Modulhandbuch

Computing Science - Bachelor's Programme

im Summer semester 2024

erstellt am 27/03/24
inf030 - Programming, Algorithms and Data Structures

inf031 - Object-oriented Modelling and Programming

inf200 - Computer Engineering I

inf400 - Theoretical Computer Science: Logic

inf005 - Software Engineering I

inf007 - Information Systems I

inf201 - Computer Engineering II

inf401 - Foundations of Theoretical Computer Science

inf800 - Proseminar in Computer Science

mat950 - Discrete Mathematics

mat955 - Mathematics of Computer Science (Linear Algebra)

mat960 - Mathematics of Computer Science (Analysis)

inf010 - Computer Networks

inf012 - Operating Systems I

inf016 - Internet Technologies

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

mat200 - Algebra I: Rings and Modules

mat310 - Statistics I - Introduction to Applied Statistics

mat995 - Special Topics in Mathematics

mat996 - Introduction to Numerical Analysis

mat997 - Introduction to Probability and Statistics
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Basismodule

info30 - Programming, Algorithms and Data Structures

Module label
Programming, Algorithms and Data Structures

Modulkürzel
info30

Credit points
9.0 KP

Workload
270 h

Verwendbarkeit des Moduls
- Bachelor's Programme Business Informatics (Bachelor) > Basiscurriculum
- Bachelor's Programme Computing Science (Bachelor) > Basismodule
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodul
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlpflichtbereich
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Basismodule

Zuständige Personen
- Schönberg, Christian (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
No participant requirement

Skills to be acquired in this module
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, Algorithms and Data Structures" 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 programmes based on Java for solving smaller problems and assess the efficiency of their programmes. 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.

Literatureempfehlungen

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
• Ottmann, Widmayer: Algorithmen und Datenstrukturen, Spektrum Verlag, 5. Auflage, 2012
• Siege: Einführung in die Informatik. Shaker Verlag, 2013
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| Präsennzeit Modul insgesamt      | 84 h     |
inf031 - Object-oriented Modelling and Programming

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<th>Module label</th>
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**Verwendbarkeit des Moduls**
- Bachelor's Programme Business Informatics (Bachelor) > Basiscurriculum
- Bachelor's Programme Computing Science (Bachelor) > Basismodule
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Basismodule

**Zuständige Personen**
- Schönberg, Christian (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
useful previous knowledge: inf030 Programming, Algorithms and Data Structures

**Skills to be acquired in this module**
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.

Literaturempfehlungen

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

Links

Language of instruction | German
---|---
Duration (semesters) | 1 Semester
Module frequency | every summer term
Module capacity | unlimited
Teaching/Learning method | 1V + 1Ü
Previous knowledge | useful previous knowledge: inf030 Programming, Algorithms and Data Structures

Examination | Prüfungszeiten | Type of examination
---|---|---
Final exam of module | At the end of the Semester. | Portfolio or written exam or oral exam

Form of instruction | Comment | SWS | Frequency | Workload of compulsory attendance
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Lecture | 4 | SoSe | 56 |
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**Verwendbarkeit des Moduls**
- Bachelor's Programme Computing Science (Bachelor) > Basismodule
- Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Basismodule
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflicht Technische Informatik (30 KP)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich

**Zuständige Personen**
- Rauh, Andreas (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
- No participant requirements

**Skills to be acquired in this module**

The students 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 analyze computer architectures as a whole, to understand in depth, to analyze, and to optimize their hardware components, and to discuss the properties induced by selecting design alternatives.

**Professional competences**
The Students:

- identify fundamental concepts of the construction of digital computer systems, the internal number representation, and analysis of combinational logic as well as their optimization.

**Methodological competences**
The Students:

- analyze computer architectures on the basis of their individual components
- design and optimize digital hardware components
- transfer systematic approaches of hardware design to unknown design problems

**Social competences**
The Students:

- present their understanding of the functional principles of digital computer systems

**Self-competences**
The Students:

- critically reflect on the results of exercises and recognize limitations of different approaches to the design of digital computer systems

**Module contents**
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, over fundamental techniques for coding and representation of numbers, program execution on machine level, basics of logics and analysis of functions of combinational logic as well as their optimization.

**Literaturempfehlungen**

- Lecture Notes
Patterson, D.A.; Hennessy, J.L. (1997): Computer Organization and Design:
The Hardware/Software Interface; 2. Edition; Morgan Kaufmann Publishers.
2. Edition; Prentice Hall.
Prentice Hall.

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Präsenzzeit Modul insgesamt 56 h
inf400 - Theoretical Computer Science: Logic

Module label: Theoretical Computer Science: Logic

Modulkürzel: inf400

Credit points: 6.0 KP

Workload: 180 h

Verwendbarkeit des Moduls
- Bachelor's Programme Computing Science (Bachelor) > Basismodule
- 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)
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich

Zuständige Personen
- Wehrheim, Heike (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites: No participant requirements

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

Topics:
- propositional logic: syntax and semantics, truth tables, natural deduction
- predicate logic: syntax and semantics, natural deduction
- logic programming: declarative and procedural semantics, unification algorithm (Robinson), SLD resolution, PROLOG
- temporal logic CTL: syntax and semantics of Kripke structures, CTL model checking algorithm
**Literaturempfehlungen**

**Essential:** Script "Logik" (in German), in its current edition


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| Präsenzzeit Modul insgesamt | 56 h |
**Aufbaumodule**

**inf005 - Software Engineering I**

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**Verwendbarkeit des Moduls**

- 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

**Zuständige Personen**

- Winter, Andreas (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**

- inf030
- inf031

**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.

**Literatureempfehlungen**

- Slide script for the lecture
- Helmut Balzert: Lehrbuch der Software-Technik, Spektrum Akademischer Verlag, 3. Auflage 2009

**Links**

<table>
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| Previous knowledge      | - inf030  
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**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)

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**Präsenzzeit Modul insgesamt**

70 h
### inf007 - Information Systems I

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#### Verwendbarkeit des Moduls
- 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

#### Zuständige Personen
- Wingerath, Wolfram (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

#### Prerequisites
- No participant requirement

#### Skills to be acquired in this module

- **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

#### Literatureempfehlungen

#### Links

- Language of instruction: German
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<td>Written or oral exam</td>
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### inf201 - Computer Engineering II

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**Verwendbarkeit des Moduls**
- Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule
- 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 of Education Programme (Hauptschule and Realschule) Computing Science (Master of Education) > Mastermodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich

**Zuständige Personen**
- Rauh, Andreas (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
Knowledge of the module "Computer Engineering I"

**Skills to be acquired in this module**

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

**Professional Competences**
The students:
- describe computer components
- design and optimise computer components
- describe and analyse electric circuits

**Methodological Competences**
The students:
- analyse computer architectures
- get familiar with fundamentals of the analysis and synthesis of flipflops and automata
- get familiar with foundations of the analysis of electical circuits

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

**Self Competences**
The students:
- critically reflect the results of exercises and acknowledge limitations of various approaches for the design of computer systems

**Module contents**
This module is the second part of the introduction to computer engineering. It explains sequential circuits (e.g. flipflops and automata), arithmetic and logical computer components, registers and memory, basics of computer communication as well as electrotechnical foundations.

**Literaturempfehlungen**

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

**Links**
<table>
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| Präsenzzzeit Modul insgesamt | 56 h |
### Inf401 - Foundations of Theoretical Computer Science

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**Verwendbarkeit des Moduls**
- 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
- Master of Education Programme (Hauptschule and Realschule) Computing Science (Master of Education) > Mastermodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich

**Zuständige Personen**
- Wehrheim, Heike (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
- No participant requirement

**Skills to be acquired in this module**

**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.

**Literaturempfehlungen**

**Essential:**
- Skript "Grundbegriffe der Theoretischen Informatik", jeweils in aktueller
Ausgabe

**Recommended:**

**Good secondary literature:**
- Hopcroft, Motwani, Ullman: "Einführung in die Automatentheorie, Formale Sprachen und Komplexitätstheorie", Pearson, 2002 (ein Klassiker...)

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Workload of compulsory attendance

Lecture: 42 WiSe
Exercises: 14 WiSe
Präsenzzeit Modul insgesamt: 56 h
### inf800 - Proseminar in Computer Science

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<tr>
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<td>• Bachelor's Programme Computing Science (Bachelor) &gt; Aufbaumodule</td>
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<td></td>
<td>• Dual-Subject Bachelor’s Programme Computing Science (Bachelor) &gt; Praktische Vertiefung (60 KP)</td>
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<td>• Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) &gt; Praktische Vertiefung der Informatik</td>
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<td>Zuständige Personen</td>
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<tr>
<td></td>
<td>• Nieße, Astrid (module responsibility)</td>
</tr>
<tr>
<td></td>
<td>• Sauer, Jürgen (module responsibility)</td>
</tr>
<tr>
<td></td>
<td>• Diethelm, Ira (module responsibility)</td>
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<td></td>
<td>• Lehrenden, Die im Modul (Prüfungsberechtigt)</td>
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<tr>
<td>Prerequisites</td>
<td>The specific participation requirements are described in the individual assigned courses.</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>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.</td>
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<tr>
<td>Professional competence</td>
<td>The students:</td>
</tr>
<tr>
<td></td>
<td>• characterise and apply computer science basics (algorithms, data structures, programming, basics of practical, technical and theoretical computer science)</td>
</tr>
<tr>
<td></td>
<td>• define and describe essential mathematical, logical and physical basics of computer science</td>
</tr>
<tr>
<td></td>
<td>• define and illustrate the core disciplines of computer science (theoretical, practical and technical computer science)</td>
</tr>
<tr>
<td>Methodological competence</td>
<td>The students:</td>
</tr>
<tr>
<td></td>
<td>• examine problems, use formal methods to phrase them and analyze them appropriately</td>
</tr>
<tr>
<td></td>
<td>• evaluate problems by the use of technical and scientific literature</td>
</tr>
<tr>
<td></td>
<td>• reflect on a scientific topic and write a scientific seminar paper under guidance and present their findings</td>
</tr>
<tr>
<td>Social competence</td>
<td>The students:</td>
</tr>
<tr>
<td></td>
<td>• communicate considerately and appropriately with users and experts</td>
</tr>
<tr>
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<td>• use presentation methods</td>
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<td>Self-competence</td>
<td>The students:</td>
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<tr>
<td></td>
<td>• plan their informatical actions independently</td>
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<tr>
<td></td>
<td>• reflect their contributions critically and discuss them with users and experts</td>
</tr>
<tr>
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<td>• collect and update their knowledge independently</td>
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<td>Students must attend one of the seminars offered.</td>
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Passing the proseminar is a prerequisite for registering for the Bachelor's thesis.

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<td>Am Ende des Semesters und nach Absprache</td>
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- Active participation in the seminar is expected
- Paper and presentation

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**mat950 - Discrete Mathematics**

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**Verwendbarkeit des Moduls**
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaumagistercurriculum - Pflichtbereich
- Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Basismodule

**Zuständige Personen**
- Heß, Florian (module responsibility)
- Stein, Andreas (module responsibility)
- Stein, Sandra (module responsibility)

**Prerequisites**
- 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

**Literaturempfehlungen**
- Graham, Knuth, Patashnik: Concrete Mathematics, Addison-Wesley 1994.
- Hartmann: Mathematik für Informatiker, Vieweg 2014.
- Tesch, Tesch: 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.

**Examination**
- **Prüfungszeiten**
- **Type of examination**
- Final exam of module: after the end of the lecture period
- Written exam or oral exam.
- Bonus points can be earned.

