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Modules for Computing Science

Pflichtbereich

inf005 - Software Engineering I

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**Applicability of the module**

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

**Responsible persons**

- Winter, Andreas (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

**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.

Recommended reading

• Slide script for the lecture
• Jochen Ludewig, Horst Lichter: Software Engineering, dpunkt.verlag, 3. Auflage 2013
• Helmut Balzert: Lehrbuch der Software-Technik, Spektrum Akademischer Verlag, 3. Auflage 2009
• Chris Rupp, Stefan Queins: UML 2 glasklar. Praxiswissen für die UML-Modellierung, Carl Hanser Verlag, 4. Auflage 2012

Links

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Module level

Type of module

1VL + 1Ü

Previous knowledge

- inf030
- inf031

Examination

Examination times

Type of examination

Final exam of module At the end of the lecture period or during the lecture period (portfolio) Written exam or oral exam or portfolio (? 3 services)

Type of course Comment SWS Frequency Workload of compulsory attendance

Lecture 3 WiSe 42
Exercises 2 WiSe 28

Total module attendance time 70 h
inf007 - Information Systems I

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

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

Responsible persons
- Wingerath, Wolfram (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

Prerequisites
No participant requirement

Skills to be acquired in this module
This module introduces the core concepts, languages and architectures of databases. In software systems these concepts are important.

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

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

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

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

Module contents
- Relational data models
- Relational algebra and its implementation in SQL (the standard of databases)
- Database design on different abstractions (conceptual and logical design)
- Normalisation - Data base architectures
- Distributed and active databases
- Object-oriented, object-related and XML-based database systems

Recommended reading

Links

Language of instruction: German
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inf600 - Business Informatics I

Module label: Business Informatics I
Module abbreviation: inf600
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Basiscurriculum
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahltbereich 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

Responsible persons
- Sauer, Jürgen (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

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.

Recommended reading

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

Links

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Type of module

Teaching/Learning method: 1VL + 1Ü

Previous knowledge: none

Examination

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Type of course

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Total module attendance time: 56 h
inf701 - Computer Science Education II

Module label: Computer Science Education II

Module abbreviation: inf701

Credit points: 6.0 KP

Workload: 180 h

Applicability of the module
- 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) > Pflichtbereich
- Master's Programme Computing Science (Master) > Angewandte Informatik

Responsible persons
- Diethelm, Ira (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

Prerequisites
- No participant requirements

Skills to be acquired in this module

Professional competence
The students:
- (re-)construct the knowledge of computer science by the method of didactical reduction
- differentiate the development of computer science and evaluate this development with current trends for class
- select computer science education approaches for lesson planning, organisation and implementation

Methodological competence
The students:
- (re-)construct core concepts of lesson planning for computer science education requirements

Social competence
The students:
- present self-developed lesson plans and lesson materials
- discuss lesson plans regarding computer science education concepts
- accept opinions and criticism
- provide constructive feedback

Self-competence
The students:
- adapt computer science education concepts for lesson planning
- reflect on their self-perception with regard to the conception of computer science education

Module contents
The lecture will focus on the requirements and challenges of computer science education in grammar school (German: Gymnasium).

Main focus:
- Didactical (re-)construction of computer science knowledge, especially its didactical reduction
- Didactical categorisation of computer science and the development, importance and evaluation of computer science in school
- Scheduling, organisation and implementation of computer science in class

Recommended reading
- Weitere Literatur wird in der Veranstaltung je nach thematischen Schwerpunkten bekannt gegeben

Links
http://elearning.uni-oldenburg.de
<table>
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Inf712 - Current Topics in Computer Science Education I

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**Applicability of the module**
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Pflichtmodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Pflichtbereich
- Master's Programme Computing Science (Master) > Angewandte Informatik

**Responsible persons**
- Diethelm, Ira (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

**Skills to be acquired in this module**

**Professional competences**
The students:
- define and contrast a computer science part, in which they are specialised, in detail or evaluate computer science in general
- recognise and evaluate applied techniques and methods of their subject and are aware of their limits
- identify, structure and solve problems/tasks, also in new or developing subject areas
- apply state of the art and innovative methods to solve problems, if necessary from other disciplines
- are aware of the current limits and contribute to the development of computer science research and technology
- discuss and evaluate recent computer science developments

