Modules for Computing Science

Mastermodule

inf006 - Software Engineering II

<table>
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<tr>
<th>Module label</th>
<th>Software Engineering II</th>
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<td>Credit points</td>
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<td>Workload</td>
<td>180 h</td>
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Used in course of study
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Fach-Bachelor Wirtschaftsinformatik > Akzentsetzungsmodule
- Master of Education (Gymnasium) Informatik > Mastermodule
- Master Wirtschaftsinformatik > Bereichswahlmodule

Contact person
Module responsibility
- Andreas Winter

Authorized examiners
- Andreas Winter
- Die im Modul Lehrenden

Entry requirements

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

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

Methodological competence
The Students:
- Structure problems with modelling techniques
- Develop actual methods of software engineering
- Present software engineering solutions
- Write scientific papers independently

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

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

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

**Reader's advisory**

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

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

**Links**

<table>
<thead>
<tr>
<th>Language of instruction</th>
<th>German</th>
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<tbody>
<tr>
<td>Duration (semesters)</td>
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<tr>
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<td></td>
<td>Portfolio (30-minute presentation, 1 paper (4 pages, IEEE) and oral exam)</td>
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**Vorkenntnisse / Previous knowledge**

- Softwaretechnik I

**Course type**

<table>
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**Total time of attendance for the module**

56 h
inf007 - Information Systems I

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

Used in course of study
- Fach-Bachelor Informatik > Aufbaumodule
- Fach-Bachelor Wirtschaftsinformatik > Aufbaumodule
- Fach-Bachelor Wirtschaftswissenschaften > Studienrichtung Wirtschaftsinformatik
- Master of Education (Gymnasium) Informatik > Mastermodule
- Master of Education (Wirtschaftspädagogik) Informatik > Mastermodule

Contact person
Module responsibility
- Marco Grawunder
Authorized examiners
- Marco Grawunder
- Die im Modul Lehrenden

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

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

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

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

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

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

Reader’s advisory

Links
Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
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<td>V + Ü</td>
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<td>Hands-on exercises and written or oral exam</td>
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**Total time of attendance for the module**: 56 h
### info10 - Computer Networks

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**Used in course of study**
- Fach-Bachelor Informatik > Aufbaumodule
- Fach-Bachelor Wirtschaftsinformatik > Aufbaumodule
- Master of Education (Gymnasium) Informatik > Mastermodule
- Master of Education (Wirtschaftspädagogik) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Informatik > Aufbaumodule

**Entry requirements**

**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 recognise their administration abilities

**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
- Wif
- Paket switchen & Dijsktra
- IP Adressing & Header
- TCP
- UDP
- Buckets & TCP-Reno
- DNS
- Flask
- RSA & PGP
- Firewalls
Reader's advisory

- lecture notes

Links
http://einstein.informatik.uni-oldenburg.de/20902.html

Language of instruction
German

Duration (semesters)
1 Semester

Module frequency
jährlich

Module capacity
unlimited

Modullevel
---

Modulart
je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program
V + Ü

Vorkenntnisse / Previous knowledge

Examination
Time of examination
Type of examination

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

Course type
Comment
SWS
Frequency
Workload attendance

Lecture
3.00
SuSe
42 h

Exercises
1.00
SuSe
14 h

Total time of attendance for the module
56 h
inf012 - Operating Systems I

Module label: Operating Systems I
Module code: inf012
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Informatik > Aufbaumodule
- Fach-Bachelor Wirtschaftsinformatik > Aufbaumodule
- Master of Education (Gymnasium) Informatik > Mastermodule

Contact person:
Module responsibility:
- Oliver Theel

Authorized examiners:
- Oliver Theel
- Die im Modul Lehrenden

Entry requirements:

Skills to be acquired in this module:
To gain knowledge of and capabilities in the design, the implementation, and the evaluation of operating systems.

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

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

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

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

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

Reader's advisory:

Links:

Language of instruction: German
Duration (semesters): 1 Semester
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<td>V + Ü</td>
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inf015 - Distributed Operating Systems

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

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master of Education (Gymnasium) Informatik > Mastermodule

Contact person:

- Module responsibility
  - Oliver Theel

- Authorized examiners
  - Oliver Theel
  - Die im Modul Lehrenden

Entry requirements:

Skills to be acquired in this module:
This module deals with the fundamentals of distributed operating systems. It gives an understanding of the terminology, structures, functions, conceptions, key problems and implementation concepts of distributed operating systems.

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

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

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

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

Module contents:
The contents of this module are:
1) The historical development towards distributed operating systems
2) Models of distributed computer systems
3) Models of distributed operating systems
4) Design criteria of distributed operating systems
5) Interprocess communication (Computer Networks, Message Passing, Remote Procedure Call)
6) Memory management
7) Process management

- DSM
- Task allocation
- Load balancing
- Load distribution
- Process migration
8) Synchronisation

- Clocks
- Ordering of events
- Distributed mutual exclusion
- Distributed leader election
- Deadlocks

9) Naming and localisation of objects

10) Distributed file systems

11) Fault tolerance concepts

Reader's advisory


Links

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<th>German</th>
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<td>Reference text</td>
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- Betriebssysteme I & II
- Betriebssysteme-Praktikum
- Fehlertoleranz in verteilten Systemen (as a possible differentiation)

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<td>Training tasks, written exam or oral exam</td>
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<td>Exercises</td>
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<td>SuSe</td>
<td>28 h</td>
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Total time of attendance for the module 56 h
inf016 - Internet Technologies

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<td>Workload</td>
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**Used in course of study**
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Fach-Bachelor Wirtschaftsinformatik > Aufbaumodule
- Master of Education (Gymnasium) Informatik > Mastermodule
- Master of Education (Wirtschaftspädagogik) Informatik > Mastermodule

**Contact person**

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

**Entry requirements**

**Skills to be acquired in this module**
The graduates of the module know different Internet concepts and technologies. They are able to evaluate the capability of the concepts and techniques to design internet-based applications. The students will apply these concepts and techniques in a project.

**Professional competence**
The students:
- Know basic concepts and technologies of the Internet and the web

**Methodological competence**
The students:
- Are able to use techniques in projects

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

**Self-competence**
The students:
- Reflect their own capability to develop web-based applications

**Module contents**
This module deals with the basic development concepts of internet-based applications. It covers the web languages: HTML, CSS, XML, XML-Schema, XPath, XSLT.
It includes the relevant client technologies of web applications (Applets, AJAX, COMET) and server technologies (Forms, Servlets, Java Server Pages, STRUTS, Ruby on Rails).
Additional topics are multimedia on the internet (SMIL, SVG, Flash), usability and accessibility.

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

**Reader's advisory**
Reserve shelf in the library; extensive list of links in e-learning platform StudIP covering course topics.