**Form of instruction**
- **Comment**
- **SWS**
- **Frequency**
- **Workload of compulsory attendance**
- Lecture: 3, W|S|e: 42
- Exercises: 1, W|S|e: 14
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<th>SWS</th>
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### mat955 - Mathematics of Computer Science (Linear Algebra)

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<td>Workload</td>
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**Verwendbarkeit des Moduls**
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum-Wahlbereich Mathematik
- Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule

**Zuständige Personen**
- Frühbis-Krüger, Anne (module responsibility)
- Heß, Florian (module responsibility)
- Stein, Andreas (module responsibility)
- Stein, Sandra (module responsibility)

**Prerequisites**
- 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
- Learning the significant ideas and methods of linear algebra
- Mastering the fundamental concepts of algebra, such as groups, rings, fields
- 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
- Mastering of further notions and methods of linear algebra, e.g. eigenvectors, eigenvalues, diagonalization

**Module contents**
- Significant techniques and structures, systems of linear equations, vector spaces, dimension, linear maps, determinants, eigenvalues, diagonalization

**Literaturempfehlungen**
- G. Fischer: Lineare Algebra, Vieweg 2010 (17. Aufl.)

**Links**
- S. Bosch: Lineare Algebra, Springer 2014
- B. Huppert, W. Willems: Lineare Algebra, Springer 2010
- F. Lorenz: Lineare Algebra, Spektrum 2008

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**
- annual

**Module capacity**
- unlimited

**Examination**
- Type of examination: written exam or oral exam. Bonus points can be earned.

**Form of instruction**

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**Präsenzzzeit Modul insgesamt**
- 56 h
mat960 - Mathematics of Computer Science (Analysis)

Module label | Mathematics of Computer Science (Analysis)
Modulkürzel | mat960
Credit points | 6.0 KP
Workload | 180 h
Verwendbarkeit des Moduls
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum-Wahlbereich Mathematik
- Bachelor's Programme Computing Science (Bachelor) > Aufbaumodule

Zuständige Personen
- Chernov, Alexey (module responsibility)
- Grieser, Daniel (module responsibility)
- Pankrashkin, Konstantin (module responsibility)
- Schöpfer, Frank (module responsibility)
- Shestakov, Ivan (module responsibility)
- Uecker, Hannes (module responsibility)
- Vertman, Boris (module responsibility)

Prerequisites
Skills to be acquired in this module
- The students learn and apply basic notions and techniques of mathematical analysis.
  - Professional competence
    - 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
    - analyse formal relations
    - structure and justify solution methods
  - Social competence
    - develop solutions to given problems in groups
    - accept constructive criticism
  - Personal competence
    - 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

Literaturempfehlungen
- 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
Examination
Prüfungszeiten | Type of examination
Final exam of module | At the end of the lecture period written exam | Final exam of module
Form of instruction | Comment | SWS | Frequency | Workload of compulsory attendance
- Lecture | 3 | SoSe | 42
- Exercises | 1 | SoSe | 14
Präsenzzeit Modul insgesamt | 56 h
### Wahlpflichtbereich Praktische Informatik

**inf010 - Computer Networks**

<table>
<thead>
<tr>
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<tr>
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<td>Credit points</td>
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<td>Workload</td>
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#### Verwendbarkeit des Moduls
- 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 (Hauptschule and Realschule) Computing Science (Master of Education) > Mastermodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich

#### Zuständige Personen
- Kramer, Oliver (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

#### Prerequisites
- No participant requirement

#### Skills to be acquired in this module

**Professional competence**
The students:
- identify the layers of the ISO/OSI model
- recognise the main concepts and algorithms of each IOS/OSI layer
- assign technical processes to the layers
- classify new technologies to the main concepts of the ISO/OSI model - Compare different methods and approaches of a layer (i.e. TCP and UDP)
- characterise safety-critical aspects of each layer

**Methodological competence**
The students:
- administer small networks
- characterise safety-critical aspects of networks

**Social competence**
The students:
- work on exercises in small teams

**Self-competence**
The students:
- 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 Shannon and Transmissions - CDMA
- Hamming & CRC
- Stop & wait, go back n, selective repeat
- Aloha & CSMA
- Ethernet technologies
- Wifi
- Paket switchen & Dijsktra
- IP Adressing & Header
- TCP
- UDP
- Buckets & TCP-Reno
- DNS
- Flask
- RSA & PGP
- Firewalls

**Literatureempfehlungen**
- lecture notes

**Links**

<table>
<thead>
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<td>Type of examination</td>
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<td>At the end of the lecture period</td>
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<td>Written or oral exam</td>
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**Workload of compulsory attendance**

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**Präsenzzeit Modul insgesamt** 56 h
### inf012 - Operating Systems I

<table>
<thead>
<tr>
<th><strong>Module label</strong></th>
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<tr>
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**Verwendbarkeit des Moduls**
- 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)

**Zuständige Personen**
- Theel, Oliver (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
Useful prior knowledge:
Study contents of the first year of the subject Bachelor of Computer Science or Business Informatics.

**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

**Literaturempfehlungen**

**Language of instruction**
German
<table>
<thead>
<tr>
<th>Duration (semesters)</th>
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</table>
| Reference text       | Linked to the modules:  
  - Operating Systems II (as a possible follow-up course)  
  - Distributed Operating Systems (as a possible specialization)  
  - Operating Systems Practicum |
| Teaching/Learning method | V+Ü         |
| Previous knowledge   | Useful prior knowledge: Study contents of the first year of the subject Bachelor of Computer Science or Business Informatics. |
| Examination          | Prüfungszeiten | Type of examination |
| Final exam of module | End of the lecture period | Written or oral exam |
| Form of instruction  | Comment | SWS | Frequency | Workload of compulsory attendance |
| Lecture              | 2        | SoSe | 28      |
| Exercises            | 2        | SoSe | 28      |
| Präsenzeit Modul insgesamt |           | 56 h |
## Inf016 - Internet Technologies

<table>
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### Verwendbarkeit des Moduls
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum-Wählbereich 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

### Zuständige Personen
- Boles, Dietrich (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

### Prerequisites
Useful previous knowledge: object-oriented programming

### 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.

### Literatureempfehlungen
List of links in the learning management system

### Links

### Language of instruction
German

### Duration (semesters)
1 Semester

### Module frequency
every summer term

### Module capacity
unlimited

### Reference text

### Teaching/Learning method
V+Ü

### Previous knowledge
Useful previous knowledge: object-oriented programming

### Examination
<table>
<thead>
<tr>
<th>Prüfungszeiten</th>
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<tbody>
<tr>
<td>Final exam of module</td>
<td>The presentation of partial results of the practical project takes place weekly during the exercises.</td>
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Examination | Prüfungszeiten | Type of examination
---|---|---
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.

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Wahlpflichtbereich Mathematik

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

<table>
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Verwendbarkeit des Moduls
- 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

Zuständige Personen
- 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 ihrer logischen 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
- Verständnis der differentialgeometrischen Bedeutung des Lösens von Differentialgleichungssystemen als Finden der Integralkurven eines Vektorfelds
- Erkennen inhaltlicher Zusammenhänge mit den zentralen Konzepten der Analysis I und der linearen Algebra

Module contents

Literaturempfehlungen
- D. Grieser, Analysis I+II, Springer (ab 2018)
- G. Forster, Analysis I+II, Vieweg
- H. Heuser, Lehrbuch der Analysis, Teil I+2, Teubner
- W. Kaballo, Einführung in die Analysis I+II, Spektrum Verlag 2000
- W. Königsberger, Analysis I+II, Springer
- G. Schnieder, Analysis, Vieweg

Links

Language of instruction
German

Duration (semesters)
1 Semester
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| Präsenzzeit Modul insgesamt | 56 h |
### mat200 - Algebra I: Rings and Modules

**Module label**: Algebra I: Rings and Modules

**Modulkürzel**: mat200

**Credit points**: 6.0 KP

**Workload**: 180 h

**Verwendbarkeit des Moduls**
- Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Mathematik
- Dual-Subject Bachelor's Programme Mathematics (Bachelor) > Aufbaumodule

**Zuständige Personen**
- Heß, Florian (module responsibility)
- Stein, Andreas (module responsibility)

**Prerequisites**

- Exemplarisches Kennenlernen weiterer mathematischer Gebiete und damit Erweiterung des eigenen mathematischen Wissens
- Kennenlernen von Anwendungen
- Vertiefung, auch exemplarisch, der im Grundlagenbereich erworbenen Kenntnisse
- Kennenlernen eines klassischen Gebietes der Mathematik, das mehr als hundert Jahre besteht ohne an Bedeutung zu verlieren
- Beherrschen der grundlegenden algebraischen Strukturen wie Gruppe, Ring und Körper
- Beherrschen grundlegender und vertiefernder Strukturttheorien in der Ringtheorie
- Beherrschen grundlegender Strukturttheorien und ausgewählter Vertiefungen in der Körpertheorie
- Kennenlernen von arithmetischen Konzepten mit dem Schwerpunkt auf explizite Berechenbarkeit

**Module contents**

- Ringe und Ideale, Primfaktorzerlegung in Hauptidealringen, faktorielle Ringe, Kongruenzen und Restklassenringe, Methoden zur Untersuchung der Irreduzibilität von Polynomen, Nullstellenadjunktion bei Polynomen, Konstruktion der endlichen Körper, Fundamentalsatz der Algebra.

**Literaturempfehlungen**

- S. Bosch: Algebra, Springer Spektrum 2013

**Links**

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

**Reference text**

Vorlesung und Übungen werden nur in den ersten 2/3 des Semesters besucht.

**Final exam of module**

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Präsenzeit Modul insgesamt: 84 h
### mat310 - Statistics I - Introduction to Applied Statistics

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| Verwendbarkeit des Moduls | Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Mathematik  
  Bachelor's Programme Mathematics (Bachelor) > Vertiefungsmodule |
| Zuständige Personen | 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  
  Kennerlernen 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  
  Kennerlernen von Anwendungen der Statistik, auch mit umfangreichen Datenbeispielen  
  Fähigkeit, vorhandene Statistiksoftware und Anwendungspläne zu verstehen, einzubinden und anzuwenden  
  Vertrautheit mit grundlegenden statistischen Kenngrößen  
  Erwerb von Methoden zur professionellen explorativen Datenanalyse mathematikspezifische Aspekte von Digitalisierung  
  Fragen digitaler Darstellung von mathematischen Begriffen ("symbolisches Rechnen" mit statistischen Modellen) und Verfahren, z.B. LASSO-Verfahren in der Regression  
  mathematiknahe Programmierung in R  
  Strategien für ein explizites Mitführen/Kontrollieren von Fehlern/Unsicherheit  
  Fragen der Codierung (Umgang mit kategoriellen Prädiktoren und Interaktionseffekten)  
  stochastiche Simulation |
| Literaturempfehlungen | Fahrmeir, Künstler, Pigeot, Tutz: Statistik - Der Weg zur Datenanalyse, Springer.  
  Fahrmeir, Künstler, Pigeot, Tutz, Caputo, Lang: Arbeitsbuch Statistik, Springer. |
| Links |  
  Language of instruction | German |
<p>| Duration (semesters) | 1 Semester |
| Module frequency | jährlich |</p>
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mat995 - Special Topics in Mathematics

Module label | Special Topics in Mathematics
---|---
Modulkürzel | mat995
Credit points | 6.0 KP
Workload | 180 h

Verwendbarkeit des Moduls
- Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Mathematik

Zuständige Personen
- Nieße, Astrid (module responsibility)
- Stein, Andreas (module responsibility)

Prerequisites

Skills to be acquired in this module

Module contents
Dies Modul dient zur Anrechnung von Mathematik-Modulen, die an anderen Hochschulen i.d.R. im Rahmen eines Mathematik- oder Informatikstudiums erbracht wurden. Bitte sprechen Sie die Antragstellung mit der Fachstudienberatung ab.

Literaturempfehlungen

Links

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

Reference text

Examination
Prüfungszeiten | Type of examination
---|---
Final exam of module | KL

Form of instruction | Comment | SWS | Frequency | Workload of compulsory attendance
---|---|---|---|---
Lecture | 2 | 28
Exercises | 2 | 28

Präsenzzeit Modul insgesamt | 56 h
mat996 - Introduction to Numerical Analysis

Module label                  Introduction to Numerical Analysis
Modulkürzel                   mat996
Credit points                  6.0 KP
Workload                      180 h
Verwendbarkeit des Moduls
- Bachelor's Programme Business Informatics (Bachelor) > Aufbaucurriculum-Wahlbereich Mathematik
- Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Mathematik
- Master's Programme Computing Science (Master) > Module aus anderen Studiengängen

Zuständige Personen
- Chernov, Alexey (module responsibility)
- Schöpfer, Frank (module responsibility)

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

Literaturempfehlungen

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.