**Methodological competences**
The students:
- examine tasks with technical and research literature, write an academic article and present their solutions academically
- evaluate problems/tasks, including new or developing subject areas of their discipline and apply computer science methods for solutions and research
- schedule time processes and resources

**Social competences**
The students:
- communicate with users and experts convincingly

**Self-competences**
The students:
- pursue the overall and special computer science development critically
- develop and reflect self-developed hypotheses to theories independently

**Module contents**
See assigned course description

**Recommended reading**
As announced in course

**Language of instruction**
German

**Duration (semesters)**
1 Semester

**Module frequency**
irregular

**Module capacity**
unlimited

**Module level**

**Type of module**
1S or 1VL

**Previous knowledge**
none
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Recht und Gesellschaft

inf851 - Computer Science and Society

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Applicability of the module

- Bachelor's Programme Biology (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Business Administration and Law (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Business Informatics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Chemistry (Bachelor) > Säule "Überfachliche Professionalisierung" more...
- Bachelor's Programme Comparative and European Law (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Computing Science (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Computing Science (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Economics and Business Administration (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Economics and Business Administration (Bachelor) > Studienrichtung Wirtschaftsinformatik
- Bachelor's Programme Education (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Engineering Physics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Environmental Science (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Intercultural Education and Counselling (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme Mathematics (Bachelor) > Säule "Überfachliche Professionalisierung"
- Bachelor's Programme 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 Economics and Business Administration (Bachelor) > Säule "Überfachliche Professionalisierung"
- Dual-Subject Bachelor's Programme Education (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"
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- Dual-Subject Bachelor's Programme History (Bachelor) > Säule "Überfachliche Professionalisierung"
- 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 Physics (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) > Mastermodule
- 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) > Pflichtmodule
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Recht und Gesellschaft

Responsible persons
- Lehrenden, Die im Modul (authorised to take exams)
- Dittert, Nadine (module responsibility)

Prerequisites
- no participant requirements

Skills to be acquired in this module
Graduates of the module Informatik und Gesellschaft know the history of the development of Information technology and its impact on society and are familiar with issues of data protection. They will be able, individually or in a team, to analyze the ethical and socio-political implications of different areas and applications of computer science and develop a reasoned own position on this, in particular concerning their professional responsibilities as computer scientists. They have learned to present the results of their work convincingly and suitable for their target group using appropriate media and they are able to organize events such as workshops or small conferences for that purpose.

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

Methodological competence
The students:
- explore methods of structured teamwork
- organize project work
- make presentations with different media

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

Self-competence
The students:
- reflect their role in a team
- reflect their role as computer scientists in society
### Module contents

In brief, topics like the following are covered:

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

### Recommended reading

- 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

### Module level

### Type of module

1VL + 1S

### Previous knowledge

none

### Examination

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### Final exam of module

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wir806 - Information Technology Law

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

Applicability of the module
- Bachelor's Programme Business Informatics (Bachelor) > Wahlbereich Informatik, Kultur und Gesellschaft
- Bachelor's Programme Computing Science (Bachelor) > 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 (Hauptschule and Realschule) 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

Responsible persons
- Rott, Peter (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)
- 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, 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.

Recommended reading
- to be announced in the first lecture

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

Examination
- Examination times
- Type of examination
- Final exam of module
- to be taken from the examination regulations
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## Praktische Vertiefung der Informatik

### inf009 - Database Practical

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### Applicability of the module

- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlbereich Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praktische Vertiefung (60 KP)
- Master of Education Programme (Gymnasium) Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)
- Master of Education Programme (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

### Responsible persons

- Grawunder, Marco (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

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

**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

**Recommended reading**

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

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inf014 - Operating Systems Practical

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

**Responsible persons**
- Theel, Oliver (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

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

**Skills to be acquired in this module**

**Professional competence**
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.

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

Recommended reading


Links

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<td>- Distributed Systems</td>
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Module level

