demonstrate a knowledge of the entrepreneurial process
- demonstrate a knowledge of cost accounting (especially break-even analysis, etc.) and will be able to calculate costs by themselves
- analyse and evaluate business models

### Module contents

The module combines the lecture "Strategie und Entrepreneurship" with a tutorial. It investigates the challenges of launching enterprises and entrepreneurial behaviour in large companies as well. The content of the module follows the process of an entrepreneur. It starts with business ideas, their perception, and evaluation. In addition, it deals with the most important questions of development and management of new business models. The contents of the courses include the following topics:

- historical, institutional, and theoretical context
- development, evaluation, and pitching ideas
- business models
- building entrepreneurial teams
- entrepreneurship in large enterprises
- resources and finance
- management of growth

### Reader's advisory


### Links

http://www.uni-oldenburg.de/wire/entrepreneurship/lehrangebot/veranstaltungen/lehrangebot-wise-20162017/

### Language of instruction

German

### Duration (semesters)

1 Semester

### Module frequency

jährlich

### Module capacity

unlimited
| Reference text | The lecture “Strategie und Entrepreneurship” must be attended in combination with the “Tutorium”. |
| Modullevel / module level | --- |
| Modulart / typ of module | je nach Studiengang Pflicht oder Wahlpflicht |
| Lehr-/Lernform / Teaching/Learning method | |
| Vorkenntnisse / Previous knowledge | |
| Examination | Time of examination | Type of examination |
| Final exam of module | at the end of the semester | written exam |
| Course type | Comment | SWS | Frequency | Workload of compulsory attendance |
| Course or seminar | 2 | | WiSe | 28 |
| Tutorial | 2 | | | 28 |
| Total time of attendance for the module | 56 h |
**wir200 - Principles of Organisation**

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<td><strong>Applicability of the module</strong></td>
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<tr>
<td>- Bachelor's Programme Business Administration and Law (Bachelor) &gt; Aufbaubereich Wirtschaftswissenschaften</td>
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<td>- Bachelor's Programme Business Informatics (Bachelor) &gt; Akzentsetzungsbereich Wirtschaftswissenschaften</td>
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<td>- Bachelor's Programme Computing Science (Bachelor) &gt; Wahlbereich Informatik, Kultur und Gesellschaft</td>
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<td>- Bachelor's Programme Economics and Business Administration (Bachelor) &gt; Studienrichtung Betriebswirtschaftslehre</td>
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<tr>
<td>- Bachelor's Programme Sustainability Economics (Bachelor) &gt; Wahlpflichtbereich</td>
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</tr>
<tr>
<td>- Master of Education Programme (Vocational and Business Education) Economics and Business Administration (Master of Education) &gt; Mastermodule</td>
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<td>- Master's Programme Business Informatics (Master) &gt; Module der Wirtschafts- und Rechtswissenschaften (Master)</td>
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**Responsible persons**

- Lehrenden, Die im Modul (Authorized examiners)
- Bartel, Teodora (Module counselling)
- Breisig, Thomas (Module counselling)
- Prokop, Jörg (Module responsibility)
- Breisig, Thomas (Module responsibility)

**Prerequisites**

- Keine

**Skills to be acquired in this module**

- Upon completion of the module, students will be able to: 
  - explain and apply the approaches and instruments of organisational sciences; 
  - demonstrate a familiarity with the basic assumptions, strategies, and core themes of organisational theories and are able to compare and reflect upon them; 
  - know different forms of organisational design and are able to differentiate them; 
  - know how to identify and predict issues and developments within operational and organisational structures and processes; 
  - demonstrate an awareness of the relevance of organisational culture, can describe its characteristics and discuss different analytical techniques; 
  - describe and analyse processes of organizational change, can point out their influences on strategy, organisational culture, operational and organisational structure, and estimate the relevance of change process initiation; 
  - work cooperatively and self-dependant within teams and to present complex professional contents precisely and with profound arguments (if chosen to present a topic within the seminar). Furthermore, the students are able: 
    - to locate a specific research question within the scientific discussion in this research area and to interlink, reflect and evaluate it accordingly; 
    - to press their point within the scientific discussion in this research area.