Examination
Prüfungszeiten
Type of examination
Final exam of module
At the end of the lecture period written exam
Final exam of module
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mat997 - Introduction to Probability and Statistics

Module label: Introduction to Probability and Statistics

Modulkürzel: mat997

Credit points: 6.0 KP

Workload: 180 h

Verwendbarkeit des Moduls:
- Bachelor's Programme Computing Science (Bachelor) > Wahlpflichtbereich Mathematik
- Master's Programme Computing Science (Master) > Module aus anderen Studiengängen

Zuständige Personen:
- Christiansen, Marcus (module responsibility)
- Ruckdeschel, Peter (module responsibility)
- May, Angelika (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 eigen数学 emathematischen Wissens durch Herstellung von Beziehungen zwischen verschiedenen mathematischen Bereichen
- Aufbau von Grundkenntnissen in Wahrscheinlichkeitstheorie und Statistik
- Vertiefung und Erweiterung der im Grundlagenbereich erworbenen Kenntnisse aus Analysis und Linearen Algebra
- Kennenlernen von schulrelevanten Anwendungen im Bereich diskreter Wahrscheinlichkeitsräume und statistischer Hypothesen
- Kennenlernen von mathematischen Grundlagen der Wahrscheinlichkeitstheorie und Einblicke in die Statistik
- Vernetzung des eigenen mathematischen Wissens durch Verknüpfung wahrcheinlichkeitstheoretischer 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

Literaturempfehlungen:
- Andreas Büchter, Hans-Wolfgang Henn: Elementare Stochastik, Springer
- Herold Dehling, Beate Haupt: Einführung in die Wahrscheinlichkeitstheorie 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.

Examination:
Prüfungszeiten: Klausur am Ende des Semesters
Type of examination: KL

Final exam of module:
Form of instruction Comment SWS Frequency Workload of compulsory attendance
Lecture 2 SoSe 28
Exercises 2 SoSe 28
Präsenzzeit Modul insgesamt 56 h
Akzentsetzungsbereich - Wahlbereich Informatik

inf006 - Software Engineering II

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<td>Workload</td>
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Verwendbarkeit des Moduls
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Master's Programme Business Informatics (Master) > Akzentsetzungsmodule der Informatik
- Master's Programme Computing Science (Master) > Praktische Informatik
- Master's Programme Environmental Modelling (Master) > Mastermodule

Zuständige Personen
- Winter, Andreas (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
- Softwaretechnik I

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

Literaturempfehlungen

- 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, ICPC, SLE, u.a.)

Links

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| Präsenzzzeit Modul insgesamt | 56 h |
### Information Systems II

**Module label**: Information Systems II  
**Modulkürzel**: inf008  
**Credit points**: 6.0 KP  
**Workload**: 180 h

**Verwendbarkeit des Moduls**
- 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) > Akzentsetzungsmodul der Informatik

**Zuständige Personen**
- Grawunder, Marco (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
No participant requirement

**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:
- improve their ability to work in a team

**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

**Literaturempfehlungen**

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/Pei. Data Mining: Concepts and Techniques, Morgan Kaufmann
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Module label: Database Practical

Modulekürzel: inf009

Credit points: 6.0 KP

Workload: 180 h

Verwendbarkeit des Moduls:
- 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 (Hauptschule and Realschule) Computing Science (Master of Education) > Mastermodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

Zuständige Personen:
- Grawunder, Marco (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites:
- Information Systems I
- Operating system knowledge

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 database 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

Methodological competence
The students:
- propose concrete processing principles for special application classes
- reflect on specific technologies and procedures with regard to their consequences

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

Literaturempfehlungen

• Held Andrea (2005), Oracle 10g Hochverfügbarkeit Addison-Wesley
• Held Andrea (2015), Oracle 12c New Features Addison Wesley

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

Language of instruction
German

Duration (semesters)
1 Semester

Module frequency
every winter term

Module capacity
unlimited

Teaching/Learning method
P

Previous knowledge
Information Systems I
Operating system knowledge

Examination
Prüfungszeiten
Type of examination
Final exam of module
At the end of the lecture period
Oral exam

Form of instruction
Exercises

SWS
4

Frequency
WiSe
inf014 - Operating Systems Practical

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Verwendbarkeit des Moduls

- 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

Zuständige Personen

- Theel, Oliver (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites

- Information Systems I
- Operating Systems I - Operating Systems II
- Programming languages: C, Assembler

Skills to be acquired in this module

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
Literaturrempfehlungen


Links

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Reference text

**Associated with the modules:**

- Operating Systems I
- Operating Systems II
- Distributed Systems

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| Previous knowledge       | - Operating Systems I  
- Operating Systems II  
- Programming languages: C, Assembler |

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<td>At the end of the semester</td>
<td>Active participation / work report and oral exam</td>
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inf015 - Distributed Operating Systems

Module label: Distributed Operating Systems
Modulkürzel: inf015
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)

Zuständige Personen
- Theel, Oliver (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites: Operating systems I

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

**Literature recommendations**


**Links**

**Language of instruction**: German

**Duration (semesters)**: 1 Semester

**Module frequency**: annual

**Module capacity**: unlimited

**Reference text**: Associated with the modules:
- Betriebssysteme I und II
- Betriebssysteme-Praktikum
- Fehlertoleranz in verteilten Systemen (as a possible differentiation)

**Teaching/Learning method**: V+Ü

**Previous knowledge**: Operating Systems I

**Examination Prüfungszeiten**: Operating Systems I

**Type of examination**: Final exam of module: End of the lecture period
- Training tasks, written exam or oral exam

**Form of instruction**

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<td>SoSe</td>
<td>28</td>
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**Präsenzzeit Modul insgesamt**: 56 h
inf017 - Interactive Systems

<table>
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<tr>
<td>Workload</td>
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Verwendbarkeit des Moduls

- 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"
- 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"
- Dual-Subject Bachelor's Programme Biology (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Chemistry (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- 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"
- Dual-Subject Bachelor's Programme Programme English Studies (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Gender Studies (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
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.

**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.

**Literature recommendations**

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale: Human Computer Interaction.
- Bernhard Preim, Raimund Dachselt: Interaktive Systeme
- Weitere Fachartikel, die in der Vorlesung vorgestellt werden

**Links**

https://uol.de/en/media-informatics/teaching/courses

**Languages of instruction**

German, English

**Duration (semesters)**

1 Semester

**Module frequency**

every winter term

**Module capacity**

40

**Teaching/Learning method**

V+Ü

**Previous knowledge**

none

**Examination**

Type of examination

Final exam of module

Individually, at the end of the lecture period

Project and oral Exam or project and written exam

**Form of instruction**

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**Präsenzzeit Modul insgesamt**

56 h
inf018 - Media Processing

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Verwendbarkeit des Moduls

- 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"
- 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"
- Dual-Subject Bachelor's Programme Biology (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Chemistry (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Dual-Subject Bachelor's Programme Computing 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"
- Dual-Subject Bachelor's Programme English Studies (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
Dual-Subject Bachelor’s Programme Gender 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 German Studies (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 Low German (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)
- 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

Zuständige Personen
- Boll-Westermann, Susanne (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
Solid programming skills in Java and/or C++, practical informatics. Interest in media processing

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
- explain the most common methods for encoding and compressing images, video and audio
- 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
- select existing software packages for simple image processing problems, as well as use and customize them for their specific task
- 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, CIELAB, ...), 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.

Literaturempfehlungen

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

Links
https://uol.de/en/media-informatics/teaching/courses

Language of instruction
German

Duration (semesters)
1 Semester

Module frequency
every winter term

Module capacity
12

Reference text

Teaching/Learning method
V+Ü

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

Examination

<table>
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<th>Prüfungszeiten</th>
<th>Type of examination</th>
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<td>Project and oral Exam or project and written exam</td>
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Final exam of module
The presentation of the practical project on a project day of all small groups takes place directly after the lecture period. The oral examination takes place in the first two weeks after the end of the lecture period. Any post-examinations will take place at the end of the lecture period. The exact schedule can be found on the department's web pages as well as the information in the learning management system Stud.IP.

<table>
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<tr>
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inf020 - Machine-oriented Programming

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**Verwendbarkeit des Moduls**
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)

**Zuständige Personen**
- Theel, Oliver (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
- Study contents of the first year of the subject Bachelor of Computer Science or Business Informatics

**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.

**Literaturempfehlungen**
- Jeff Duntemann (2009): Assembly Language Step by Step, 3rd edition,
### Links

<table>
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### Reference text

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

### Teaching/Learning method

| V+Ü |

### Previous knowledge

Study contents of the first year of the subject Bachelor of Computer Science or Business Informatics

### Examination

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<th>Type of examination</th>
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### Form of instruction

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**Präsenzzzeit Modul insgesamt**

56 h
inf021 - Advanced Java Technologies

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

Verwendbarkeit des Moduls
- 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

Zuständige Personen
- Boles, Dietrich (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
useful knowledge: Object-oriented programming

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
- set up own Java class libraries
- look up required classes in the JDK-Library and solve problems with these classes
- structure their programs properly
- understand and interpret large programs of other students
- evaluate the quality of large programs related to their maintainability, reuseability 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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| Präsenzzeit Modul insgesamt | 84 h |

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**inf040 - Introduction to Data Science**

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**Verwendbarkeit des Moduls**

- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlpflichtbereich
- Master Applied Economics and Data Science (Master) > Data Science
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Theoretische Informatik)
- Master of Education Programme (Hauptschule and Realschule) Computing Science (Master of Education) > Mastermodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich
- Master's Programme Computing Science (Master) > Praktische Informatik

**Zuständige Personen**

- Wingerath, Wolfram (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**

Basics of databases, Python programming and statistics

**Skills to be acquired in this module**

The module teaches fundamentals from the field of Data Science, covering purposes, challenges, and common best practices.

**Professional competences**

The students

- have knowledge of basic concepts, problems and solution approaches from the field of Data Science.
- are able to justify the choice of specific data analysis methods for a given problem
- include possible imponderables in the analysis when evaluating analysis results

**Methodological competences**

The students

- are able to translate questions from a specific domain into a feasible analysis
- work on Data Science tasks to expand their understanding of the different approaches and methods.

**Social competences**

The students

- discuss approaches and problems encountered in smaller and larger groups

**Self competences**

The students

- reflect on their actions when identifying possible solutions and critically question their own results

**Module contents**
Data Science is an interdisciplinary science at the intersection of statistics, machine learning, data visualization, and mathematical modeling. This course is designed to provide a practical introduction to the field of Data Science by teaching theoretical principles while also applying them practically. Topics covered range from data collection and preparation (data sources & formats, data cleaning, data bias), mathematical foundations (statistical distributions, correlation analysis, significance) and methods for visualization (tables & plots, histograms, best practices) to the development of models for classifying or predicting values (linear regression, classification, clustering).

Literaturempfehlungen

See description of the assigned course

Links

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<td>Teaching/Learning method</td>
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<td>Basics of databases, Python programming and statistics</td>
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Examination

<table>
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<tr>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Written or oral exam or portfolio or project or practical exercise</td>
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</table>

Final exam of module

At the end of the lecture period or by arrangement with the instructor.

Form of instruction

<table>
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<tr>
<th>Comment</th>
<th>SWS</th>
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<tr>
<td>Lecture</td>
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<td>Exercises</td>
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<td>SoSe oder WiSe</td>
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Präsenzzzeit Modul insgesamt

56 h
### inf203 - Embedded Systems I

<table>
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#### Verwendbarkeit des Moduls
- 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 Engineering of Socio-Technical Systems (Master) > Embedded Brain Computer Interaction
- Master's Programme Engineering of Socio-Technical Systems (Master) > Human-Computer Interaction
- Master's Programme Engineering of Socio-Technical Systems (Master) > Systems Engineering

#### Zuständige Personen
- Fränzle, Martin Georg (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

#### Prerequisites
- Basics of technical computer science
- Computer Engineering

#### 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 excercises 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.

Literaturempfehlungen


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 elt ZA 1536)
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## inf204 - Embedded Systems II

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### Verwendbarkeit des Moduls
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlpflichttechnische Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Wahlpflichttechnische Informatik (30 KP)
- Master's Programme Engineering of Socio-Technical Systems (Master) > Embedded Brain Computer Interaction
- Master's Programme Engineering of Socio-Technical Systems (Master) > Systems Engineering

### Zuständige Personen
- Fränzle, Martin Georg (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

### Prerequisites
No participant requirement

### Skills to be acquired in this module

#### 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
Literaturrempfehlungen


Secondary literature:


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| Präsenzzeit Modul insgesamt | 56 h |

module contents.
inf205 - Formal Methods in Embedded System Design

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Verwendbarkeit des Moduls
- 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)

Zuständige Personen
- Fränzle, Martin Georg (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
Sound basic knowledge in mathematical logic, discrete mathematics, automata and computability theory as taught in the modules "Discrete Structures" and "Theoretical Computer Science I + II". In addition, programming skills as acquired in the "Programming Course".