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Previous knowledge

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

Examination

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<th>Type of examination</th>
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<td>Active participation / work report and oral exam</td>
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Type of course

- Practical training

SWS

- 4

Frequency

- WiSe

On-site workload

- 56 h
inf018 - Media Processing

Module label: Media Processing
Module abbreviation: inf018
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module

- Bachelor's Programme Biology (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Business Administration and Law (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Bachelor's Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor's Programme Business Informatics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer" 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 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 Elementary Mathematics (Bachelor) > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- 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"

Fach-Bachelor's Programme Computing Science (Master of Education) > Wahlpflichtmodule (Praktische Informatik)
Fach-Bachelor's Programme Computing Science (Master of Education) > Praktische Vertiefung der Informatik
Fach-Bachelor's Programme Business Informatics (Master) > Akzentsetzungsmodul der Informatik

Responsible persons
- Theel, Oliver (module responsibility)
- Boll-Westermann, Susanne (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

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

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

Social competence
The students:

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

Self competence
The students:

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

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

Recommended reading
- 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

Type of module

Teaching/Learning method
1VL + 1Ü

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

Examination

Examination times
Type of examination
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.
Project and oral Exam or project and written exam

Type of course
Comment
SWS
Frequency
Workload of compulsory attendance
Lecture
2
WiSe
28
Exercises
2
WiSe
28

Total module attendance time
56 h
inf021 - Advanced Java Technologies

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

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

Responsible persons:
- Boles, Dietrich (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

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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<th>list of links in the learning management system</th>
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**inf202 - Computer Engineering Practical**

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**Applicability of the module**

- Bachelor's Programme Biology (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Business Administration and Law (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Business Informatics (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Chemistry (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Comparative and European Law (Bachelor) > Fachnahe Angebote Informatik more...
- Bachelor's Programme Computing Science (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Economics and Business Administration (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Education (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Engineering Physics (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Environmental Science (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Intercultural Education and Counselling (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Mathematics (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Physics (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Physics, Engineering and Medicine (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Social Studies (Bachelor) > Fachnahe Angebote Informatik
- Bachelor's Programme Sustainability Economics (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Art and Media (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Biology (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Chemistry (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Computing Science (Bachelor) > Praktische Vertiefung (60 KP)
- Dual-Subject Bachelor's Programme Dutch Linguistics and Literary Studies (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Economic Education (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Economics and Business Administration (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Education (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Elementary Mathematics (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme English Studies (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Gender Studies (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme General Education (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme German Studies (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme History (Bachelor) > Fachnahe Angebote Informatik
- Dual-subject bachelor's programme Low German (Bachelor) > Fachnahe Angebote Informatik
- Dual-Subject Bachelor's Programme Material Culture: Textiles (Bachelor) > Fachnahe Angebote Informatik

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• Dual-Subject Bachelor's Programme Mathematics (Bachelor) > Fachnahe Angebote Informatik
• Dual-Subject Bachelor's Programme Music (Bachelor) > Fachnahe Angebote Informatik
• Dual-Subject Bachelor's Programme Philosophy / Values and Norms (Bachelor) > Fachnahe Angebote Informatik
• Dual-Subject Bachelor's Programme Physics (Bachelor) > Fachnahe Angebote Informatik
• Dual-Subject Bachelor's Programme Politics-Economics (Bachelor) > Fachnahe Angebote Informatik
• Dual-Subject Bachelor's Programme Protestant Theology and Religious Education (Bachelor) > Fachnahe Angebote Informatik
• Dual-Subject Bachelor's Programme Slavic Studies (Bachelor) > Fachnahe Angebote Informatik
• Dual-Subject Bachelor's Programme Social Studies (Bachelor) > Fachnahe Angebote Informatik
• Dual-Subject Bachelor's Programme Sport Science (Bachelor) > Fachnahe Angebote Informatik
• Dual-Subject Bachelor's Programme Technology (Bachelor) > Fachnahe Angebote Informatik
• Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft (Bachelor) > Fachnahe Angebote Informatik
• 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) > Praktische Vertiefung der Informatik

Responsible persons

• Fränzle, Martin Georg (module responsibility)
• Janßen, Detlef (module responsibility)
• Lehrenden, Die im Modul (authorised to take exams)

Prerequisites

Recommendation: Inf200 "Fundamentals of Computer Engineering"

Skills to be acquired in this module

This course enables students to analyze information technology systems, understand individual components of computers, design and optimize them, and discuss domain-specific hardware design in a qualified manner.