**Links**
https://www.uni-oldenburg.de/informatik/medieninformatik/lehre/

**Language of instruction**
German

**Duration (semesters)**
1 Semester

**Module frequency**
jährlich

**Module capacity**
unlimited

**Reference text**
Associated with the modules:
- Complements with Software-Systementwurf
- Informationssysteme I
> Informationssysteme II
> Technologien des Wissensmanagement im Internet

<table>
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<td>V+P</td>
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**Total time of attendance for the module** 56 h
**inf017 - Interactive Systems**

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**Used in course of study**

- Fach-Bachelor Betriebswirtschaftslehre für Leistungssportlerinnen und Leistungssporter > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Betriebswirtschaftslehre mit juristischem Schwerpunkt > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Biologie > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Business Administration in mittelständischen Unternehmen > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Chemie > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Engineering Physics > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Informatik > Akzentsetzungsmodul
- Fach-Bachelor Informatik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Interculturelle Bildung und Beratung > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Mathematik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Nachhaltigkeitsökonomik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Pädagogik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Physik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Physik, Technik und Medizin > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Sozialwissenschaften > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Umweltwissenschaften > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Wirtschaftsinformatik > Akzentsetzungsmodul
- Fach-Bachelor Wirtschaftsinformatik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Anglistik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Biologie > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Chemie > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Elementarmathematik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Ev. Theologie und Religionspädagogik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Gender Studies > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Germanistik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Geschichte > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Informatik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Interdisziplinäre Sachbildung > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Materielle Kultur: Textil > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Mathematik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Musik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Niederlandistik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Ökonomische Bildung > PP "Medieninformatik für Studierende musisch-
künstlerischer Fächer"  
• Zwei-Fächer-Bachelor Pädagogik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"  
• Zwei-Fächer-Bachelor Philosophie / Werte u. Normen > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"  
• Zwei-Fächer-Bachelor Physik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"  
• Zwei-Fächer-Bachelor Politik-Wirtschaft > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"  
• Zwei-Fächer-Bachelor Slavistik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"  
• Zwei-Fächer-Bachelor Sonderpädagogik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"  
• Zwei-Fächer-Bachelor Sozialwissenschaften > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"  
• Zwei-Fächer-Bachelor Sportwissenschaft > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"  
• Zwei-Fächer-Bachelor Technik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"  
• Zwei-Fächer-Bachelor Wirtschaftswissenschaften > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"

### Contact person

**Module responsibility**

- Susanne Boll-Westermann

**Authorized examiners**

- Susanne Boll-Westermann
- Die im Modul Lehrenden

### Entry requirements

**Skills to be acquired in this module**

**Professional competence**

The students:

- name the basic concepts and characteristics of usable user interfaces
- characterise the basic elements of the user-centered design of interactive systems

**Methodological competence:**

The students:

- characterise the basic approaches to analyse context of use and user requirements
- explain methods for the design and prototypical implementation of interactive systems
- characterise established evaluation techniques and are able to use them

**Social competence**

The students:

- develop and present solutions for Human-Computer-Interaction related problems

### Module contents

The field of interactive systems deals with the tasks, concepts and technologies of human-computer interaction and its user-friendly and suitable design. The lecture is based on the so-called Human Centred Design Process and includes models of interaction between humans and their environment, iterative design, prototyping techniques, study and evaluation processes. Basic design principles, methods and tools are presented. Practical tasks complete the lecture.

### Reader’s advisory

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale: Human Computer Interaction.
- Bernhard Preim, Raimund Dachselt: Interaktive Systeme
- Further articles and papers that are presented in the lecture

### Links

**Language of instruction**

German

**Duration (semesters)**

1 Semester

**Module frequency**

jährlich

**Module capacity**

unlimited

**Modullevel**

AS (Akzentsetzung / Accentuation)

**Modulart**

je nach Studiengang Pflicht oder Wahlpflicht

**Lern-/Lehrform / Type of program**

V+Ü
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**Total time of attendance for the module**: 56 h
inf018 - Media Processing

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**Used in course of study**

- Fach-Bachelor Betriebswirtschaftslehre für Leistungssportlerinnen und Leistungssportler > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Betriebswirtschaftslehre mit juristischem Schwerpunkt > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Biologie > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Business Administration in mittelständischen Unternehmen > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Chemie > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Comparative and European Law > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Engineering Physics > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Fach-Bachelor Informatik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Interculturelle Bildung und Beratung > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Mathematik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Nachhaltigkeitsökonomik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Pädagogik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Physik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Physik, Technik und Medizin > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Sozialwissenschaften > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Umweltwissenschaften > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Wirtschaftswissenschaften > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Fach-Bachelor Wirtschaftswissenschaften > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Master of Education (Gymnasium) Informatik > Mastermodule
- Master of Education (Wirtschaftspädagogik) Informatik > Mastermodule
- Master of Education (Wirtschaftspädagogik) Informatik > Praktische Vertiefung der Informatik
- Master Wirtschaftsinformatik > Bereichswahlmodule
- Zwei-Fächer-Bachelor Anglistik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Biologie > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Chemie > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Elementarmathematik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Ev. Theologie und Religionspädagogik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Germanistik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Geschichte > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Informatik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Informatik > Praktische Vertiefung
- Zwei-Fächer-Bachelor Interdisziplinäre Sachbildung > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Kunst und Medien > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Materielle Kultur: Textil > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
- Zwei-Fächer-Bachelor Mathematik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
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Zwei-Fächer-Bachelor Philosophie / Werte u. Normen > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
Zwei-Fächer-Bachelor Physik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
Zwei-Fächer-Bachelor Politik-Wirtschaft > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
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Zwei-Fächer-Bachelor Technik > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"
Zwei-Fächer-Bachelor Wirtschaftswissenschaften > PP "Medieninformatik für Studierende musisch-künstlerischer Fächer"

Contact person
Module responsibility
- Susanne Boll-Westermann
Authorized examiners
- Susanne Boll-Westermann
- Die im Modul Lehrenden

Entry requirements
Skills to be acquired in this module
Professional competence:
The students:
- name the basic concepts and characteristics of digital media
- name the core concepts of encoding and compressing images, videos and audio files
- characterise the complexity of the analysis, classification and processing of unstructured media, using the examples of image analysis
- apply concepts of encoding, compression and image analysis independently

Module contents
Media processing technologies are presented in the lecture. One focus of the lecture is the encoding of digital images and the compression of an image, image enhancement and image processing. The lecture also deals with encoding and analysis of video and audio. This lecture is accompanied by simple practical tasks.

Reader's advisory
- Reserve shelf in the library; extensive list of links in e-learning platform StudIP covering course topics.