Justification:
The methods presented in the lecture are based on an operationalization of semantics by reduction to logical encodings and mechanized testing of logical statements. An understanding of these contents as well as their tool-technical implementation requires the basics from the aforementioned courses.

Skills to be acquired in this module
The module provides an overview over semantic models for reactive systems, real-time systems, and hybrid systems, as well as examples of corresponding specification logics. It explains state-exploratory verification procedures in both explicit and symbolic variants. The knowledge acquired can be employed in all domains requiring the development of reliable software and hardware systems is concerned

Professional competences
The students:
- make a sound judgement on the scope of the certificates that can be obtained with formal methods
- assess the suitability of available verification tools for a particular problem and system class
- use automatic analysis tools on real systems, interpret the results obtained and subsequently improve the system under investigation in an informed and targeted manner
- prepare system models for automatic analysis procedures and encode them symbolically (or otherwise)
- design and implement their own verification algorithms

Methodological competences
The students:
- master the mathematical modelling of complex and heterogeneous dynamical systems
- know relevant mathematical models of dynamic systems and can instantiate them to new problem classes

Social competences
The students:
- together in a team develop and implement basic algorithms of automatic verification
- discuss the advantages and disadvantages of algorithmic alternatives and different formalisations

Self competences
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
Embedded computer systems maintain constant interaction with their...
environment. This induces interaction sequences that are difficult to predict, which complicates the construction and validation of such systems. Akin to the use of structural models for rigorous validation of building layouts in the construction industry, formal models in computer science have consequently been developed for analysis of various aspects of computing systems in general and embedded systems in particular. They cover execution time, energy demand, or possible system dynamics of embedded systems. They represent the respective aspect of the system in a closed form and thus allow for the - often fully automatic - derivation of reliable certificates that apply to any interaction scenario with the environment. This is in contrast to methods of testing or profiling, which only test selected scenarios and thus can only provide limited coverage.

In this module, various such models are explained and methods for their fully automatic analysis - i.e., derivation certificates - or synthesis - i.e., automatic generation of correct system designs - from such models are explained and demonstrated in their application.

The exercises provide opportunity for deepening understanding through hands-on experience with domain-specific modelling and verification tools, as well as by creating a (small) fully automated verification tool yourself in a guided process.

In the lectures, the semantic, logical, and algorithmic basics of automatic analysis of embedded software systems are taught. The primary form of instruction is the media-supported lecture as well as the didactic question-answer game.

In the exercise classes, the knowledge acquired in the lecture is deepened and put into practice. For this purpose, in the first half of the semester, exercises are set fortnightly, the completion of which in small groups encourages independent testing of the individual understanding of the topic and peer teaching. In the second half of the semester, a larger tool development task is set, also to be pursued on in small groups of 3 students each. The work on these projects spans the entire second half of the semester and offers the possibility of project-oriented learning. In this phase, the exercise classes serve as consultation time with the lecturers; in particular, solution approaches and problems can be presented and discussed.

**Literaturempfehlungen**


**Links**

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**Previous knowledge**

Sound basic knowledge in mathematical logic, discrete mathematics, automata and computability theory as taught in the modules “Discrete Structures” and “Theoretical Computer Science I + II”. In addition, programming skills as acquired in the “Programming Course”.

**Examination**

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- 1st deadline: Submission of the semester project incl. one week after the end of the lecture period of the lecture period; followed by a colloquium and a final discussion
- 2nd deadline: Repeat of the submission of the semester project incl. written elaboration
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<tr>
<td></td>
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<td>two weeks before the beginning of the following semester followed by colloquium and final discussion</td>
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Präsenzzeit Modul insgesamt 56 h
inf207 - Electrical Engineering

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**Verwendbarkeit des Moduls**
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahltbereich 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 of Education Programme (Hauptschule and Realschule) Computing Science (Master of Education) > Mastermodule
- Master's Programme Computing Science (Master) > Interdisziplinäre Module

**Zuständige Personen**
- Hein, Andreas (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
Module Analysis II or Numerics

**Skills to be acquired in this module**

**Professional competence:**
The students:
- analyse linear electrical networks (direct current and alternating current)
- name basic concepts to calculate and to use electrical and magnetic fields
- list the characteristics of simple electrical elements (two terminal networks)
- calculate the parameters of simple electrical networks/wirings
- apply computer based analysing tools
- design and implement simple networks/wirings

**Methodological competence:**
The students:
- transfer calculation methods onto complex dynamic systems
- implement electrical system models

**Social competence:**
The students:
- present solutions for specific questions

**Self-competence:**
The students:
- reflect their solutions by using methods learned in this course

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

**Literaturempfehlungen**

**essential:**
- slides

**recommended:**
- Hagmann, G.: Aufgabensammlung zu den Grundlagen der
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**inf208 - Microrobotics and Microsystems Technology**

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**Verwendbarkeit des Moduls**
- 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) > Interdisziplinäre Module

**Zuständige Personen**
- Fatikow, Sergej (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
No participant requirements

**Skills to be acquired in this module**
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, magnetostrictive, electromagnetic, SMA-based, thermomechanical, electrorheological
and other actuators);

**Microsensors:**
- principles and examples (force and pressure, position and speed, acceleration, biological and chemical, temperature and other sensors);
- MST and information processing;
- microsystem design and simulation;
- classification of microrobots;
- coarse positioning of a microrobot;
- fine positioning of a microrobot;

**Handling of microparts:**
- problems and solutions;
- micro grasp techniques;
- microassembly;

**Process automation by microrobots:**
- desktop robot cell in SEM

**Literaturempfehlungen**

**Essential:**
- Vorlesungsskript in Buchform

**Recommended:**

**Secondary Literature:**
- Eibel, Th.: Mikrosensorik, Vieweg, Wiesbaden, 1996
- Völklein, F. und Zetterer, Th.: Einführung in die Mikrosystemtechnik, Vieweg, Wiesbaden, 2000

**Links**

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**
- annual

**Module capacity**
- unlimited

**Reference text**
- Associated with the modules:
  - Embedded Systems and Microrobotics

**Teaching/Learning method**
- V+Ü

**Previous knowledge**
- none

**Examination**
- Prüfungszeiten
- Type of examination
- Final exam of module
- At the end of the semester
- Oral exam in German

**Form of instruction**
- Comment
- SWS
- Frequency
- Workload of compulsory attendance
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inf209 - Control Theory

**Module label**  
Control Theory

**Modulkürzel**  
inf209

**Credit points**  
6.0 KP

**Workload**  
180 h

**Verwendbarkeit des Moduls**
- 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) > Interdisziplinäre Module

**Zuständige Personen**
- Fatikow, Sergej (module responsibility)
- Hein, Andreas (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
- Differential Equations
- Analysis II
- Fundamentals of 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 modeling;
- step response;
- frequency response;
- frequency response locus;
- differential equations and transfer function; control loop stability;
- types of controlled systems;
- types of linear controllers;

**linear control loops:**
- reference and disturbance reaction of the controlled system;
- rules for control loop optimization;
- methods of analysis and synthesis, implementation;
- computerbased control MATLAB/Simulink
Literaturempfehlungen

- 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

Links

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Previous knowledge

- Differential Equations
- Analysis II
- Fundamentals of electrical engineering

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Präsenzzeit Modul insgesamt

| 56 h |
inf210 - Signal and Image Processing

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**Verwendbarkeit des Moduls**
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahltbereich 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) > Interdisziplinäre Module

**Zuständige Personen**
- Hein, Andreas (module responsibility)
- Fränzle, Martin Georg (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
Module math040 Analysis II b: Differential calculus of several variables

**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

**Literatureempfehlungen**

**Essential:**
- Foliensammlung zur Vorlesung

**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
- Lehrmann, Th.; Oberschelp, W.; Pelinak, E.; Pepges, R.; Bildverarbeitung in der Medizin; Springer Verlag 1997
- Handels, H.; Medizinische Bildverarbeitung; Teubner Verlag, Stuttgart
- Leipzig 2000 weiterführende Literatur wird in der Vorlesung bekannt gegeben

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<td>Skills to be acquired in this module</td>
<td>Introduction to methods for proving the correctness of sequential, parallel, and distributed programs. Professional competence</td>
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<td>The students:</td>
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<tr>
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<td>• describe operational semantics of sequential, parallel, and distributed programs - Know the concepts of partial and total correctness of programs</td>
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<td>• establish soundness and completeness of proof systems</td>
</tr>
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<td>• construct input-output specifications of programs</td>
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<td>• conduct correctness proofs for programs of different classes with the help of proof rules</td>
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<td>• check interference and deadlock freedom of parallel programs</td>
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<td>• transform parallel and distributed programs into nondeterministic programs</td>
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<td>The students:</td>
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<td>• recognize correctness as an important aspect of programs and informatics systems</td>
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<td>Social competence</td>
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<td>The students:</td>
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<td>• work together in small groups to solve problems</td>
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<td>• present their solutions to groups of other students</td>
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<td>Self-competence</td>
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<td>The students:</td>
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<td></td>
<td>• learn persistence in pursuing difficult tasks</td>
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<td>• learn precision in specifying problems</td>
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<td>Module contents</td>
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<td>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.</td>
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| **Präsenzzeit Modul insgesamt** | 56 h |
inf410 - Formal Methods

Module label: Formal Methods
Modulkürzel: inf410
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Theoretische Informatik)

Zuständige Personen
- Wehrheim, Heike (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
Useful previous knowledge: Course Logic

Skills to be acquired in this module
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

Module contents
- Short recap of predicate logic, use of predicate logic in program verification
- Petri nets
- Process algebra CCS
- Timed automata
- Z

Literaturempfehlungen

Links
Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: every summer term
Module capacity: unlimited
### Reference text

#### Teaching/Learning method

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#### Previous knowledge

Useful previous knowledge: Course Logic

#### Examination

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#### Final exam of module

Weekly assignments, oral examination at the end

#### Form of instruction

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inf420 - Introduction to IT-Security

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Verwendbarkeit des Moduls
- 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) > Pflichtmodule
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Angewandte Informatik)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Theoretische Informatik)
- Master of Education Programme (Hauptschule and Realschule) Computing Science (Master of Education) > Mastermodule

Zuständige Personen
- Peter, Andreas (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
- No participant requirements

Skills to be acquired in this module

Students understand the basic concepts, methods and protocols for protecting data and systems from manipulation and misuse on a basic, practice-oriented, scientific level (see "contents of the module"). The students can explain the causes of security problems in today’s systems, can reproduce the connections between protection mechanisms and the problems they address, and can apply them to case studies. They can identify vulnerabilities, analyze them and understand the attack mechanisms described. In addition, the students are able to discuss possible solutions and are able to protect systems accordingly.

Professional competence
The students
- understand the semantics of security and explain the properties of secure IT systems (see "contents of the module"),
- discuss the importance of IT security, and
- carry out simple security analyses of systems.

Methodological competence
The students
- use concepts and techniques to increase security, in particular regarding which protection goals can be achieved with which techniques (see "contents of the module"),
- apply mechanisms of IT security in simple scenarios, and
- question the properties and limits of security concepts and combine different concepts in a meaningful way.

Social competence
The students
- solve problems partially in small groups and thus improve their willingness to cooperate and their communication skills,
- present solutions to IT security problems in front of the exercise group,
- discuss their different solutions within the exercise group, and
- improve their English language skills.

Self-competence
The students
- motivate themselves to work on questions and problems in the domain of IT security,
- justify their own actions with theoretical and methodical knowledge, and
- critically reflect on proposed solutions in relation to social expectations.
and consequences, taking into account the methods taught.

Module contents

The course provides a broad introduction to IT security, covering the following topics:

- basic terms, concepts, and principles in IT security,
- major cryptographic building blocks (encryption, signatures, ...),
- access control models and mechanisms,
- authentication and key exchange protocols,
- network security basics,
- anonymous communication (including TOR), and
- basics of privacy protection.

Literaturempfehlungen


Links

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Examination

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Präsenzzeit Modul insgesamt 4 h
inf517 - Introduction to Energy Informatics

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**Verwendbarkeit des Moduls**
- 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 (Vocational and Business Education) Computing Science (Master of Education) > Praktische Vertiefung der Informatik

**Zuständige Personen**
- Nieße, Astrid (module responsibility)
- Vogel-Sonnenschein, Ute (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
Die Studierenden lernen an Beispielen, die Grenzen der eigenen Fachdisziplin in der Anwendung zu erkennen sowie Forschungsfragestellungen zu identifizieren und einzuordnen.