Professional competences

The students

• describe individual components of computers
• design and optimize individual components of computers
• design and optimize automata specify and imply autonomous systems

Methodological competence

The students

• synthesize computer architectures
• can transfer methods of hardware design to different systems

Social competence

The students

• discuss hardware in a qualified manner

Self-competence

The students

• are able to clearly distinguish their level of knowledge from professionals of related disciplines

Module contents

This module is the practical part of the course Introduction to Computer Engineering.

Recommended reading

• Script for the course
• Patterson, D.A., Hennessy, J.L.: Computer Organisation and Design: The Hardware/Software Interface

Links

Language of instruction

German
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<th>Duration (semesters)</th>
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inf517 - Introduction to Energy Informatics

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

**Responsible persons**
- Nieße, Astrid (module responsibility)
- Vogel-Sonnenschein, Ute (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

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

**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

**Recommended reading**

**Links**

**Language of instruction**
German

**Duration (semesters)**
1 Semester

**Module frequency**
irregular

**Module capacity**
unlimited

**Module level**

**Type of module**
1VL

**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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inf800 - Proseminar in Computer Science

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

Responsible persons
- Diethelm, Ira (module responsibility)
- Nieße, Astrid (module responsibility)
- Sauer, Jürgen (module responsibility)
- Lehrenden, Die im Modul (Module counselling)

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

Skills to be acquired in this module
- Supported by a lecturer the students familiarise with a given topic by literature research. They understand and evaluate the relevance of the literature. After this evaluation the students present and discuss their solutions academically.

Professional competence
- The students:
  - characterise and apply computer science basics (algorithms, data structures, programming, basics of practical, technical and theoretical computer science)
  - define und describe essential mathematical, logical and physical basics of computer science
  - define and illustrate the core disciplines of computer science (theoretical, practical and technical computer science)

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

Social competence
- The students:
  - communicate considerately and appropriately with users and experts
  - use presentation methods

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

Module contents
- according to the assigned task

Recommended reading

Links

Language of instruction
- German

Duration (semesters)
- 1 Semester

Module frequency
- semi-annual

Module capacity
- unlimited

Reference text
- Choose one of the seminaire courses of the module.
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inf803 - Special Topics in Computer Science I

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

**Responsible persons**
- Lehrenden, Die im Modul (authorised to take exams)

**Prerequisites**
- No participant requirements

**Skills to be acquired in this module**
- This module integrates current computer science developments within appropriate study courses. **Professional competence**
  - The students:
    - know recent technological or scientific computer science developments
    - transfer computer science methods and development models to IT application area requirements
    - evaluate the possibilities and limitations of computer science methods and tools and apply them appropriately
- **Methodological competence**
  - The students:
    - review problems, formulate them with formal models and explore them appropriately
    - identify and present (one or more) computer science problem solutions
    - select and evaluate appropriate tools and methods
    - examine problems with technical and scientific literature
- **Social competence**
  - The students:
    - work in a team
- **Self-competence**
  - The students:
    - plan their informatical actions independently

**Module contents**
- According to the assigned task

**Recommended reading**
- Werden in der zugeordneten Lehrveranstaltung bekannt gegeben.

**Links**

**Languages of instruction**
- German, English

**Duration (semesters)**
- 1 Semester

**Module frequency**
- semi-annual

**Module capacity**
- unlimited

**Module level**

**Type of module**

**Teaching/Learning method**
- 2 events from V, Ü, S, P, PR

**Previous knowledge**
- none

**Examination**

**Examination times**

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

**Final exam of module**

**Type of course**
- VA-Auswahl
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## inf804 - Special Topics in Computer Science II