Links
https://www.uni-oldenburg.de/informatik/medieninformatik/lehre/

Language of instruction
German

Duration (semesters)
1 Semester

Module frequency
jährlich

Module capacity
unlimited

Modulelevel
AS (Akzentsetzung / Accentuation)

Modular
je nach Studiengang Pflicht oder Wahlpflicht

Lern- / Lehrform / Type of program
V+P

Vorkenntnisse / Previous knowledge

Examination
Time of examination
Type of examination
Final exam of module
At the end of the lecture period
Project and oral exam

Course type
Comment
SWS
Frequency
Workload attendance
Lecture
2.00
WiSe
28 h
Project
2.00
WiSe
28 h
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inf019 - Compiler Construction

Module label  Compiler Construction
Module code  inf019
Credit points  6.0 KP
Workload  180 h
Used in course of study  
  * Fach-Bachelor Informatik > Akzentsetzungsmodule
  * Master of Education (Gymnasium) Informatik > Mastermodule

Contact person

Module responsibility  
  * Die im Modul Lehrenden
Unterweisungs Verantwortung  
  * Die im Modul Lehrenden

Entry requirements

Skills to be acquired in this module

Professional competence

The students:

  * name the structure of a compiler and each part of the compiling process of a programming language
  * describe the standards of each phase of a compiling process
  * understand and evaluate typical characteristics as well as advantages and disadvantages of different methods of the compilation stages
  * practically apply the learned methods of the compilation stages
  * evaluate the use of a compilation generator

Methodological competence

The students:

  * link the automata theory and the formal language concepts regarding the compiler construction

Social competence

The students:

  * develop and present solutions of given problems in small teams

Module contents

The module provides all steps of a compiler: scanner, parser, semantic analysis, intermediate code generation, code optimisation and machine code generation. Each step is introduced by its current methods. For the parsing step LL-Parser and LR-Parser are presented. The code optimisation step is introduced by different procedures with different conditions for the register optimisation. The lecture essentially follows the book of Aho, Lam, Sethi, Ullman which can validly be described as a compiler construction classic.

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

Reader's advisory

Essential:

  * Handout

Recommended:


Links

Language of instruction  German
Duration (semesters)  1 Semester
Module frequency  jährlich
Module capacity  unlimited
Modullevel  AS (Akzentsetzung / Accentuation)
Modulart  je nach Studiengang Pflicht oder Wahlpflicht
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<td>2.00</td>
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<td>2.00</td>
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<td>28 h</td>
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**Total time of attendance for the module**: 56 h
inf020 - Machine-oriented Programming

Module label: Machine-oriented Programming

Module code: inf020

Credit points: 6.0 KP

Workload: 180 h

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master of Education (Gymnasium) Informatik > Mastermodule

Contact person

Module responsibility
- Oliver Theel

Authorized examiners
- Oliver Theel
- Die im Modul Lehrenden

Entry requirements

Skills to be acquired in this module

Professional competence
The students:
- Comprehend special concepts and methods of low-level programming of tightly-coupled computer systems in C and their translation into NASM assembly language
- Design and implement programs in C independently and systematically translate them into a computer architecture-specific assembly language
- Implement machine-oriented software with appropriate programming and compilation techniques and concepts
- Recognize the relation of technical and practical computer science as well as the relations of high- and low-level programming

Methodological competence
The students:
- understand aspects of the practical and theoretical computer science
- understand the connection between high level language constructs and low level language constructs
- translate C programs into NASM programs

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

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

Module contents

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

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

Reader's advisory

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

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

### Modul level
- **AS (Akzentsetzung / Accentuation)**

### Modul art
- je nach Studiengang Pflicht oder Wahlpflicht

### Lern-/Lehrform / Type of program
- V+Ü

### Vorkenntnisse / Previous knowledge
- First year courses of the Bachelor of computer science or business informatics

### Examination
- **Final exam of module**: At the end of the lecture period
- **Type of examination**: Written or oral exam

### Course type
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### Total time of attendance for the module
- 56 h
inf203 - Embedded Systems I

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

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Informatik > Basismodule

Contact person:
Module responsibility:
- Wolfgang Nebel
- Martin Georg Fränzle

Authorized examiners:
- Wolfgang Nebel
- Martin Georg Fränzle
- Die im Modul Lehrenden

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

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

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

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

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

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

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

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

Reader's advisory
Slides and:
Secondary literature:

- Artikelserie zum MPEG-2-Standard 3/94 - 10/94 und das Tutorial "Digitale Bildcodierung" 1/92 - 1/93, beides in "Fernseh- und Kinotechnik" (BIS: Z elt ZA 1536)

Links

Language of instruction: German

Duration (semesters): 1 Semester

Module frequency: jährlich

Module capacity: unlimited

Reference text: This module is compulsory for students who are specialising in "Eingebettete Systeme und Mikrorobotik".

Associate with the modules:
In the module "Eingebettete Systeme II" additional relevant topics such as design processes, HW/SW-Partitioning, High-Level-Synthesis and Hardware description languages are discussed. The modules Eingebettete Systeme I und II offer cross-references to the module "Rechnerarchitektur".

"Realzeitbetriebssysteme" and semantic orientated modules of theoretical computer science. It is possible to enhance the knowledge of embedded systems design by attending the modules "System Level Design" and "Low energy System Design".

Modullevel: ---

Modulart: je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program:

Vorkenntnisse / Previous knowledge:
- Grundlagen der technischen Informatik
- Technische Informatik

Examination:
Time of examination: At the end of the semester
Type of examination: Written or oral exam

Final exam of module:
At the end of the semester
Written or oral exam

Course type:
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Total time of attendance for the module: 56 h
inf204 - Embedded Systems II

Module label: Embedded Systems II
Module code: inf204
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodul
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zweijahres-Bachelor Informatik > Basismodule

Contact person:
Module responsibility:
- Wolfgang Nebel
- Martin Georg Fränzle

Authorized examiners:
- Wolfgang Nebel
- Martin Georg Fränzle
- Die im Modul Lehrenden

Entry requirements:
Skills to be acquired in this module:

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

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

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

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

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

This module is the continuation of the module “Eingebettete Systeme I” and deals with different architectures of embedded systems and processors.
The module provides system partitioning methods and the synthesis of hardware components.
Hands-on exercises with development tools, hardware description languages and simulation support the module contents.

**Reader's advisory**

Slides and:


**Secondary literature:**


**Links**

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**Reference text**

This module is supposed to be a compulsory module for students who are specialising in "Eingebettete Systeme und Mikrorobotik".