ACHTUNG: Dies Modul wird nicht mehr angeboten! Die Inhalte wurden in Modul inf518 integriert.

**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.

**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
- Virtual power plants
- Demand side management and flexibility

**Literaturempfehlungen**

**Links**

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**Previous knowledge**

Basic knowledge in the field of power engineering or computer science can be brought in, but is not a prerequisite.

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Lecture

**SWS**

2

**Frequency**

siehe Angebotsrhythmus Modul
inf518 - Foundations of Energy Informatics

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**Verwendbarkeit des Moduls**
- 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 of Education Programme (Hauptschule and Realschule) Computing Science (Master of Education) > Mastermodule

**Zuständige Personen**
- Lehrenden, Die im Modul (Prüfungsberechtigt)
- Rauh, Andreas (module responsibility)
- Vogel-Sonnenschein, Ute (module responsibility)

**Prerequisites**
Diesem Modul können Sie gut folgen, wenn Sie Vorkenntnisse mitbringen in
- Grundkenntnisse in Lineare Algebra,
- Analysis,
- Grundlegende Programmierkenntnisse

**Skills to be acquired in this module**
The students learn to recognize the limits of their own specialist discipline in the application and to identify and classify research questions. They have a basic understanding of the structure of such systems and their physical/chemical properties. and can model simple system components.

**Professional competences**
The students
- know the basics of modern energy systems and energy markets
- can critically classify issues in the context of energy systems and energy research
- are familiar with the structure of selected energy-related components in energy systems
- know the regulatory challenges and components in energy systems and their electrotechnical properties
- know approaches to the experimental identification of energy technology components.

**Methodological competences**
The students
- can apply computer science methods for energy systems and energy research
- can model and simulate simple dynamic systems in a control-oriented form in Matlab/Simulink
- independently acquire knowledge on given questions

**Social competences**
The students
- discuss appreciatively in an interdisciplinary context
- work cooperatively in teams to solve given tasks

**Self competences**
The students
- deepen their competence in presenting the results they have worked out themselves

**Module contents**
The first part of the module gives an introduction to the different topics in energy informatics. The role of computer science in this area is explained on the basis of a subject area and the connection between energy technology and energy management issues and
basic IT skills is shown.<br />

Topics are

- Foundations of electrical engineering and power management
- Energy markets
- Network planning and management
- Demand Side Management
- Virtual Power Plants

The second part addresses the control-oriented modelling on the example of energy systems and components taking into account their physical and electro-technical features. We will derive models of system components like battery storage, wind turbines, photovoltaics and fuel cells.<br />

The participants will design first control-oriented Models with MatLab/Simulink and validate them e.g. by using measurements of open circuit voltages of batteries. (Basics of Matlab Simulink will be explained in the tutorials. The batteries' internal resistances and charge/discharge dynamics are identified by controllable electronic loads in conjunction with programmable rapid control prototyping hardware.)

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**Literatureempfehlungen**

**Links**

- Languages of instruction: German, English
- Duration (semesters): 1 Semester
- Module frequency: every summer term
- Module capacity: 20
- Teaching/Learning method: 1VL + 1Ü (4 SWS)
- Previous knowledge: Linear algebra, calculus, basic programming skills

**Examination**

- Prüfungszeiten: Linear algebra, calculus, basic programming skills
- Type of examination: Final exam of module during the semester

**Final exam of module**

- Form of instruction: Lecture: 2 SWS, Exercises: 2 SWS
- Comment: During the semester
- Frequency: SoSe
- Workload of compulsory attendance: 28

**Präsenzzeit Modul insgesamt**

- 56 h
### Module Contents

The assigned lectures will provide an overview of the fields of medical informatics and the unique challenges of applying informatics methods and technologies to medicine and health care.

### Literatureempfehlungen

Will be announced in the course.

### Links

**Language of instruction**  
German

**Duration (semesters)**  
1 Semester
Module frequency: every winter term
Module capacity: unlimited
Teaching/Learning method: 1VL + 1Ü
Previous knowledge: none

Examination
Prüfungszeiten: Type of examination
Final exam of module: Written or oral exam
at the end of the lecture period

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<td>&quot;Präsenzzeit Modul insgesamt&quot;</td>
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inf529 - Big Data in Medicine

<table>
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<td>Workload</td>
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<td>Verwendbarkeit des Moduls</td>
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<td>• Bachelor’s Programme Computing Science (Bachelor) &gt; Akzentsetzungsbereich - Wahlbereich Informatik</td>
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<td>Zuständige Personen</td>
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<td></td>
<td>• Wulff, Antje (module responsibility)</td>
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<td></td>
<td>• Lehrenden, Die im Modul (Prüfungsberechtigt)</td>
</tr>
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</table>

**Prerequisites**

- Introduction to the subfield "Big Data in Medicine" from the field of medical informatics.

**Professional competences**

The students

- know the definition and meaning of "Big Data" in the medical context
- know the challenges of dealing with healthcare data sets
- know the Big Data pipeline and examples from the different areas of the pipeline for the medical context

**Methodological competences**

The students

- recognize potentials and challenges in data-driven use cases from the healthcare sector
- can describe the characteristics of medical data sets using the methods learned
- can design solutions for medical, data-driven issues using the methods learned

**Social competences**

The students

- recognize the importance of interdisciplinary communication and collaboration in the analysis of medical data
- develop, present and discuss the solutions from the exercises with others

**Self competences**

The students

- know their responsibilities when dealing with medical records
- reflect on problems and solutions, incorporating the methods they have learned

**Module contents**

The assigned lectures will provide an overview of the subject area "Big Data in Medicine" and the particular challenges and characteristics of medical data and its sources, (storage) infrastructures, and processing and presentation options.

**Literaturempfehlungen**

Will be announced in the course

**Links**

**Language of instruction** German

**Duration (semesters)** 1 Semester

**Module frequency** every summer term

**Module capacity** unlimited

**Teaching/Learning method** 1VL + 1Ü oder 1PR

**Previous knowledge** none
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| Präsenzzeit Modul insgesamt | 56 h |


inf530 - Artificial Intelligence

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**Verwendbarkeit des Moduls**
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- 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 (Hauptschule and Realschule) Computing Science (Master of Education) > Akzentsetzungsbereich

**Zuständige Personen**
- Sauer, Jürgen (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
- Basic knowledge of computer science/business informatics

**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

**Literaturempfehlungen**
### Links

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### Previous knowledge

Basic knowledge of computer science/business informatics

### Examination

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### Form of instruction

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### Präsenzzeit Modul insgesamt

56 h
inf540 - Applications in Artificial Intelligence

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| Skills to be acquired in this module| Upon successful completion of the course students should have acquired the ability to master the presented methods safely in theory and practice. The students solve practical problems in the area of ??AI by themselves in a goal-oriented manner.  

**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

**Literaturempfehlungen**

Scientific publications with the tags:
Autonomous drone, robotics, ai, deep drone racing.

See: https://scholar.google.de/scholar?hl=de&as_sdt=0%2C5&q=deep+drone+racing&btnG=

**Links**

https://www.iros2019.org/
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**inf600 - Business Informatics I**

**Module label**  
Business Informatics I

**Modulkürzel**  
inf600

**Credit points**  
6.0 KP

**Workload**  
180 h

**Verwendbarkeit des Moduls**
- Bachelor's Programme Business Informatics (Bachelor) > Basiscurriculum
- 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 (Hauptschule and Realschule) Computing Science (Master of Education) > Mastermodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Pflichtbereich

**Zuständige Personen**
- Sauer, Jürgen (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
No participant requirements

**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 focusses on information systems of the networked company. Technical, economic, organisational, and psychosocial aspects are considered. The understanding of these relations will be trained by means of case studies taken from Laudon et al. (cf. suggested reading).

The lecture gives an overview of the following business informatics
fields:

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

Literatureempfehlungen

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

Links

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inf601 - Business Informatics II

Module label Business Informatics II
Modulkürzel inf601
Credit points 6.0 KP
Workload 180 h

Verwendbarkeit des Moduls
- 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) > Studiennachricht Wirtschaftsinformatik
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlpflichtbereich
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Angewandte Informatik)

Zuständige Personen
- Marx Gómez, Jorge (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
No participant requirements

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 Ressource Management, Management approach, management approach, personal information management) and understand why determining the value of information management is necessary and how it is done
- specify the objectives of information management, differentiate and classify its tasks appropriately
- recognize the methodological characteristics of information management
- transfer the concept of architecture to the information infrastructure
- assess the importance to plan features for strategic IT-design oriented on IT-architecture
- schedule the procedures concerning the strategetical 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 strategetical 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

Literaturempfehlungen

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

Links

http://www.wi-ol.de

Language of instruction

German

Duration (semesters)

1 Semester

Module frequency

annual

Module capacity

unlimited

Teaching/Learning method

1VL + 1Ü

Previous knowledge

none

Examination

Prüfungszeiten

Type of examination

Final exam of module

Usually two weeks after lecture time

Written exam max. 120 minutes

Form of instruction

Comment

SWS

Frequency

Workload of compulsory attendance

Lecture

2

SoSe

28

Exercises

2

SoSe

28

Präsenzzzeit Modul insgesamt

56 h
inf603 - Planning and Simulation in Logistics

<table>
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**Verwendbarkeit des Moduls**
- 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)

**Zuständige Personen**
- Sauer, Jürgen (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
No participant requirements

**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 logistics
- know approaches and algorithms to solve simulation and planning problems/challenges
- are able to model solutions for simple production problems/challenges with a simulation tool and
- are able to solve given tasks with it
- are able to identify, classify and associate solutions to problems/challenges
- are able 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.

**Literatureempfehlungen**
- selected material on the simulation tool
- others will be announced in the lecture
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| Präsenzzeit Modul insgesamt | 56 h |
inf609 - Business Process Management

<table>
<thead>
<tr>
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<td>Modulkürzel</td>
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<tr>
<td>Credit points</td>
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<tr>
<td>Workload</td>
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</table>

**Verwendbarkeit des Moduls**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

**Zuständige Personen**
- Sauer, Jürgen (module responsibility)
- Lehrenden, die im Modul (Prüfungsberechtigt)

**Prerequisites**
- Business Informatics 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**
- The 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
  - 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

**Literaturempfehlungen**
- Gadatsch, A. (2010), Grundkurs Geschäftsprozess-Management, &.
  Aufl., Wiesbaden
This is an e-learning module offered by the University of Osnabrück as a teaching import (ATLANTIS project).

<table>
<thead>
<tr>
<th>Language of instruction</th>
<th>German</th>
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<td>This is an e-learning module offered by the University of Osnabrück as a teaching import (ATLANTIS project).</td>
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<td>At the end of the lecture period Written exam</td>
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<td>Exercises</td>
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<td>28</td>
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</table>

| Präsenzzeit Modul insgesamt | 56 h |
inf608 - eBusiness

Module label: eBusiness
Modulkürzel: inf608
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls
- 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) > Mastermodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich

Zuständige Personen
- Marx Gómez, Jorge (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
- No participant requirement

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 conceptualities 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 SQL Injection, PHP, XML, XML-Security, data modelling, Online-Shop development and Online-Shop administration)

**Literaturempfehlungen**


**Links**

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

**Language of instruction**

- German

**Duration (semesters)**

- 1 Semester

**Module frequency**

- annual

**Module capacity**

- unlimited

**Teaching/Learning method**

- 1VL + 1Ü

**Previous knowledge**

- none

**Examination**

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<tr>
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inf610 - Enterprise Architecture Management

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Verwendbarkeit des Moduls
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

Zuständige Personen
- Sauer, Jürgen (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
Business Informatics I

Skills to be acquired in this module
- This module addresses basic elements of enterprise architectures and their management as well as concepts and methodologies used to describe and develop enterprise architectures.