**Module contents**

- The module contents are arranged in the following way: 
  - Basic concepts and conceptual demarcation 
  - Objectives of an organisation 
  - Dimensions in formal organisation 
  - Organisational culture, operational and organisational structure, and estimate the relevance of change process initiation; 
  - work cooperatively and self-dependant within teams and to present complex professional contents precisely and with profound arguments (if chosen to present a topic within the seminar). Furthermore, the students are able: 
    - to locate a specific research question within the scientific discussion in this research area and to interlink, reflect and evaluate it accordingly; 
    - to press their point within the scientific discussion in this research area.

**Reader's advisory**

- Further literature will be announced during the semester according to the particular lecture/seminar content.

**Links**

- www.uol.de/orgpers

**Language of instruction**

- German

**Duration (semesters)**

- 1 Semester

**Module frequency**

- jährlich

**Module capacity**

- unlimited

**Modullevel / module level**

- Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**

- Einführung in die BWL (wir011)

**Examination**

- Time of examination
- Type of examination

**Final exam of module**

- Written exam: end of the lecture period
- Presentation: During the lecture period
- Portfolio: (group seminar paper and online test)
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<th>Workload of compulsory attendance</th>
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**Total time of attendance for the module** 56 h
wir210 - Corporate Environmental Management

Module label: Corporate Environmental Management
Module code: wir210
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module
- Bachelor's Programme Business Administration and Law (Bachelor) > Aufbaubereich Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Business Administration (Bachelor) > Studienrichtung Betriebswirtschaftslehre more...
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Ökologie und Nachhaltigkeit
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlpflichtbereich
- Master of Education Programme (Vocational and Business Education) Economics and Business Administration (Master of Education) > Mastermodule
- Master's Programme Business Informatics (Master) > Module der Wirtschafts- und Rechtswissenschaften (Master)
- Master's Programme Computing Science (Master) > Nicht Informatik

Responsible persons
Siebenhüner, Bernd (Module responsibility)
Lehrenden, Die im Modul (Module counselling)

Prerequisites
Skills to be acquired in this module
The students:
- understand the goals and concepts of sustainable development;
- discuss the importance of sustainability for companies;
- know basic strategies and instruments that enable companies to achieve sustainable development;
- acquire conceptual and practical skills using case studies, in particular about which instruments can be used to prepare companies for the challenges of sustainable development.

Module contents
The module consists of a lecture and a seminar. While the lecture presents and explains concepts, instruments and strategies for sustainable development, the seminar focuses on the practical relevance of the various instruments, concepts and strategies and discusses these based on case studies.
- Concepts and goals of sustainable development
- Introduction to the current discussion on sustainable development
- Current sustainability instruments and strategies for companies
- Case studies

Reader's advisory
- Siebenhüner, B. et al. (2006): Organisationsales Lernen und Nachhaltigkeit. Marburg: Metropolis

Links
https://www.uni-oldenburg.de/wire/

Language of instruction
German

Duration (semesters)
1 Semester

Module frequency
jährlich

Module capacity
unlimited

Modullevel / module level
je nach Studiengang Pflicht oder Wahlpflicht

Lehr-/Lernform / Teaching/Learning method
Vorlesung mit begleitendem Seminar

Vorkenntnisse / Previous knowledge

161 / 167
<table>
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<tr>
<td>Seminar</td>
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</table>

**Total time of attendance for the module** 56 h
wir530 - Corporate / Consumer Protection Law

**Module label**
Corporate / Consumer Protection Law

**Module code**
wir530

**Credit points**
6.0 KP

**Workload**
180 h

**Applicability of the module**
- Bachelor's Programme Business Administration and Law (Bachelor) > Aufbaubereich Recht
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft

**Responsible persons**
Lehrenden, Die im Modul (Authorized examiners)
- Louven, Sebastian (Authorized examiners)
- Rott, Peter (Module responsibility)
- Louven, Sebastian (Module counselling)