**Modullevel**

---

**Modulart**

je nach Studiengang Pflicht oder Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

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<th>Type of examination</th>
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<td>Written or oral Exam</td>
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**Course type**

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**Total time of attendance for the module**

56 h
inf205 - Formal Methods in Embedded System Design

Module label
Formal Methods in Embedded System Design

Module code
inf205

Credit points
6.0 KP

Workload
180 h

Used in course of study
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Informatik > Basismodule

Contact person
Module responsibility
- Martin Georg Fränzle

Authorized examiners
- Martin Georg Fränzle
- Die im Modul Lehrenden

Entry requirements

Skills to be acquired in this module
Embedded computer systems sustain a permanent interaction with their environment. This interaction may lead to hardly predictable stimuli and reponse sequences, which complicates the design and validation of such systems tremendously.

As in more mature engineering disciplines, formal analytical models have been proposed as a remedy. Their role in the design flow is equivalent to the use of structural analysis and material science within, e.g., building statics. Pertinent formal methods for and formal models of embedded systems cover, for instance, execution time, power demand, and possible system dynamics.

As they represent relevant aspects of a system in a formal, mathematical way, they often permit automatic analysis - i.e., to derive characteristic data - and automatic certificate generation. The distinguishing factor to more traditional forms of analysis like testing and profiling is the exhaustive form of analysis achieved by mathematical methods, which guarantee that the results apply for any environmental interaction. This is in stark contrast to the inherently incomplete coverage provided by test-based methods.

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

Professional competence
The students:

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

Methodological competence
The students:

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

Social competence
The students:

- Develop and implement fundamental verification algorithms in teams
- Discuss the relative merits of alternative algorithms and formalisms

Self-competence
The students:

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

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

Reader's advisory


Links

Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Modullevel: AS (Akzentsetzung)
Modulart: Wahlpflicht

Lern-/Lehrform / Type of program: V+Ü

Vorkenntnisse / Previous knowledge:

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

**Module label**
Electrical Engineering

**Module code**
inf207

**Credit points**
6.0 KP

**Workload**
180 h

**Used in course of study**
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master Informatik > Nicht Informatik
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Informatik > Basismodule

**Contact person**

Module responsibility
- Andreas Hein

Authorized examiners
- Andreas Hein
- Die im Modul Lehrenden

**Entry requirements**

**Skills to be acquired in this module**

**Professional competence:**
The students:

- Analyse linear electrical networks (direct current and alternating current)
- Name basic concepts to calculate and to use electrical and magnetic fields
- List the characteristics of simple electrical elements (two terminal networks)
- Calculate the parameters of simple electrical networks/wirings
- Apply computer based analysing tools
- Design and implement simple networks/wirings

**Methodological competence:**
The students:

- Transfer calculation methods onto complex dynamic systems
- Implement electrical system models

**Social competence:**
The students:

- Present solutions for specific questions

**Self-competence:**
The students:

- Reflect their solutions by using methods learned in this course

**Module contents**

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

**Reader's advisory**

**essential:**
- slides

**recommended:**
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**Total time of attendance for the module** 56 h
inf208 - Microrobotics and Microsystems Technology

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

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master Informatik > Nicht Informatik
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Informatik > Basismodule

Contact person:
Module responsibility: Sergej Fatikow
Authorized examiners:
- Sergej Fatikow
- Die im Modul Lehrenden

Entry requirements:

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

Professional competence:
The students:
- name the ideas, challenges and activities of microrobotics and microsystem technology
- describe the microrobotics and MST applications
- characterise MST methods
- name microsensor functionality
- characterise microsensor examples
- discuss MST terms of information technology
- classify microrobotics

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

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

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

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

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Reader's advisory

Essential:
- Lecture notes

Recommended:

Secondary Literature (only available for some subareas):
- Elbel, Th.: Mikrosensorik, Vieweg, Wiesbaden, 1996
- Vöklein, F. und Zetterer, Th.: Einführung in die Mikrosystemtechnik, Vieweg, Wiesbaden, 2000

Links

Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Reference text: Associated with the modules: Embedded Systems and Microrobotics
Modal level: ---
Modular: je nach Studiengang Pflicht oder Wahlpflicht
Lern-/Lehrform / Type of program: Analysis II or Numerics
Vorkenntnisse / Previous knowledge: Type of examination
Examination: Time of examination
Final exam of module: At the end of the semester
Oral exam in German
Course type: Comment SWS Frequency Workload attendance
Lecture 3.00 WiSe 42 h
Exercises 1.00 WiSe 14 h
Total time of attendance for the module: 56 h
inf209 - Control Theory

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

Used in course of study
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master Informatik > Nicht Informatik
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Informatik > Basismodule

Contact person
Module responsibility
- Sergej Fatikow
- Andreas Hein

Authorized examiners
- Sergej Fatikow
- Andreas Hein
- Die im Modul Lehrenden

Entry requirements
- Module Differential Equations
- Module Basics Electrical Engineering

Skills to be acquired in this module
Instruction on theoretical and mathematical basics of control engineering

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

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

Social competence
The students:
- Present solutions for specific questions

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

Module contents
Basics; analog transfer elements; linear time invariant (LTI-) systems; simulation and modeling; step response; frequency response; frequency response locus; differential equations and transfer function; control loop stability; types of controlled systems; types of linear controllers; linear control loops: reference and disturbance reaction of the controlled system; rules for control loop optimization; methods of analysis and synthesis, implementation; computer-based control MATLAB/Simulink

Reader's advisory
- Unbehauen, H.:Regelungstechnik I, Klassische Verfahren zur Analyse und Synthese linearer kontinuierlicher Regelsysteme
- Lutz, H. und Wendt, W.:Taschenbuch der Regelungstechnik
- further reading will be announced at lecture
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| Total time of attendance for the module | 56 h |
# inf210 - Signal and Image Processing

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Used in course of study

- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master Informatik > Nicht Informatik
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Informatik > Basismodule

Contact person

- Module responsibility
  - Martin Georg Fränzle
  - Andreas Hein
- Authorized examiners
  - Martin Georg Fränzle
  - Andreas Hein
  - Die im Modul Lehrenden

Entry requirements

#### Professional competence
The students:

- Name the concepts of signal and image processing in technical systems
- Name the methods/algorithms of preprocessing, filtering, classification, interpretation and visualisation of signals and pictures
- Select algorithms appropriately
- Evaluate the effectiveness of algorithms
- Design algorithms and processing chains and evaluate their quality

#### Methodological competence
The students:

- Get used to specific subjects of signal and image processing

#### Social competence
The students:

- Present solutions for specific questions in signal and image processing

#### Self-competence
The students:

- Reflect their solutions by using methods learned in this course

Module contents

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

Reader's advisory

- essential:


Slides

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

**Links**

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**Examination**

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**Total time of attendance for the module**

56 h
**inf402 - Graph Transformation Systems**

**Module label**  
Graph Transformation Systems

**Module code**  
inf402

**Credit points**  
6.0 KP

**Workload**  
180 h

**Used in course of study**  
- Fach-Bachelor Informatik > Akzentsetzungsmodul
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Informatik > Basismodule

**Contact person**  
Module responsibility

- Annegret Habel

Authorized examiners

- Annegret Habel
- Die im Modul Lehrenden

**Entry requirements**

**Skills to be acquired in this module**

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

**Professional competence**

The students:

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

**Methodological competence**

The students:

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

**Social competence**

The students:

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

**Self-competence**

The students:

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

**Module contents**

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

**Reader's advisory**


**Links**

**Language of instruction**  
German

**Duration (semesters)**  
1 Semester

**Module frequency**  
im 2-Jahres-Zyklus
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Cryptology is a key technology for the security of worldwide computer nets. Modern cryptographic techniques are used to keep data secret, sign electronic messages, control computer network access, secure electronic financial transactions, protect copyrights, among others. In view of these applications, users should be able to assess the efficiency and security of these key technologies. For this purpose, it is important not only to know the function of cryptographic processes, it is also important to understand their mathematical basics. Both is explained in this module.