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
- technology architecture

Literaturempfehlungen
- Enterprise Architecture Frameworks Kompendium – Dirk Matthes –
<table>
<thead>
<tr>
<th>Links</th>
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<tbody>
<tr>
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<th>Prüfungszeiten</th>
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<td>With an appropriate number of participants (&lt;12 students), an oral examination will be held. In case of a high number of participants (&gt;12 students), an exam will be held instead. It counts the number of participants in the Stud.IP at the beginning of the first course. Exercises are issued during the semester, the successful completion of them is credited to the examination with a maximum total of 10% bonus.</td>
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| Präsenzzeit Modul insgesamt | 56 h |
### inf612 - Re-engineering of business processes

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**Verwendbarkeit des Moduls**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

**Zuständige Personen**
- Marx Gómez, Jorge (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
- Business Informatics II

**Skills to be acquired in this module**

**Professional Competence**
The students:
- 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.

**Methodological Competence**
The students:
- learn the pros and cons of different methods by applying them to model business processes.

**Social Competence**
The students:
- 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**
The students:
- 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.

**Literaturempfehlungen**

**Links**
https://uol.de/vlba/

**Language of instruction**
German
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<td>written exam and practical exercises</td>
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inf700 - Computer Science Education I

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<td>• Bachelor's Programme Computing Science (Bachelor) &gt; Akzentsetzungsbereich - Wahlbereich Informatik</td>
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<td>Zuständige Personen</td>
<td>• Diethelm, Ira (module responsibility)</td>
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<td>• Lehrenden, Die im Modul (Prüfungsberechtigt)</td>
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<td>Prerequisites</td>
<td>Basic knowledge of computer science</td>
</tr>
<tr>
<td>Skills to be acquired in this module</td>
<td>Professional competence</td>
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</tbody>
</table>
|                       | 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.

Literaturempfehlungen

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### inf801 - Research Seminar in Computer Science

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#### Verwendbarkeit des Moduls
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

#### Zuständige Personen
- Nieße, Astrid (module responsibility)
- Sauer, Jürgen (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

#### Prerequisites
- No participant requirements

#### 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.

<table>
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<tr>
<th>Professional competence</th>
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<tbody>
<tr>
<td>The students:</td>
</tr>
<tr>
<td>- characterise and apply computer science basics (algorithms, data structures, programming, basics of practical, technical and theoretical computer science)</td>
</tr>
<tr>
<td>- reflect a scientific topic and present their solutions</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Methodological competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>The students:</td>
</tr>
<tr>
<td>- examine problems, use formal methods to phrase them and analyze them appropriately</td>
</tr>
<tr>
<td>- evaluate problems by the use of technical and scientific literature</td>
</tr>
<tr>
<td>- reflect on a scientific topic and write a scientific seminar paper under guidance and present their findings</td>
</tr>
<tr>
<td>- work scientifically</td>
</tr>
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<table>
<thead>
<tr>
<th>Social competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>The students:</td>
</tr>
<tr>
<td>- communicate considerately and appropriately with users and experts</td>
</tr>
<tr>
<td>- use presentation methods</td>
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<table>
<thead>
<tr>
<th>Self-competence</th>
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</thead>
<tbody>
<tr>
<td>The students:</td>
</tr>
<tr>
<td>- plan their informatical actions independently</td>
</tr>
<tr>
<td>- reflect their contributions critically and discuss them with users and experts</td>
</tr>
<tr>
<td>- collect and update their knowledge independently</td>
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#### Module contents
- according to the assigned task

#### Literaturempfehlungen
- according to the assigned task

#### Links

#### Language of instruction
- German

#### Duration (semesters)
- 1 Semester

#### Module frequency
- semi-annual

#### Module capacity
- unlimited

#### Teaching/Learning method
- 1S

#### Previous knowledge
- none

#### Examination
- Prüfungsberechtigt

#### Final exam of module
- Type of examination: Presentation

#### Form of instruction
- Seminar

#### SWS
- 2
inf803 - Special Topics in Computer Science I

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**Verwendbarkeit des Moduls**
- 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

**Zuständige Personen**
- Nieße, Astrid (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
The expected previous knowledge is specified in the details of the assigned course.

**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 course

**Literaturempfehlungen**
According to the assigned course

**Languages of instruction**
German, English

**Duration (semesters)**
1 Semester

**Module frequency**
semi-annual

**Module capacity**
unlimited

**Reference text**
Falls mehr dem Modul mehr als eine Veranstaltung zugeordnet ist, wählen Sie in der Regel Veranstaltungen im Gesamtumfang von 4 SWS aus, bspw. eine Vorlesung mit zugehöriger Übung. Weitere Informationen finden Sie in der Beschreibung (Details) der zugeordneten Veranstaltungen.

**Examination**

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**Form of instruction**
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### inf804 - Special Topics in Computer Science II

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#### Verwendbarkeit des Moduls
- 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

#### Zuständige Personen
- Nieße, Astrid (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

#### Prerequisites
The expected previous knowledge is specified in the details of the assigned course.

#### 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 course

#### Literatureempfehlungen
According to the assigned course

#### Links

#### Languages of instruction
German, English

#### Duration (semesters)
1 Semester

#### Module frequency
irregularly

#### Module capacity
unlimited

#### Reference text
Falls mehr dem Modul mehr als eine Veranstaltung zugeordnet ist, wählen Sie in der Regel Veranstaltungen im Gesamtumfang von 4 SWS aus, bspw. eine Vorlesung mit zugehöriger Übung. Weitere Informationen finden Sie in der Beschreibung (Details) der zugeordneten Veranstaltungen.

#### Examination

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#### Final exam of module

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inf805 - Special Topics in Computer Science III

Module label: Special Topics in Computer Science III
Modulkürzel: inf805
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls:
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

Zuständige Personen:
- Nieße, Astrid (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites:
The expected previous knowledge is specified in the details of the assigned course.

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 course
Literatureempfehlungen: According to the assigned course
Links
Languages of instruction: German, English
Duration (semesters): 1 Semester
Module frequency: irregularly
Module capacity: unlimited


Examination
Prüfungszeiten
Type of examination
Final exam of module
Exercises or presentation or oral exam or written exam
Form of instruction: VA-Auswahl
SWS: 4
Frequency: siehe Angebotsrhythmus Modul
inf806 - Special Topics in Computer Science IV

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Verwendbarkeit des Moduls
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

Zuständige Personen
- Nieße, Astrid (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
The expected previous knowledge is specified in the details of the assigned course.

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 course

Literaturempfehlungen
According to the assigned course

Links

Languages of instruction
German, English

Duration (semesters)
1 Semester

Module frequency
irregularly

Module capacity
unlimited

Examination
Prüfungszeiten
Type of examination

Final exam of module
Exercises or presentation or oral exam or written exam

Form of instruction
VA-Auswahl

SWS
4

Frequency
siehe Angebotsrhythmus Modul
inf807 - Special Topics in Computer Science V

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| Zuständige Personen   | • Nieße, Astrid (module responsibility)  
                          • Lehrenden, Die im Modul (Prüfungsberechtigt) |
| Prerequisites         | The expected previous knowledge is specified in the details of the assigned course. |
| 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 |

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<th>Module contents</th>
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inf808 - Current Topics in Computer Science

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**Verwendbarkeit des Moduls**
- 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

**Zuständige Personen**
- Nieße, Astrid (module responsibility)
- Sauer, Jürgen (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
Keine

**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

**Literaturempfehlungen**
According to the assigned task

**Language of instruction**
German

**Duration (semesters)**
1 Semester

**Module frequency**
unregelmäßig

**Module capacity**
unlimited

**Examination**

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inf809 - Current Topics in Computer Science II

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</tr>
<tr>
<td></td>
<td>• evaluate the possibilities and limits of computer science methods and tools and apply them appropriately</td>
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</tbody>
</table>

**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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<td>Duration (semesters)</td>
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inf852 - IT Project Management

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Verwendbarkeit des Moduls

- Bachelor's Programme Biology (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Business Administration and Law (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Business Informatics (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Chemistry (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Comparative and European Law (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Bachelor's Programme Computing Science (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Economics and Business Administration (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Bachelor's Programme Education (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Engineering Physics (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Environmental Science (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Intercultural Education and Counselling (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Mathematics (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Physics (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Physics, Engineering and Medicine (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Social Studies (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Bachelor's Programme Sustainability Economics (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Art and Media (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Biology (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Chemistry (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Dutch Linguistics and Literary Studies (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Economic Education (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Education (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Elementary Mathematics (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme English Studies (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Gender Studies (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme General Education (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme German Studies (Bachelor) >
Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme History (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-subject bachelor's programme Low German (Bachelor) > Praxismodule für Studierende mit außerschulischem Berufsziel
- Dual-Subject Bachelor's Programme Material Culture: Textiles (Bachelor) > Praxismodule für Studierende mit außerschulischem 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 Special Needs Education (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) > Interdisziplinäre Module

Zuständige Personen
- Sauer, Jürgen (Prüfungsberechtigt)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
No participant requirements

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)
- Project Planning (Project Structure, Network Analysis, Project Plans)
- Project Control (Cost Evaluation, Quality Control)
- Project Completion The participants get familiar with project management tools.
- Presentations drawn from practice are intended.

### Literatureempfehlungen


### Links

- www.wi-ol.de

### Language of instruction

- German

### Duration (semesters)

- 1 Semester

### Module frequency

- annual

### Module capacity

- unlimited

### Teaching/Learning method

- 1VL + 1Ü

### Previous knowledge

- none

### Examination

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<tbody>
<tr>
<td>Exercises</td>
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</table>

### Präsenzzeit Modul insgesamt

| 56 h |
inf853 - Application Fields of Computer Science I

<table>
<thead>
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<th>Module label</th>
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<tbody>
<tr>
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Verwendbarkeit des Moduls
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

Zuständige Personen
- Nieße, Astrid (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

Prerequisites
The required prerequisites are specified in the details of the assigned course.

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

Literaturempfehlungen
According to the assigned task

Links

Languages of instruction
German, English

Duration (semesters)
1 Semester

Module frequency
irregular

Module capacity
unlimited

Teaching/Learning method
2 VA aus VL, Ü, S, P, PR

Examination
Prüfungszeiten
Type of examination

Final exam of module
Exercises or presentation or oral exam or written exam

Form of instruction
VA-Auswahl

SWS
4

Frequency
siehe Angebotsrhythmus Modul
### inf854 - Application Fields of Computer Science II

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<tr>
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#### Verwendbarkeit des Moduls
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

#### Zuständige Personen
- Nieße, Astrid (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

#### Prerequisites
The required prerequisites are specified in the details of the assigned course.

#### 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

#### Literatureempfehlungen
According to the assigned task

#### Links

#### Languages of instruction
German, English

#### Duration (semesters)
1 Semester

#### Module frequency
irregular

#### Module capacity
unlimited

#### Examination
Prüfungszeiten
Type of examination

#### Final exam of module
Exercises or presentation or oral exam or written exam

#### Form of instruction
VA-Auswahl

#### SWS
4

#### Frequency
siehe Angebotsrhythmus Modul
### inf855 - Application Fields of Computer Science III

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| Verwendbarkeit des Moduls          | - Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik  
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik |
| Zuständige Personen               | - Nieße, Astrid (module responsibility)  
- Lehrenden, Die im Modul (Prüfungsberechtigt) |
| Prerequisites                     | The required prerequisites are specified in the details of the assigned course. |
| 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 course          |
| Literatureempfehlungen             | According to the assigned course          |
| Links                              |                                            |
| Languages of instruction           | German, English                           |
| Duration (semesters)               | 1 Semester                                |
| Module frequency                   | semi-annual                               |
| Module capacity                    | unlimited                                  |
| Examination                       |                                            |
| Prüfungszeiten                    |                                            |
| Type of examination               |                                            |
| Final exam of module              | Exercises or presentation or oral exam or written exam |
| Form of instruction               | VA-Auswahl                                 |
| SWS                               | 4                                          |
| Frequency                         | siehe Angebotsrhythmus Modul              |
### inf856 - Application Fields of Computer Science IV

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<td></td>
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<tr>
<td></td>
<td><strong>Professional competence</strong></td>
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<tr>
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<td>The students:</td>
</tr>
<tr>
<td></td>
<td>• know a computer science application area</td>
</tr>
<tr>
<td></td>
<td>• transfer computer science methods and development models to/with IT application area requirements</td>
</tr>
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<td><strong>Methodological competence</strong></td>
</tr>
<tr>
<td></td>
<td>The students:</td>
</tr>
<tr>
<td></td>
<td>• know and name ways of thinking and methods of other subject areas</td>
</tr>
<tr>
<td></td>
<td><strong>Social competence</strong></td>
</tr>
<tr>
<td></td>
<td>The students:</td>
</tr>
<tr>
<td></td>
<td>• communicate considerately and appropriately with users and experts</td>
</tr>
<tr>
<td></td>
<td><strong>Self-competence</strong></td>
</tr>
<tr>
<td></td>
<td>The students:</td>
</tr>
<tr>
<td></td>
<td>• plan their informationsal actions independently</td>
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<tr>
<td></td>
<td>• reflect their contributions critically and discuss them with users and experts</td>
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<td>Examination</td>
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<td>Type of examination</td>
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<td>Final exam of module</td>
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<td>Form of instruction</td>
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<td>SWS</td>
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inf857 - Application Fields of Computer Science V

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**Verwendbarkeit des Moduls**
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik

**Zuständige Personen**
- Nieße, Astrid (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
The required prerequisites are specified in the details of the assigned course.