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

### Responsible persons
- Lehrenden, Die im Modul (authorised to take exams)

### Prerequisites
- No participant requirement

### Skills to be acquired in this module

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

#### Methodological competence
The students:
- review problems, formulate them with formal models and explore them appropriately
- identify and present (one or more) computer science problem solutions
- select and evaluate appropriate tools and methods
- examine problems with technical and scientific literature

#### Social competence
The students:
- work in a team

#### Self-competence
The students:
- plan their informatical actions independently

### Module contents
According to the assigned task

### Recommended reading
Werden in der zugeordneten Lehrveranstaltung bekannt gegeben

### Links

### Languages of instruction
German, English

### Duration (semesters)
1 Semester

### Module frequency
semi-annual

### Module capacity
unlimited

### Module level

### Type of module

### Teaching/Learning method
2 events from V, Ü, S, P, PR

### Previous knowledge
none

### Examination

#### Examination times

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

### Final exam of module

### Type of course
VA-Auswahl
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inf808 - Current Topics in Computer Science

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

**Responsible persons**
- Nieße, Astrid (module responsibility)
- Sauer, Jürgen (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

**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

**Recommended reading**
- According to the assigned task

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**
- unregelmäßig

**Module capacity**
- unlimited

**Module level**

**Type of module**

**Teaching/Learning method**

**Previous knowledge**
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Abschlussmodul
mam - Master Thesis and Colloquium

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<td>• Diethelm, Ira (authorised to take exams)</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>By completing the master's thesis, the student provides evidence that he/she is able to process and solve complex and holistic tasks in computer science on the basis of comprehensive scientific knowledge and by applying the scientific method apparatus. In particular, the student has brought the technical and methodological knowledge acquired during the master's program as well as his/her technical and social competence into the processing of the master's thesis and applied them successfully. The master's seminar serves to discuss the content and methodology of the master's thesis. At the same time, it serves as an exchange of scientific and practical experience and enables the students to reflect on different approaches to solutions on the basis of theoretical knowledge and experience. The master seminar ends with a colloquium on the master thesis.</td>
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## Akzentsetzungsbereich

### inf010 - Computer Networks

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

### Responsible persons
- Kramer, Oliver (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

### 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 Addressing & Header
• TCP
• UDP
• Buckets & TCP-Reno
• DNS
• Flask
• RSA & PGP
• Firewalls

Recommended reading

• lecture notes

Links

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Module level

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Examination

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Type of course

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Total module attendance time

| 56 h |

43 / 68
inf016 - Internet Technologies

Module label: Internet Technologies
Module abbreviation: inf016
Credit points: 6.0 KP
Workload: 180 h

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

Responsible persons
- Boles, Dietrich (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

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.

Recommended reading
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

Module level

Type of module
Teaching/Learning method: 1VL + 1Ü
Previous knowledge
Useful previous knowledge: object-oriented programming
Examination times

**Final exam of module**

The presentation of partial results of the practical project takes place weekly during the exercises. Final delivery of the final project is one week after the end of the lecture period. The written exam or oral exam take place in the last week of the lecture period or the first week after the end of the lecture period. Any re-examinations take place at the end of the semester break. The exact timetable can be found in the learning management system.

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### inf040 - Introduction to Data Science

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**Applicability of the module**

- Bachelor’s Programme Business Informatics (Bachelor) > Akzentsetzungsbereich Praktische Informatik und Angewandte Informatik
- Bachelor’s Programme Computing Science (Bachelor) > Akzentsetzungsbereich - Wahlpflichtbereich
- 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) > Abschlussmodul more...
- 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 und 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

**Responsible persons**

- Wingerath, Wolfram (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

**Prerequisites**

- Basics of databases, Python programming and statistics
- Lehrenden, Die im Modul (authorised to take exams)

**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).

Recommended reading: See description of the assigned course

Links

Language of instruction: English

Duration (semesters): 1 Semester

Module frequency: regular in summer term

Module capacity: unlimited

Module level

Type of module

Teaching/Learning method: 1VL + 1Ü

Previous knowledge: Basics of databases, Python programming and statistics

Examination

Examination times

Type of examination: Written or oral exam or portfolio or project or practical exercise

Final exam of module

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

Type of course

Comment

SWS

Frequency

Workload of compulsory attendance

Lecture

2

SoSe oder WiSe

0

Exercises

2

SoSe oder WiSe

0

Total module attendance time

0 h
inf200 - Computer Engineering I

Module label: Computer Engineering I
Module abbreviation: inf200
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- 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

Responsible persons:
- Rauh, Andreas (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

Prerequisites:
- No participant requirements

Skills to be acquired in this module:

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.