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

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

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

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

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

Reader's advisory
Lecture notes; further literature will be announced in the lecture.
For attunement: Singh, Simon: The Code Book: Science of Secrecy from Ancient Egypt to Quantum
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**Total time of attendance for the module**: 56 h
### inf404 - Petri Nets

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|                 | Master of Education (Gymnasium) Informatik > Mastermodule  
|                 | Zweifächer-Bachelor Informatik > Basismodule  |
| Contact person  | Module responsibility |
|                 | Eike Best           |
| Authorized examiners | |  
|                 | Eike Best           |
|                 | Die im Modul Lehrenden |

#### Entry requirements

**Skills to be acquired in this module**

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

**Professional competence**

The students:

- define basic concepts of Petri nets
- classify Petri nets according to their salient properties
- analyse and synthesise Petri nets
- apply Petri nets in the context of well-defined problems

**Methodological competence**

The students:

- can apply specification and analysis methods based on Petri nets

**Social competence**

The students:

- present solutions to given problems to a wider audience

#### Module contents

- Basic concepts of Petri net theory.
- Petri net languages.
- Reachability and coverability.
- Marking equation.
- Linear-algebraic and graph-theoretic structure of Petri nets.
- Free-choice nets.
- Program verification using traps.
- Computing functions with nets.
- Untoldings.
- High-level nets.

#### Reader's advisory


#### Links

**Languages of instruction**

- German, English

**Duration (semesters)**

- 1 Semester
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**Total time of attendance for the module**

56 h
inf405 - Algorithmic Graph Theory

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

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Informatik > Basismodule

Contact person:
Module responsibility:
- Elke Wilkeit

Authorized examiners:
- Elke Wilkeit
- Die im Modul Lehrenden

Entry requirements:

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

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

Methodological competence
The students:
- extend their knowledge about algorithms and their complexity
- develop their programming skills
- expand their range of methods of mathematical modelling

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

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

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

Reader's advisory:
A detailed bibliography is contained in the lecture notes of this module.

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| Total time of attendance for the module | 56 h |
Inf407 - Program Verification

Module label: Program Verification
Module code: inf407
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zwei-Fächer-Bachelor Informatik > Basismodule

Contact person:
- Module responsibility: Ernst-Rüdiger Olderog
- Authorized examiners:
  - Ernst-Rüdiger Olderog
  - Die im Modul Lehrenden

Entry requirements:

Skills to be acquired in this module:

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

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

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

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

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

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

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

Reader's advisory
essential:

Or the extended English version:
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inf408 - Algorithms for Software Verification

Module label: Algorithms for Software Verification
Module code: inf408
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Master of Education (Gymnasium) Informatik > Mastermodule
- Zweifächer-Bachelor Informatik > Basismodule

Contact person
Module responsibility
- Ernst-Rüdiger Olderog

Authorized examiners
- Ernst-Rüdiger Olderog
- Die im Modul Lehrenden

Entry requirements

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

Professional competence
The students:

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

Methodological competence
The students:

- specify reactive systems by means of Kripke structures and CTL formulas
- implement model checking methods using Java

Social competence
The students:

- work in small groups

Self-competence
The students:

- reflect their actions and use newly learned methods

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

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

Reader's advisory

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inf409 - Formal Languages

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Entry requirements

Skills to be acquired in this module

Introduction to syntactic analysis and compiler construction.

Professional competence

The students:

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

Methodological competence

The students:

- Perceive syntax analysis algorithms as a essential tool in computer science

Social competence

The students:

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

Self-competence

The students:

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

Module contents

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

Reader's advisory


Links

Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: im 2-Jahres-Zyklus
Module capacity: unlimited
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| Total time of attendance for the module | 56 h |
inf521 - Medical Informatics

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

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Fach-Bachelor Wirtschaftsinformatik > Akzentsetzungsmodule
- Master of Education (Gymnasium) Informatik > Mastermodule

Contact person:
- Module responsibility: Rainer Röhrig
- Authorized examiners:
  - Rainer Röhrig
  - Die im Modul Lehrenden

Entry requirements:
- This module provides an introduction to the medical informatics and medical technology.

Skills to be acquired in this module:

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

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

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

Self-competence
The students:
- Realise their responsibility as a medical informatic and reflect their impact on patients, medical employers and hospitals (corporates)

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

Reader’s advisory:
- Jan van Bemmel, M.A. Musen, Mark A. Musen (Hrsg.): Handbook of Medical Informatics. Springer, Heidelberg 1997
- Christian Johner und Peter Haas (Hrsg.): Praxishandbuch IT im Gesundheitswesen
Links

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Total time of attendance for the module: 56 h
inf530 - Artificial Intelligence

Module label: Artificial Intelligence
Module code: inf530
Credit points: 6.0 KP
Workload: 180 h

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Fach-Bachelor Wirtschaftsinformatik > Akzentsetzungsmodule
- Master of Education (Gymnasium) Informatik > Mastermodule

Contact person:
- Module responsibility:
  - Jürgen Sauer
- Authorized examiners:
  - Jürgen Sauer
  - Die im Modul Lehrenden

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

Professional competence
The students:
- describe the concept of rational agents and their behavior in an agent environment
- name and describe the basic search and problem solving techniques of Artificial Intelligence
- describe and implement expert systems
- describe basic techniques of knowledge representation

Methodological competence
The students:
- acknowledge the basic methods of AI
- transfer AI methods to other application areas
- evaluate AI methods regarding their appropriateness for distinct problem areas
- modify and adapt AI methods for specific application areas

Social competence
The students:
- work in teams
- present results to groups

Self-competence
The students:
- reflect their results with regard to the methods of AI

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

Reader's advisory

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<tr>
<td>Lecture</td>
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<td>SuSe</td>
<td>28 h</td>
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| Total time of attendance for the module | 56 h |
inf600 - Business Informatics I