**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 course

**Literaturempfehlungen**
According to the assigned course

**Links**

**Languages of instruction**
German, English

**Duration (semesters)**
1 Semester

**Module frequency**
semi-annual

**Module capacity**
unlimited

**Examination**
Prüfungszeiten
Type of examination

**Final exam of module**
Exercises or presentation or oral exam or written exam

**Form of instruction**
VA-Auswahl

**SWS**
4

**Frequency**
siehe Angebotsrhythmus Modul
inf860 - Study Abroad I

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<td>180 h</td>
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**Verwendbarkeit des Moduls**
- 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

**Zuständige Personen**
- Marx Gómez, Jorge (Module counselling)
- Fränkle, Martin Georg (Module counselling)
- Vogel-Sonnenschein, Ute (module responsibility)
- Sauer, Jürgen (module responsibility)

**Further responsible persons**
Studiengangsverantwortliche der Bachelor-Studiengänge des Departments für Informatik

**Prerequisites**
According to the requirements of the selected courses at the international host university

**Skills to be acquired in this module**

**Professional competence**
- depending on the chosen course at the host university

**Methodological competence**
- depending on the chosen course at the host university

The students
- organize themselves independently in the culture of the host country
- use time and other resources efficiently and in a goal-oriented manner

**Social competence**
The students
- have intercultural competence: they interact successfully and appropriately with individuals and groups from other cultures,
- communicate with people from other cultures in a targeted and respectful manner,
- have in-depth empathic skills. They empathize with other people on a cognitive and emotional level, listen carefully and attentively, and understand the opinions of others.

**Self-competence**
The students
- have generally deepened their skills in a foreign language for subject-related discourse,
- express themselves fluently in the language of their host country,
- adapt to changing living and learning environments,
- deal tolerantly with ambiguities,
- approach other people openly,
- assess their own strengths and weaknesses appropriately,
- make appropriate decisions even in difficult situations,
- work on challenges in a solution- and goal-oriented manner,
- face up to new tasks, challenges and experiences.

**Module contents**
The ongoing process of globalization requires preparation for professional activities that are increasingly internationally oriented.
This requires not only foreign language skills, but also intercultural skills in particular. These skills are intensively promoted during a semester abroad. As courses at the host university can also relate to areas of knowledge that are not included in the Computer Science curriculum or are outside of Computer Science, such coursework completed in the host country can be credited via this module.

The choice of courses at the host university is agreed in advance of the stay as part of a learning agreement with the student advisor or, depending on the requirements of the place of study and the study financing, with the international representatives of the Department of Computer Science.

<table>
<thead>
<tr>
<th>Literatureempfehlungen</th>
<th>Specification of the foreign university</th>
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<tbody>
<tr>
<td><strong>Links</strong></td>
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<tr>
<td>• International Student Office of CvO Universität</td>
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<tr>
<td>• Web-Site of the Computer Science Department (in German)</td>
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| Languages of instruction                         | English, French, German |
| Duration (semesters)                             | 1 Semester |
| Module frequency                                 | individual |
| Module capacity                                  | unlimited |
| Teaching/Learning method                         | VA |
| Previous knowledge                               | none |
| Examination                                      | Prüfungszeiten |
| Final exam of module                             | Vorgabe der ausländischen Hochschule |
| Form of instruction                              | VA-Auszahl (Vorgabe der ausländischen Hochschule) |
| SWS                                               | 4 |
| Frequency                                         | siehe Angebotsrhythmus Modul |

Recognition must be applied for at the Academic Examinations Office. Transcripts of records from courses attended at the foreign university must be submitted in German or English translation.
inf861 - Study Abroad II

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Verwendbarkeit des Moduls
- 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

Zuständige Personen
- Sauer, Jürgen (module responsibility)
- Vogel-Sonnenschein, Ute (module responsibility)
- Marx Gómez, Jorge (Module counselling)
- Fränzle, Martin Georg (Module counselling)

Further responsible persons
- Studiengangsverantwortliche der Bachelor-Studiengänge des Departments für Informatik

Prerequisites
According to the requirements of the selected courses at the international host university

Skills to be acquired in this module

Professional competence
- depending on the chosen course at the host university

Methodological competence
- depending on the chosen course at the host university

The students
- organize themselves independently in the culture of the host country
- use time and other resources efficiently and in a goal-oriented manner

Social competence
The students
- have intercultural competence: they interact successfully and appropriately with individuals and groups from other cultures,
- communicate with people from other cultures in a targeted and respectful manner,
- have in-depth empathic skills. They empathize with other people on a cognitive and emotional level, listen carefully and attentively, and understand the opinions of others.

Self-competence
The students
- have generally deepened their skills in a foreign language for subject-related discourse,
- express themselves fluently in the language of their host country,
- adapt to changing living and learning environments,
- deal tolerantly with ambiguities,
- approach other people openly,
- assess their own strengths and weaknesses appropriately,
- make appropriate decisions even in difficult situations,
- work on challenges in a solution- and goal-oriented manner,
- face up to new tasks, challenges and experiences.

Module contents
The ongoing process of globalization requires preparation for professional activities that are increasingly internationally oriented. This requires not only foreign language skills, but also intercultural skills in particular. These skills are intensively promoted during a semester abroad. As courses at the host university can also relate to areas of knowledge that are not included in the Computer Science curriculum or are outside of Computer
Science, such coursework completed in the host country can be credited via this module. The choice of courses at the host university is agreed in advance of the stay as part of a learning agreement with the student advisor or, depending on the requirements of the place of study and the study financing, with the international representatives of the Department of Computer Science.

<table>
<thead>
<tr>
<th>Literatureempfehlungen</th>
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<td>• Web-Site of the Computer Science Department (in German)</td>
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<table>
<thead>
<tr>
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<tbody>
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<td>Examination</td>
<td>Prüfungszeiten</td>
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<tr>
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<td>Recognition must be applied for at the Academic Examinations Office.</td>
</tr>
<tr>
<td></td>
<td>Transcripts of records from courses attended at the foreign university must be submitted in German or English translation.</td>
</tr>
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</table>

| Form of instruction      | VA-Auswahl (Vorgabe der ausländischen Hochschule) |
| Frequency                | siehe Angebotsrhythmus Modul |
| SWS                      | 6 |
## Wahlbereich Informatik, Kultur und Gesellschaft

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### Verwendbarkeit des Moduls
- 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

### Zuständige Personen
- Diethelm, Ira (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

### Prerequisites
- Basic knowledge of computer science

### 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.
Literaturempfehlungen


Links

<table>
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Form of instruction Comment SWS Frequency Workload of compulsory attendance

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<td>SoSe</td>
<td>28</td>
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Präsenzzeit Modul insgesamt 56 h
inf851 - Computer Science and Society

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Verwendbarkeit des Moduls

- 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"
- 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 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 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 Economic Education (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme History (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 German Studies (Bachelor) > Säule "Überfachliche Professionalisierung"
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:

- Dual-subject bachelor's programme Low German (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 (Hauptschule and Realschule) Computing Science (Master of Education) > Mastermodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Recht und Gesellschaft
- 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

Literaturempfehlungen

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

Links

https://uol.de/iug

Language of instruction

German

Duration (semesters)

1 Semester

Module frequency

annual

Module capacity

unlimited

Reference text

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

Teaching/Learning method

1VL + 1S

Previous knowledge

none

Examination

Type of examination

Final exam of module

During semester and at the end

Portfolio (5-6 partial performances)

Form of instruction

Comment

SWS

Frequency

Workload of compulsory attendance

| Lecture | 2 | WiSe | 28 |
| Seminar | 2 | WiSe | 28 |

Präsenzzzeit Modul insgesamt

56 h
inf860 - Study Abroad I

Module label | Study Abroad I
---|---
Modulkürzel | inf860
Credit points | 6.0 KP
Workload | 180 h

**Verwendbarkeit des Moduls**
- 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

**Zuständige Personen**
- Marx Gómez, Jorge (Module counselling)
- Fränzle, Martin Georg (Module counselling)
- Vogel-Sonnenschein, Ute (module responsibility)
- Sauer, Jürgen (module responsibility)

**Further responsible persons**
Studiengangsverantwortliche der Bachelor-Studiengänge des Departments für Informatik

**Prerequisites**
According to the requirements of the selected courses at the international host university

**Skills to be acquired in this module**

**Professional competence**
- depending on the chosen course at the host university

**Methodological competence**
- depending on the chosen course at the host university

The students
- organize themselves independently in the culture of the host country
- use time and other resources efficiently and in a goal-oriented manner

**Social competence**

The students
- have intercultural competence: they interact successfully and appropriately with individuals and groups from other cultures,
- communicate with people from other cultures in a targeted and respectful manner,
- have in-depth empathic skills. They empathize with other people on a cognitive and emotional level, listen carefully and attentively, and understand the opinions of others.

**Self-competence**

The students
- have generally deepened their skills in a foreign language for subject-related discourse,
- express themselves fluently in the language of their host country,
- adapt to changing living and learning environments,
- deal tolerantly with ambiguities,
- approach other people openly,
- assess their own strengths and weaknesses appropriately,
- make appropriate decisions even in difficult situations,
- work on challenges in a solution- and goal-oriented manner,
- face up to new tasks, challenges and experiences.

**Module contents**
The ongoing process of globalization requires preparation for professional activities that are increasingly internationally oriented.
This requires not only foreign language skills, but also intercultural skills in particular. These skills are intensively promoted during a semester abroad. As courses at the host university can also relate to areas of knowledge that are not included in the Computer Science curriculum or are outside of Computer Science, such coursework completed in the host country can be credited via this module.

The choice of courses at the host university is agreed in advance of the stay as part of a learning agreement with the student advisor or, depending on the requirements of the place of study and the study financing, with the international representatives of the Department of Computer Science.

**Literaturempfehlungen**

**Specification of the foreign university**

**Links**

- International Student Office of CvO Universität
- Web-Site of the Computer Science Department (in German)

<table>
<thead>
<tr>
<th>Languages of instruction</th>
<th>English, French, German</th>
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<tr>
<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
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<tr>
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<td>Prüfungszeiten</td>
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**Final exam of module**

Vorgabe der ausländischen Hochschule

Specification of the foreign university

Recognition must be applied for at the Academic Examinations Office.

Transcripts of records from courses attended at the foreign university must be submitted in German or English translation.

**Form of instruction**

VA-Auswahl (Vorgabe der ausländischen Hochschule)

**SWS**

4

**Frequency**

siehe Angebotsrhythmus Modul
inf861 - Study Abroad II

Module label | Study Abroad II
Modulkürzel | inf861
Credit points | 9.0 KP
Workload | 270 h

Verwendbarkeit des Moduls
- 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

Zuständige Personen
- Sauer, Jürgen (module responsibility)
- Vogel-Sonnenschein, Ute (module responsibility)
- Marx Gómez, Jorge (Module counselling)
- Fränzle, Martin Georg (Module counselling)

Further responsible persons
Studiengangsverantwortliche der Bachelor-Studiengänge des Departments für Informatik

Prerequisites
According to the requirements of the selected courses at the international host university

Skills to be acquired in this module

Professional competence
- depending on the chosen course at the host university

Methodological competence
- depending on the chosen course at the host university

The students
- organize themselves independently in the culture of the host country
- use time and other resources efficiently and in a goal-oriented manner

Social competence
The students
- have intercultural competence: they interact successfully and appropriately with individuals and groups from other cultures,
- communicate with people from other cultures in a targeted and respectful manner,
- have in-depth empathic skills. They empathize with other people on a cognitive and emotional level, listen carefully and attentively, and understand the opinions of others.