Recommended reading:
- Lecture Notes
  The Hardware/Software Interface; 2. Edition; Morgan Kaufmann Publishers.
  2. Edition; Prentice Hall.
  Prentice Hall.

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| Total module attendance time | 56 h    |
inf201 - Computer Engineering II

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**Applicability of the module**
- 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

**Responsible persons**
- Rauh, Andreas (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

**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.

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

**Links**
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**Type of module**

- **Teaching/Learning method**: 1VL + 1Ü
- **Previous knowledge**: Knowledge of the module "Computer Engineering I"

**Examination**

- **Examination times**: At the end of the lecture period
- **Type of examination**: Written or oral Exam

**Final exam of module**

- **Type of course**: Lecture, Exercises
- **Comment**: SWS, Frequency, Workload of compulsory attendance
- **SWS**: 3, 1
- **Frequency**: SoSe, SoSe
- **Workload of compulsory attendance**: 42, 14

**Total module attendance time**: 56 h
inf400 - Theoretical Computer Science: Logic

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Applicability of the module
- 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

Responsible persons
- Olderog, Ernst-Rüdiger (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

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
Recommended reading

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<th>Essential</th>
<th>Script &quot;Logik&quot; (in German), in its current edition</th>
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Total module attendance time

56 h
inf401 - Foundations of Theoretical Computer Science

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

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

Responsible persons:
- Olderog, Ernst-Rüdiger (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

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.

Recommended reading:
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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### Links

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#### Module level

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#### Previous knowledge

- none

#### Examination

- Examination times
- Type of examination
  - Written or oral exam

#### Final exam of module

- At the end of the lecture period

#### Type of course

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#### Total module attendance time

- 56 h
inf420 - Introduction to IT-Security

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<tr>
<td></td>
<td>• Peter, Andreas (module responsibility)</td>
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<td>• Lehrenden, Die im Modul (authorised to take exams)</td>
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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.

**Recommended reading**


**Links**

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<th>English</th>
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<tbody>
<tr>
<td>Duration (semesters)</td>
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<td>Module frequency</td>
<td>Every winter semester</td>
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<td>Type of module</td>
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**Previous knowledge**

Hard requirement: Fundamental knowledge on algorithms, discrete structures, and linear algebra as for instance covered in the following courses at the UOL:

- inf030 Programmierung, Datenstrukturen und Algorithmen
- mat950 Diskrete Strukturen
- mat955 Linear Algebra für Informatik

Useful (but optional) additional knowledge: Basics of computer networks as for instance covered in the UOL course inf010 Rechnernetze

**Examination**

<table>
<thead>
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<th>Final exam of module</th>
<th>Examination times</th>
<th>Type of examination</th>
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**Type of course** | **Comment** | **SWS** | **Frequency** | **Workload of compulsory attendance** |
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**Total module attendance time** 0 h
inf530 - Artificial Intelligence

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

Responsible persons
- Sauer, Jürgen (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

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

Recommended reading
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<tbody>
<tr>
<td>Language of instruction</td>
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| Total module attendance time | 56 h |

Aproach, 3rd Ed.
inf604 - Business Intelligence I

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Applicability of the module
- Master Applied Economics and Data Science (Master) > Data Science
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich
- Master's Programme Business Informatics (Master) > Akzentsetzungsmodule Bereich Wirtschaftsinformatik
- Master's Programme Business Informatics (Master) > Akzentsetzungsmodule der Informatik
- Master's Programme Computing Science (Master) > Angewandte 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

Responsible persons
- Marx Gómez, Jorge (authorised to take exams)
- Lehrenden, Die im Modul (authorised to take exams)

Prerequisites
No participant requirement

Skills to be acquired in this module
**Objective of the module/skills:**
Current module provides basics of business intelligence with focus on enterprises and strong emphasis on data warehousing technologies. Students of the course are provided with knowledge, which reflects current research and development in a data analytic domain.