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

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Fach-Bachelor Nachhaltigkeitsökonomik > Basismodule
- Fach-Bachelor Wirtschaftsinformatik > Basismodule
- Fach-Bachelor Wirtschaftswissenschaften > Studienrichtung Wirtschaftsinformatik
- Master of Education (Gymnasium) Informatik > Mastermodule
- Master of Education (Wirtschaftspädagogik) Informatik > Mastermodule

Contact person:
Module responsibility
- Axel Hahn

Authorized examiners
- Axel Hahn
- Die im Modul Lehrenden

Entry 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 focuses on information systems of the networked company. Technical, economic, organisational, and psychosocial aspects are considered. The understanding of these relations will be trained by means of case studies taken from Laudon et al. (cf. suggested reading). The lecture gives an overview of the following business informatics fields.
- Information systems, (object of BI)
- Application systems
- E-Commerce and E-Business
- Ethical, social and political aspects
- Business process integration
- Knowledge management
- Support of decision making
- Reorganisation of companies
- Economic evaluation

For a better understanding of each subject, it is recommended to take specific modules later in the course of studies.

Reader's advisory

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

Links

Language of instruction | German
Duration (semesters) | 1 Semester
Module frequency | jährlich
Module capacity | unlimited
Modullevel | ---
Modulart | je nach Studiengang Pflicht oder Wahlpflicht
Lern-/Lehrform / Type of program | V & Ü
Vorkenntnisse / Previous knowledge

Examination | Time of examination | Type of examination
Final exam of module | At the end of the lecture period | Tasks and active partaking during the exercises / written exam or oral exam

Course type | Comment | SWS | Frequency | Workload attendance
Lecture | 2.00 | WiSe | 28 h
Exercises | 2.00 | WiSe | 28 h

Total time of attendance for the module | 56 h
**inf601 - Business Informatics II**

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<tbody>
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<tr>
<td>Workload</td>
<td>180 h</td>
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**Used in course of study**
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Fach-Bachelor Wirtschaftsinformatik > Basismodule
- Fach-Bachelor Wirtschaftswissenschaften > Studienrichtung Wirtschaftsinformatik
- Master of Education (Gymnasium) Informatik > Mastermodule

**Contact person**

<table>
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<tr>
<th>Module responsibility</th>
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<tr>
<td>Jorge Marx Gomez</td>
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**Authorized examiners**

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<tr>
<td>Jorge Marx Gomez</td>
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<tr>
<td>Die im Modul Lehrenden</td>
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</table>

**Entry requirements**

**Skills to be acquired in this module**

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

**Professional competence**

The students:

- name the strategic aspects of information management and identify their impact on technical and operational information management
- examine the essential questions of enterprise reorganization in connection with an information system and recognize the influence of the Internet and its services on commercial processes and information systems by an exemplary system, e.g. SAP R/3
- identify different approaches to information management (Information Ressource Management, Management approach, management approach, personal information management) and understand why determining the value of information management is necessary and how it is done
- specify the objectives of information management, differentiate and classify its tasks appropriately
- recognize the methodological characteristics of information management
- transfer the concept of architecture to the information infrastructure
- assess the importance to plan features for strategic IT-design oriented on IT-architecture
- schedule the procedures concerning the strategical situation analysis of the competition analysis, the information infrastructure and the environmental analysis with the objective to transfer them to simple problems
- name the key contents of strategical IT objectives and are aware of difficulties in determining the measurement category
- identify and learn the scope and central tasks of business process and environmental management (as excursion) and the significance for information management

**Methodological competence**

The students:

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

**Social competence**

The students:

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

**Self-competences**

The Students:

- accept criticism and understand it as a precondition for the further development of one's own actions

**Module contents**

The proportion of information technology in the investment budget of companies is rising continuously. For instance, banks spend 25% of all investments for their information systems. Information is not just a production factor, it is also an element of competition. Information is increasingly important for business. The business informatics deals with these economic tasks of information technology.
Information systems in businesses and organisations are of central concern. The interdisciplinary nature of business informatics raises questions about proceedings, problems of models (modelling in a narrow sense) and the application in specific problem domains.

Contents of this module are:

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

Reader’s advisory

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

Links

http://www.wi-ol.de

Language of instruction

German

Duration (semesters)

1 Semester

Module frequency

jährlich

Module capacity

unlimited

Modullevel

AS (Akzentsetzung / Accentuation)

Modulart

Pflicht o. Wahlpflicht / compulsory or optional

Lern-/Lehrform / Type of program

V+Ü

Vorkenntnisse / Previous knowledge

Examination

Time of examination

Type of examination

Final exam of module

Usually two weeks after lecture time

Written exam max. 120 minutes

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<th>Workload attendance</th>
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Total time of attendance for the module 56 h
**inf603 - Planning and Simulation in Logistics**

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<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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| Used in course of study | • Fach-Bachelor Informatik > Akzentsetzungsmodulle  
|               | • Fach-Bachelor Wirtschaftsinformatik > Akzentsetzungsmodulle  
|               | • Master of Education (Gymnasium) Informatik > Mastermodule |

**Contact person**

- Module responsibility
  - Jürgen Sauer
- Authorized examiners
  - Jürgen Sauer
  - Die im Modul Lehrenden

**Entry requirements**

**Skills to be acquired in this module**

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

**Learning objectives:**

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

**They are able:**

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

**Professional competence**

The students:

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

**Methodological competence**

The students:

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

**Social competence**

The students:

- Develop solutions to given simulation problems in small groups
- Present the solutions to other groups

**Self-competence**

The students:

- Reflect their own solutions in conjunction with other solutions

**Module contents**

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

**Reader's advisory**

- selected material on the simulation tool
- others will be announced in the lecture
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inf608 - eBusiness

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

Used in course of study:
- Fach-Bachelor Informatik > Akzentsetzungsmodule
- Fach-Bachelor Wirtschaftsinformatik > Aufbaumodule
- Fach-Bachelor Wirtschaftswissenschaften > Studienrichtung Wirtschaftsinformatik
- Master of Education (Gymnasium) Informatik > Mastermodule
- Master of Education (Wirtschaftspädagogik) Informatik > Mastermodule

Contact person:
Module responsibility:
- Jorge Marx Gomez

Authorized examiners:
- Jorge Marx Gomez
- Die im Modul Lehrenden

Entry requirements:

Skills to be acquired in this module:
The module provides an introduction to the "Electronic Business" (e-business). The graduates know the fundamental and current technologies, advanced concepts, applications and competitive strategies of the "Electronic-Commerce" (e-commerce).

The knowledge and abilities acquired in this module are directly applicable in study and business. They are deepening the basics from the module „Wirtschaftsinformatik II“. They provide a professional e-business consulting background and the skills to design software products for this area of business in practice.