**Prerequisites**
none

**Skills to be acquired in this module**
The students:
- have basic knowledge in corporate and consumer protection law,
- can determine individual company forms and detect adhesion problems,
- know the basic rights of consumers and know the implementation of the rights of the consumer

**Module contents**
In the lecture and the seminar basic knowledge of corporate and consumer protection law will be taught. In economic life, choosing the optimal legal form of a company is usually based on the need to protect private assets. Therefore, for the limitation of liability to the business property knowledge of the legal forms is essential. In relation of the company to its customers, it is also necessary to know them from the legal rights and obligations. In particular, the consumer protection law plays in this context an important role, the contents of which are handled by seminar papers.

Topics of the module:
- Civil law (GbR internal / external GbR); the general partnership (CHG); Legal status of the general partner / limited partners of the KG; Overview of other companies (e.g. partnership);
- the law of associations; The law of corporate bodies; the law of GmbH / UG; the corporation / SE; the cooperative. In the seminar the consumer's rights are discussed.

The module will enable students to perform an independent assessment of complex legal relationships in the economy.

**Reader's advisory**

**Links**
http://www.privatrecht.uni-oldenburg.de/

**Language of instruction**
German

**Duration (semesters)**
1 Semester

**Module frequency**
jährlich

**Module capacity**
unlimited

**Modullevel / module level**
ej nach Studiengang Pflicht oder Wahlpflicht

**Lehr-/Lernform / Teaching/Learning method**
Vorlesung mit begleitendem Seminar

**Vorkenntnisse / Previous knowledge**
Bürgerliches Recht und Handelsrecht (wir130), Vertiefung im Bürgerlichen Recht (wir320)

**Examination**

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<th>Time of examination</th>
<th>Module frequency</th>
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**Final exam of module**

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**Total time of attendance for the module**
56 h
### wir806 - Information Technology Law

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**Applicability of the module**
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Master Applied Economics and Data Science (Master) > Specialization
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Recht und Gesellschaft
- Master's Programme Business Administration, Economics and Law (Master) > Basismodule
- Master's Programme Business Administration, Economics and Law (Master) > Mantelmodule (MPO2020)
- Master's Programme Business Administration, Economics and Law (Master) > Schwerpunktmodule RdW - Recht
- Master's Programme Business Informatics (Master) > Module der Wirtschafts- und Rechtswissenschaften (Master)
- Master's Programme Computing Science (Master) > Nicht Informatik

**Responsible persons**
- Lehrenden, Die im Modul (Authorized examiners)
  - Louven, Sebastian (Module counselling)

**Prerequisites**

**Skills to be acquired in this module**
- Upon completion of the module, students will be able to:
  - deal with all legal questions arising from the use of information and communication technology in all sectors of society,
  - identify legal issues arising from the use of information and communication technology,
  - draft solutions for these legal questions.

**Module contents**
- Internet law; IT contracts law

**Reader's advisory**
- Köhler, Fetzer, Recht des Internet, 8. Aufl., 2016
- Redeker, IT-Recht, 6. Aufl., 2017

**Links**

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**
- jährlich

**Module capacity**
- unlimited

**Modulart / module level**
- je nach Studiengang Pflicht oder Wahlpflicht

**Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**

**Examination**
- Time of examination: during term
- Type of examination: presentation and handout, written exam or oral exam

**Final exam of module**

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**Total time of attendance for the module**
- 56 h
Abschlussmodul

bam - Bachelor Thesis and Colloquium

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<td>Prerequisites</td>
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Skills to be acquired in this module

- 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 computational/informatical 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

Module contents

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

Reader's advisory

According to the topic

Links

https://uol.de/informatik/studium-lehre/studium-aktuell/abschlussarbeiten

Language of instruction

German

Duration (semesters)

1 Semester

Module frequency

halbjährlich

Module capacity

unlimited

Modullevel / module level

Abschlussmodul (Abschlussmodul / Conclude)

Modulart / typ of module

Pflicht / Mandatory

Lehr-/Lernform / Teaching/Learning method

Vorkenntnisse / Previous knowledge

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