Self-competence
The students
- have generally deepened their skills in a foreign language for subject-related discourse,
- express themselves fluently in the language of their host country,
- adapt to changing living and learning environments,
- deal tolerantly with ambiguities,
- approach other people openly,
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- face up to new tasks, challenges and experiences.

Module contents
The ongoing process of globalization requires preparation for professional activities that are increasingly internationally oriented. This requires not only foreign language skills, but also intercultural skills in particular. These skills are intensively promoted during a semester abroad. As courses at the host university can also relate to areas of knowledge that are not included in the Computer Science curriculum or are outside of Computer
Science, such coursework completed in the host country can be credited via this module. The choice of courses at the host university is agreed in advance of the stay as part of a learning agreement with the student advisor or, depending on the requirements of the place of study and the study financing, with the international representatives of the Department of Computer Science.

<table>
<thead>
<tr>
<th>Literatureempfehlungen</th>
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<td>• International Student Office of CvO Universität</td>
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<td>Previous knowledge</td>
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<tr>
<td>Examination</td>
<td>Prüfungszeiten</td>
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<tr>
<th>Final exam of module</th>
<th>Vorgabe der ausländischen Hochschule</th>
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<tr>
<td>Type of examination</td>
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<td>Recognition must be applied for at the Academic Examinations Office.</td>
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<td>Frequency</td>
<td>siehe Angebotsrhythmus Modul</td>
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wir041 - Introduction to economics

Module label | Introduction to economics
---|---
Modulkürzel | wir041
Credit points | 6.0 KP
Workload | 180 h

Verwendbarkeit des Moduls

- Bachelor's Programme Business Administration and Law (Bachelor) > Basiscurriculum Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Comparative and European Law (Bachelor) > Module
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft more...
- Bachelor's Programme Economics and Business Administration (Bachelor) > Basismodule
- Bachelor's Programme Mathematics (Bachelor) > Nebenfachmodule
- Bachelor's Programme Sustainability Economics (Bachelor) > Grundlagen-/Basiscurriculum
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > Basismodule
- Master's Programme Business Informatics (Master) > Module der Wirtschafts- und Rechtswissenschaften (Master)

Zuständige Personen

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

Prerequisites

none

Skills to be acquired in this module

Students: acquire a basic understanding of economics
- know elementary economic terms and theories
- learn to analyze economic problems graphically and/or mathematically
- are able to grasp both micro- and macroeconomic relationships based on theory
- understand basic economic models and are able to apply them to current economic problems
- place current economic and political events and debates in economic contexts
- understand under which conditions market interventions by policy makers are justified from an economic perspective
- are able to assess possible effects of economic policy instruments (for example: taxes, subsidies, minimum and maximum prices, etc.).

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.

Literaturempfehlungen

- The CORE Team: The Economy (free, open access text for introductory undergraduate courses; continuous updates), URL: https://www.core-econ.org
<table>
<thead>
<tr>
<th>Links</th>
<th><a href="http://www.vwl.uni-oldenburg.de/">http://www.vwl.uni-oldenburg.de/</a></th>
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**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).

**Examination**

<table>
<thead>
<tr>
<th>Final exam of module</th>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
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<tbody>
<tr>
<td>end of semester</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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**Präsenzzeit Modul insgesamt**  
56 h
**wir070 - Principles of Marketing**

<table>
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<td>Modulkürzel</td>
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**Verwendbarkeit des Moduls**
- Bachelor's Programme Business Administration and Law (Bachelor) > Basiscurriculum Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Comparative and European Law (Bachelor) > Module
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Economics and Business Administration (Bachelor) > Aufbaumodule
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlpflichtbereich
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > Aufbaumodule
- 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)

**Zuständige Personen**
- Alavi, Sascha (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)

**Prerequisites**
- keine

**Skills to be acquired in this module**
Upon completion of the module, students will be able to:
- recognize and provide solutions to challenges in market-oriented business management
- reflect on market-oriented business management with regard to practise, as well as related societal and ethical implications
- actively participate in scholarly marketing discourse
- build their own capacities to acquire knowledge and skills within the discipline

**Module contents**
The module focuses on the fundamentals of marketing in the sense of market-orientated management by linking philosophy and theoretical connections, as well as the necessary analytical and methodical knowledge with concrete case studies.

**Literaturempfehlungen**

**Links**
- www.uni-oldenburg.de/marketing

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**
- jährlich

**Module capacity**
- unlimited

**Examination**

<table>
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<tr>
<th>Prüfungszeiten</th>
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<tr>
<td>end of term</td>
<td>written exam; voluntary contributions that improve grades may undertaken as 'portfolio-presentations' during tutorials</td>
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**Form of instruction**

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| Präsenzzeit Modul insgesamt | 56 h |
wir090 - Human Resource Management

<table>
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<tr>
<td>Modulkürzel</td>
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<td>Credit points</td>
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**Verwendbarkeit des Moduls**

- Bachelor's Programme Business Administration and Law (Bachelor) > Aufbaubreiche Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Wirtschaftswissenschaften
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Comparative and European Law (Bachelor) > Module
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Economics and Business Administration (Bachelor) > Akzentsetzungsmodule
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlbereichsbereich
- 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)

**Zuständige Personen**

- Junker-Michel, Mareike (Module counselling)
- Breisig, Thomas (Module counselling)
- Lehrenden, Die im Modul (Prüfungsberechtigt)
- 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

**Literatureempfehlungen**


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

**Examination**

Prüfungszeiten

Type of examination

written exam

**Final exam of module**

At the end of the lecture period and at the end of the semester

**Form of instruction**

Comment

SWS

Frequency

Workload of compulsory attendance

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</table>

**Präsenzzeit Modul insgesamt**

84 h
wir160 - Entrepreneurship

Module label: Entrepreneurship
Modulkürzel: wir160
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls
- 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) > Module aus anderen Studiengängen

Zuständige Personen
- Lehrenden, Die im Modul (Prüfungsberechtigt)
- Nicolai, Alexander (module responsibility)

Prerequisites
- none

Skills to be acquired in this module
The module introduces to the basics of Entrepreneurship. Upon completion of the module, students will be able to:
- 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

Literaturempfehlungen
<table>
<thead>
<tr>
<th>Links</th>
<th><a href="http://www.uni-oldenburg.de/wire/entrepreneurship/lehrangebot/veranstaltungen/lehrangebot-wise-20162017/">http://www.uni-oldenburg.de/wire/entrepreneurship/lehrangebot/veranstaltungen/lehrangebot-wise-20162017/</a></th>
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<tr>
<td>Language of instruction</td>
<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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<td>Module capacity</td>
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<td>The lecture “Strategie und Entrepreneurship” must be attended in combination with the “Tutorium”.</td>
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<td>Examination</td>
<td>Prüfungszeiten</td>
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<tr>
<td>Type of examination</td>
<td>at the end of the semester</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>written exam</td>
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<td>Comment</td>
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<tr>
<td>Tutorial</td>
<td>2</td>
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### wir200 - Principles of Organisation

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<tbody>
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<td>Modulkürzel</td>
<td>wir200</td>
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<tr>
<td>Credit points</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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</table>
| Verwendbarkeit des Moduls | - 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) |
| Zuständige Personen   | - Lehrende, Die im Modul (Prüfungsberechtigt)  
- 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 - Organisational structure - Operational structure and processes These basic principles of organisation are presented and discussed within the lectures. Current economic and business developments are included. Seminars and tutorials are offered to deepen the lecture presentations and to relate them to examples and cases. |
| Links                 | www.uol.de/orgpers          |
| Language of instruction | German                     |
| Duration (semesters)  | 1 Semester                  |
| Module frequency      | jährlich                    |
| Module capacity       | unlimited                   |
| Type of module        | je nach Studiengang Pflicht oder Wahlpflicht |
| Module level          | ---                         |
| Examination           | Prüfungszeiten              |
| Final exam of module  | Written exam: end of the lecture period  
portfolio (group seminar paper and online test) |
<table>
<thead>
<tr>
<th>Examination</th>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
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</thead>
<tbody>
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<table>
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<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
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<tr>
<td>Seminar</td>
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wir210 - Corporate Environmental Management

Module label: Corporate Environmental Management

Modulkürzel: wir210

Credit points: 6.0 KP

Workload: 180 h

Verwendbarkeit des Moduls

- 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 Economics and Business Administration (Bachelor) > Studienrichtung Ökologie und Nachhaltigkeit
- Bachelor's Programme Sustainability Economics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Business Informatics (Master) > Module der Wirtschafts- und Rechtswissenschaften (Master)
- Bachelor's Programme Computing Science (Master) > Module aus anderen Studiengängen

Zuständige Personen

- 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

Literaturempfehlungen


Links

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

Language of instruction: German

Duration (semesters): 1 Semester

Module frequency: jährlich

Module capacity: unlimited
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<tr>
<td>Seminar</td>
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Präsenzzeit Modul insgesamt 56 h
wir806 - Information Technology Law

Module label: Information Technology Law
Modulkürzel: wir806
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls
- 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 (Gymnasium) Computing Science (Master of Education) > Pflichtmodule
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Mastermodule more...
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Recht und Gesellschaft
- Master's programme Business Administration: Management and Law (Master) > Basismodule
- Master's programme Business Administration: Management and Law (Master) > Schwerpunktmodule RdW - Recht
- Master's Programme Business Informatics (Master) > Module der Wirtschafts- und Rechtswissenschaften (Master)
- Master's Programme Computing Science (Master) > Module aus anderen Studiengängen

Zuständige Personen
- Rott, Peter (module responsibility)
- Lehrenden, Die im Modul (Prüfungsberechtigt)
- Rott, Peter (Module counselling)

Prerequisites
- not applicable

Skills to be acquired in this module
The students are familiar with the effects of digitalisation with its chances and risks in European and German private law and, in particular, consumer law. They obtain knowledge of specific areas of digitalised private law and consumer law with particular relevance for their future professional practice, are able to solve consumer law cases in a goal-oriented way, are able to find approaches for legal problems as well as recognise liability risks and how to deal with them, and are, in contract negotiations, able to recognise the requirements for regulation and to evaluate its consequences

Module contents
This module conveys how new technologies impact on private law and, in particular, on consumer law. It focuses on the (modified) interpretation of existing laws but even more on the reactions of the EU and national legislators and of the judiciary to new technological developments. The module discusses, among others, distance selling law, digitalised sales law and product liability law, the law of digital content and digital services, unfair commercial practices on internet and the law of the platform economy. Finally, the module looks at enforcement.

Literaturempfehlungen
- to be announced in the first lecture

Links

Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Type of module: Wahlpflicht / Elective
Module level: MM (Mastermodul / Master module)
Teaching/Learning method: Lecture and Seminar
Previous knowledge: basic knowledge of civil law is helpful.

Examination: Prüfungszeiten
Type of examination: to be taken from the examination regulations

Final exam of module:
<table>
<thead>
<tr>
<th>Form of instruction</th>
<th>Comment</th>
<th>SWS</th>
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<th>Workload of compulsory attendance</th>
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<tr>
<td>Seminar</td>
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</table>
Abschlussmodul

bam - Bachelor Thesis and Colloquium

<table>
<thead>
<tr>
<th>Module label</th>
<th>Bachelor Thesis and Colloquium</th>
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<tbody>
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<tr>
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<td>15.0 KP</td>
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<tr>
<td>Verwendbarkeit des Moduls</td>
<td>Bachelor's Programme Computing Science (Bachelor) &gt; Abschlussmodul</td>
</tr>
</tbody>
</table>
| Zuständige Personen | Lehrenden, Die im Modul (Prüfungsberechtigt)  
Nieße, Astrid (module responsibility) |
| Prerequisites | No participant requirements |
| 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. |
| Literatureempfehlungen | According to the topic |
| Links | https://uol.de/informatik/studium-lehre/studium-aktuell/abschlussarbeiten |
| Language of instruction | German |
| Duration (semesters) | 1 Semester |
| Module frequency | every semester |
| Module capacity | unlimited |
| Teaching/Learning method | 1S |
| Previous knowledge | none |
| Examination | Prüfungszeiten | Type of examination |
| Final exam of module | varying | thesis, seminar paper |
| Form of instruction | Seminar |

Language of instruction: German

Duration: 1 Semester

Module frequency: every semester

Module capacity: unlimited

Teaching/Learning method: 1S

Previous knowledge: none

Examination: Prüfungszeiten

Type of examination: thesis, seminar paper

Form of instruction: Seminar
<table>
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<tbody>
<tr>
<td>Frequency</td>
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