**Professional competence**
The students:
- name and recognize the role of business intelligence as part of daily business process
- being able to analyse advantages and disadvantages of different approaches and methods of the data analytics and being able to apply them in simple case studies
- obtain theoretical knowledge about data collection and modelling processes, including most applicable approaches and best practices

**Methodological competence**
The students:
- being able to execute typical tasks of business intelligence, and also being able to deepen knowledge on different approaches and methods
- gain a hands on experience and being able to understand advantages and disadvantages of different methods and being able to use obtained knowledge in most efficient ways

**Social competence**
The students:
- build solutions based on case studies given to the group, for example solving the issue of a factless fact table
- discuss solutions on a technical level
- present obtained case studies solutions as part of the exercises

**Self-competence**
The students:
- critically review provided data and information

Module contents
Data warehouse technology together with business intelligence are increasingly being used by business in order to get better decision support and enrich ongoing rocesses with data-rich decisions. Data warehouse technology enables an integration of data from heterogeneous sources, whether business intelligence builds data recessing on top of it. For instance, business intelligence allows to build reporting on very large volumes of data (including historical) coming primary from data warehouse.

**As part of the current module following contents are taught:**

---

60 / 68
• Definition and scope of business intelligence.
• Procedures and objectives of data warehousing.
• Process of extracting, transforming and loading (ETL) of data.
• Phases of data modelling, data capturing and reporting in conjunction with a plausible case studies/scenarios.
• Prospects for further and evolving topics for business intelligence (e.g. Adaptive Business Intelligence, In-Memory Computing, etc.)
• Introduction to Data Mining.
• Case studies based practical exercises and assessments in order to impart practical knowledge.

Recommended reading

• Marx Gómez, Rautenstrauch, Cissek (2008): Einführung in die Business Intelligence mit SAP NetWeaver 7.0.
• Moss, Atre (2006): Business Intelligence Roadmap, Addison-Wesley, Boston.
• Loshin (2003): Business Intelligence, Kaufmann, Amsterdam.
• Müller, Lenz (2013): Business Intelligence.

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

Languages of instruction
German, English

Duration (semesters)
1 Semester

Module frequency
annual

Module capacity
unlimited

Module level

Type of module

Teaching/Learning method
1VL + 1Ü

Previous knowledge
none

Examination
Examination times
Type of examination
Final exam of module
At the end of the lecture period
Written exam max. 120 minutes

Type of course
Comment
SWS
Frequency
Workload of compulsory attendance

Lecture
2
WiSe
28

Exercises
2
WiSe
28

Total module attendance time
56 h
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)

Recommended reading

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

Language of instruction
- German

Duration (semesters)
- 1 Semester

Module frequency
- annual

Module capacity
- unlimited

Module level

Type of module

Teaching/Learning method
- 1VL + 1Ü

Previous knowledge
- none

Examination
- Examination times
- Type of examination

Final exam of module
- At the end of the lecture period
- Written or oral exam

Type of course
- Comment
- SWS
- Frequency
- Workload of compulsory attendance

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Total module attendance time
- 56 h
inf653 - ERP Technologies