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

Methodological competence
The students:
- Assess the core technologies of e-business and e-commerce
- Apply methods in case studies

Social competence
The students:
- Develop case studies on basis of given problems in groups
- Present their solutions

Self-competence
The students:
- Learn about their own limitations while planning and developing e-commerce applications

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

Reader's advisory


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

Language of instruction
German

Duration (semesters)
1 Semester

Module frequency
jährlich

Module capacity
unlimited

Module level
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Module type
je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program
V & Ü

Vorkenntnisse / Previous knowledge

Examination
Time of examination
Type of examination

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

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Total time of attendance for the module
56 h
inf701 - Computer Science Education II

Module label
Computer Science Education II

Module code
inf701

Credit points
6.0 KP

Workload
180 h

Used in course of study
- Master of Education (Gymnasium) Informatik > Mastermodule
- Master of Education (Haupt- und Realschule) Informatik > Mastermodule
- Master of Education (Wirtschaftspädagogik) Informatik > Mastermodule

Contact person
Module responsibility
- Ira Diethelm
- Die im Modul Lehrenden

Authorized examiners
- Ira Diethelm
- Die im Modul Lehrenden

Entry 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

Reader's advisory
- Further literature will be announced in the lecture.

Links
Language of instruction
German

Duration (semesters)
1 Semester
<table>
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<tr>
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| **Total time of attendance for the module** | 56 h |
inf703 - Computer Science Education III

Module label
Computer Science Education III

Module code
inf703

Credit points
6.0 KP

Workload
180 h

Used in course of study
- Master of Education (Gymnasium) Informatik > Mastermodule

Contact person

Module responsibility
- Ira Diethelm
- Die im Modul Lehrenden

Authorized examiners
- Ira Diethelm
- Die im Modul Lehrenden

Entry requirements

Skills to be acquired in this module
The students:
- know research methods from the computer science education field and apply these methods exemplary
- are able to verify computer science education approaches and develop those approaches
- characterise computer science education approaches by their effects to the lesson content, methods and tools

Professional competence
The students:

- characterise computer science education research methods
- analyse research issues with computer science education research methods
- differentiate computer science education concepts and their effects on lesson content, teaching methods and tools

Methodological competence
The students:

- transfer the research methods acquired on different research issues and adjust them appropriately
- develop research theories, hypotheses and prove them on new contexts

Social competence
The students:

- discuss research methods acquired from other students and lecturers
- present research methods and accept or provide appropriate criticism

Self-competence**
The students:

- include the presented research methods into their plans and activities to prove their hypotheses
- reflect their self-perception with regard to the research methods of computer science education

Module contents

- Computer science education research methods
- The purpose of theoretically developed specific lessons
- Approaches for the evaluation of computer science education or computer science education concepts

Reader's advisory

- Further literature will be announced in the lecture
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<td>Language of instruction</td>
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<td>Duration (semesters)</td>
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### inf851 - Computer Science and Society

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<tr>
<td><strong>Credit points</strong></td>
<td>6.0 KP</td>
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<tr>
<td><strong>Workload</strong></td>
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**Used in course of study**

- Fach-Bachelor Betriebswirtschaftslehre für Leistungssportlerinnen und Leistungssportler > Fachnahe Angebote Informatik
- Fach-Bachelor Betriebswirtschaftslehre für Leistungssportlerinnen und Leistungssportler > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Betriebswirtschaftslehre für Leistungssportlerinnen und Leistungssportler > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Betriebswirtschaftslehre mit juristischem Schwerpunkt > Fachnahe Angebote Informatik
- Fach-Bachelor Betriebswirtschaftslehre mit juristischem Schwerpunkt > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Betriebswirtschaftslehre mit juristischem Schwerpunkt > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Biologie > Fachnahe Angebote Informatik
- Fach-Bachelor Biologie > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Biologie > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Business Administration in mittelständischen Unternehmen > Fachnahe Angebote Informatik
- Fach-Bachelor Business Administration in mittelständischen Unternehmen > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Business Administration in mittelständischen Unternehmen > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Chemie > Fachnahe Angebote Informatik
- Fach-Bachelor Chemie > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Chemie > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Comparative and European Law > Fachnahe Angebote Informatik
- Fach-Bachelor Comparative and European Law > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Comparative and European Law > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Engineering Physics > Fachnahe Angebote Informatik
- Fach-Bachelor Engineering Physics > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Engineering Physics > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Informatik > Fachnahe Angebote Informatik
- Fach-Bachelor Informatik > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Informatik > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Interculturelle Bildung und Beratung > Fachnahe Angebote Informatik
- Fach-Bachelor Interculturelle Bildung und Beratung > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Interculturelle Bildung und Beratung > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Mathematik > Fachnahe Angebote Informatik
- Fach-Bachelor Mathematik > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Mathematik > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Nachhaltigkeitsökonomik > Fachnahe Angebote Informatik
- Fach-Bachelor Nachhaltigkeitsökonomik > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Nachhaltigkeitsökonomik > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Pädagogik > Fachnahe Angebote Informatik
- Fach-Bachelor Pädagogik > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Pädagogik > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > Fachnahe Angebote Informatik
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Physik > Fachnahe Angebote Informatik
- Fach-Bachelor Physik > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Physik > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Physik, Technik und Medizin > Fachnahe Angebote Informatik
- Fach-Bachelor Physik, Technik und Medizin > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Physik, Technik und Medizin > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Sozialwissenschaften > Fachnahe Angebote Informatik
- Fach-Bachelor Sozialwissenschaften > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Sozialwissenschaften > Säule "Überfachliche Professionalisierung"
- Fach-Bachelor Umweltwissenschaften > Fachnahe Angebote Informatik
- Fach-Bachelor Umweltwissenschaften > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Wirtschaftsinformatik > Fachnahe Angebote Informatik
- Fach-Bachelor Wirtschaftsinformatik > Fachnahe Angebote Wirtschaftsinformatik
- Fach-Bachelor Wirtschaftsinformatik > Säule "Überfachliche Professionalisierung"
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
Reader's advisory

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

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

Language of instruction
- German

Duration (semesters)
- 1 Semester

Module frequency
- jährlich

Module capacity
- unlimited

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

Modul level
- AS (Akzentsetzung / Accentuation)

Modulart
- je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program
- S+P

Vorkenntnisse / Previous knowledge

<table>
<thead>
<tr>
<th>Examination</th>
<th>Time of examination</th>
<th>Type of examination</th>
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<tr>
<td>Final exam of module</td>
<td>During semester and at the end</td>
<td>Portfolio (5-6 partial performances)</td>
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<table>
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<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload attendance</th>
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<td>WiSe</td>
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<tbody>
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## wir806 - Information Technology Law