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<tr>
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<td>- Master's Programme Business Informatics (Master) &gt; Akzentsetzungsmodul Bereich Wirtschaftsinformatik</td>
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<td>- Master's Programme Business Informatics (Master) &gt; Akzentsetzungsmodul der Informatik</td>
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<td></td>
<td>- Master's Programme Computing Science (Master) &gt; Angewandte Informatik</td>
</tr>
<tr>
<td>Responsible persons</td>
<td>Marx Gómez, Jorge (module responsibility)</td>
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<td>Lehrenden, Die im Modul (authorised to take exams)</td>
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<tr>
<td>Prerequisites</td>
<td>No participant requirement</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>Learning objectives</td>
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<tr>
<td></td>
<td>Generation of understandings into the working approaches and tasks of ERP systems</td>
</tr>
<tr>
<td></td>
<td>Examining components of ERP systems</td>
</tr>
<tr>
<td></td>
<td>Generating knowledge about important aspects of the operation processes of ERP systems, such as data storage and processing, user management, and system maintenance.</td>
</tr>
<tr>
<td>Professional competence</td>
<td>The students:</td>
</tr>
<tr>
<td></td>
<td>describe ERP systems in compliance with functions and technologies</td>
</tr>
<tr>
<td></td>
<td>identify state-of-the-art and future architectures of ERP systems</td>
</tr>
<tr>
<td></td>
<td>discuss the usage of core technologies (also in practical case studies, for example with SAP NetWeaver)</td>
</tr>
<tr>
<td>Methodological competence</td>
<td>The students:</td>
</tr>
<tr>
<td></td>
<td>categorize fundamental technologies in combination with other enterprise-wide information systems</td>
</tr>
<tr>
<td></td>
<td>apply the presented methods in practical contexts</td>
</tr>
<tr>
<td>Social Competence</td>
<td>The students:</td>
</tr>
<tr>
<td></td>
<td>construct solutions to given problems in groups</td>
</tr>
<tr>
<td></td>
<td>present solutions to computing science problems before groups</td>
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<td>Self-competence</td>
<td>The students:</td>
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<tr>
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<td>recognize the limit of their capacity in implementing and customizing of business application systems</td>
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<td>Module contents</td>
<td>The module provides the following content:</td>
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<tr>
<td></td>
<td>Overview of the components of ERP systems and their functionality and administration</td>
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<tr>
<td></td>
<td>In-depth analysis of ERP system architecture under consideration of surface structures and user management in ERP systems, with focus on data storage, particularly the used data models and database structures, backup and recovery strategies</td>
</tr>
<tr>
<td></td>
<td>Deployment of ERP applications in form of application service providing, including the technical characteristics of this business model, especially Special Administration, delimitation and monitoring tasks for the systems, which at the same time be provided several customers</td>
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<td>Lecture will be accompanied by SAP case studies.</td>
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Recommended reading


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

**Language of instruction**
German

**Duration (semesters)**
1 Semester

**Module frequency**
annual

**Module capacity**
unlimited

**Module level**

**Type of module**

**Teaching/Learning method**
1VL + 1Ü

**Previous knowledge**
none

**Examination**

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**Total module attendance time**
56 h
inf654 - Mobile Commerce

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**Applicability of the module**
- Master of Education Programme (Vocational and Business Education) Computing Science (Master of Education) > Akzentsetzungsbereich
- Master's Programme Business Informatics (Master) > Akzentsetzungsmodule Bereich Wirtschaftsinformatik
- Master's Programme Business Informatics (Master) > Akzentsetzungsmodule der Informatik
- Master's Programme Computing Science (Master) > Angewandte Informatik

**Responsible persons**
- Marx Gómez, Jorge (module responsibility)
- Lehrenden, Die im Modul (authorised to take exams)

**Prerequisites**
- No participant requirement

**Skills to be acquired in this module**

### Professional competence
- define and encompass MC
- explain the development stages of MC
- are aware of the current developments within MC and are able to classify them
- get to know technical essentials, functionalities and standards of wireless ICT
- assess the fields of application and limitations of wireless ICT
- examine the relevant mobile devices and their respective operating systems, know their characteristics and evaluate their fields of application
- examine market participants, assess business models, optimize business processes
- gain insight into specifics via examples and exercises

### Methodological competence
- get to know security aspects and specifics of mobile application design
- prototypically develop an Android application
- prepare and give presentations
- develop a concept of a business model for an Android application

### Social competence
- work on their project in groups of three

### Self-competence
- reflect their own group-dynamic activities in respect of a mutual goal (successfully finish their project)

**Module contents**
See above

**Recommended reading**
- Also all materials provided within the lecture

**Links**
- http://vlba.wi-ol.de

**Language of instruction**
- German

**Duration (semesters)**
- 1 Semester

**Module frequency**
- annual

**Module capacity**
- unlimited

**Module level**
- 66 / 68
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