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### Used in course of study
- Master of Education (Gymnasium) Informatik > Mastermodule
- Master of Education (Wirtschaftspädagogik) Informatik > Recht und Gesellschaft
- Master Wirtschaftsinformatik > Module der Wirtschafts- und Rechtswissenschaften (Master)
- Master Wirtschafts- und Rechtswissenschaften > Mantelmodule

### Contact person
- Module responsibility
  - Jürgen Taeger
- Authorized examiners
  - Die im Modul Lehrenden
- Module counseling
  - Sebastian Louven

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

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

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

### Links
- German

### Language of instruction
- German

### Duration (semesters)
- 1 Semester

### Module frequency
- jährlich

### Module capacity
- unlimited

### Modullevel
- ---

### Modulart
- je nach Studiengang Pflicht oder Wahlpflicht

### Lern-/Lehrform / Type of program

### Vorkenntnisse / Previous knowledge

### Examination
- **Time of examination**
  - presentation and handout, written exam or oral exam

### Final exam of module
- **during term**

### Course type
- **Comment**
- **SWS**
- **Frequency**
- Workload attendance

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### Total time of attendance for the module
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# inf202 - Computer Engineering Practical

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## Used in course of study

- Fach-Bachelor Betriebswirtschaftslehre für Leistungssportlerinnen und Leistungssportler > Fachnahe Angebote Informatik
- Fach-Bachelor Betriebswirtschaftslehre mit juristischem Schwerpunkt > Fachnahe Angebote Informatik
- Fach-Bachelor Biologie > Fachnahe Angebote Informatik
- Fach-Bachelor Business Administration in mittelständischen Unternehmen > Fachnahe Angebote Informatik
- Fach-Bachelor Chemie > Fachnahe Angebote Informatik
- Fach-Bachelor Comparative and European Law > Fachnahe Angebote Informatik
- Fach-Bachelor Engineering Physics > Fachnahe Angebote Informatik
- Fach-Bachelor Informatik > Fachnahe Angebote Informatik
- Fach-Bachelor Interkulturelle Bildung und Beratung > Fachnahe Angebote Informatik
- Fach-Bachelor Mathematik > Fachnahe Angebote Informatik
- Fach-Bachelor Nachhaltigkeitsökonomik > Fachnahe Angebote Informatik
- Fach-Bachelor Pädagogik > Fachnahe Angebote Informatik
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > Fachnahe Angebote Informatik
- Fach-Bachelor Physik > Fachnahe Angebote Informatik
- Fach-Bachelor Physik, Technik und Medizin > Fachnahe Angebote Informatik
- Fach-Bachelor Sozialwissenschaften > Fachnahe Angebote Informatik
- Fach-Bachelor Umweltwissenschaften > Fachnahe Angebote Informatik
- Fach-Bachelor Wirtschaftsinformatik > Fachnahe Angebote Informatik
- Fach-Bachelor Wirtschaftswissenschaften > Fachnahe Angebote Informatik
- Master of Education (Gymnasium) Informatik > Mastermodule
- Master of Education (Wirtschaftspädagogik) Informatik > Praktische Vertiefung der Informatik
- Zwei-Fächer-Bachelor Anglistik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Biologie > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Chemie > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Elementarmathematik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Ev. Theologie und Religionspädagogik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Gender Studies > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Germanistik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Geschichte > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Informatik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Interdisziplinäre Sachbildung > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Kunst und Medien > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Materielle Kultur: Textil > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Mathematik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Musik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Niederlandistik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Ökonomische Bildung > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Pädagogik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Philosophie / Werte u. Normen > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Physik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Politik-Wirtschaft > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Slavistik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Sonderpädagogik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Sozialwissenschaften > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Sportwissenschaft > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Technik > Fachnahe Angebote Informatik
- Zwei-Fächer-Bachelor Wirtschaftswissenschaften > Fachnahe Angebote Informatik

## Entry requirements

- **Skills to be acquired in this module**
  - Die im Modul Lehrenden

## Module contents

- **Reader's advisory**
<table>
<thead>
<tr>
<th>Links</th>
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<td>Language of instruction</td>
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# Abschlussmodul

**mam - Master Thesis and Colloquium**

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**Used in course of study**
- Master of Education (Gymnasium) Informatik > Abschlussmodul

**Contact person**

- Module responsibility
  - Ira Diethelm
- Authorized examiners
  - Die im Modul Lehrenden
  - Lehrende der Informatik
- Module counseling
  - Lehrende der Informatik
  - Die im Modul Lehrenden

**Entry requirements**

- unlimited

**Skills to be acquired in this module**

- The students prove that they are able to process and solve complex computer science tasks based on gained scientific knowledge and applied research methods. The students successfully implement a task especially by using their acquired professional and methodological knowledge and their professional and social competences.
- The accompanying seminar is used to discuss the master's thesis methodically and content-related. During the seminar, the exchange of research and practical experience fosters the students' ability to discuss and evaluate their thesis with other students and experts.
- The master's thesis is finished by a colloquium.

**Professional competence**

- The students:
  - Recognise and evaluate applied techniques and methods of their subject and are aware of their limits
  - Design solutions for complex, possibly vaguely defined or unusual computer science tasks/problems and evaluate these with reference to state of the art computer science and technology
  - 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
  - Relate knowledge from different disciplines and apply this new knowledge in complex situations
  - Develop complex computer systems, processes and datamodels
  - 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 competence**

- The students:
  - Identify and develop one or more solutions
  - Evaluate and apply tools, technology and methods sophisticatedly
  - Examine tasks with technical and research literature, write an academic article and present their solutions academically
  - Schedule processes and resources
  - Apply project management techniques
  - Combine new and original approaches and methods creatively
  - Evaluate problems/tasks, including new or developing subject areas of their discipline and apply computer science methods for solutions and research

**Social competence**

- The students:
  - Communicate with users and experts convincingly
  - Take reasonable decisions

**Self-competence**

- The students:
- Pursue the overall and special computer science development critically
- Implement innovative professional activities effectively and independently
- Recognise their abilities and extend them purposefully
- Reflect their self-perception and actions with regard to professional, methodological and social aspects
- Develop and reflect self-developed hypothesis to theories independently
- Work in their field independently

Module contents
The content of this module is an independent topic research. The research findings will be presented and discussed in a master’s thesis colloquium.

Reader’s advisory

Links

Languages of instruction
German, English

Duration (semesters)
1 Semester

Module frequency
halbjährlich

Module capacity
unlimited

Modullevel
Abschlussmodul (Abschlussmodul)

Modulart
Pflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination
Time of examination
Type of examination
Final exam of module
Masterthesis, presentation and discussion

Course type
Seminar

SWS
2.00

Frequency
SuSe and WiSe

Workload attendance
28 h