Computer Science
- Courses in English* -

- Artificial intelligence & software agents
- Databases
- Modelling & Simulation Research Project
- Operating Systems
- Seminar (Bachelor)
- Software Construction 2

Additional electives and projects will be announced closer to the start of the semester. Students can also choose classes from the Information Engineering programme, where capacity allows.

* courses are offered in the summer semester (March – July) only

Collaboration of the Department of Computer Science & Department of Information & Electrical Engineering (Oct. 2019)
**Course Name:** Artificial Intelligence & software agents (elective course)

<table>
<thead>
<tr>
<th>Degree programme:</th>
<th>Responsible Lecturer: Prof. Dr. Thomas Clemen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Computer Science</strong> (Bachelor)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work load: 180 hrs</th>
<th>Lecture hours per week: 2 hrs + 2 hrs lab</th>
<th>ECTS Credits: 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Course objectives:**
How do we come to a decision? How do we perceive our surrounding environment? Computer scientists, psychologists, and cognitive scientists have been considering these questions for a long time. This course gives an experimental introduction in corresponding topics of artificial intelligence. Here, software agents will be implemented as ‘digital twins’ of humans.

**Contents:**
- Cognitive processes and architectures
- Human perception and decision-making
- Agent-based modeling and simulation

**About didactics and work load distribution:**
Seminar-style lecture and practical training in small subgroups

**Requirements for participation:**
- Successful completion of elementary studies
- Good programming skills (C#, Java, Python or similar)

**Course language:**
English + German

**Type of exam:**
Technical report and presentation

**Requirements for credit point allocation:**
Active participation in class and successful completion of technical report and presentation

**Literature:**
Course Name: Databases

Degree programme:  
**Information Engineering** (Bachelor)  
Responsible Lecturer: Prof. Dr. Wilfried Wöhlke

<table>
<thead>
<tr>
<th>Work load: 180 hours</th>
<th>Lecture hours per week: 3 + 1 hrs lab/week</th>
<th>ECTS Credits: 6</th>
</tr>
</thead>
</table>

**Course objectives:**
The students
- have the ability to design a relational database system,
- have the knowledge of Entity Relationship Modeling, Normalization, Structured Query Language.

**Contents:**
- History
- Database Management Systems
- Entity Relationship Model
- Algebra of Relations
- Normalization
- Structured Query Language

**About didactics and work load distribution:**
Lecture: Tuition in seminars, blackboard, slides, computer simulation
Laboratory: Laboratory- and computer practical course
attendance: 72h, individual study: 108h

**Requirements for participation:**
Good knowledge of software construction (This is a 4th semester class)

**Course language:**  
English

**Type of exam:**
Lecture: Successful passing of written exam
Laboratory: Successful participation of the lab-courses with written reports and short final exam

**Requirements for credit point allocation:**
- Active participation in lectures and lab
- Passing lab requirements & written exam

**Literature:**
**Course Name:** Modelling & Simulation Research Project (interdisciplinary)

<table>
<thead>
<tr>
<th>Degree programme:</th>
<th>Computer Science (Bachelor/Master/PhD students)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsible Lecturer:</td>
<td>Prof. Dr. Thomas Clemen</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work load:</th>
<th>180 hours*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture hours per week:</td>
<td>N/A</td>
</tr>
<tr>
<td>ECTS Credits:</td>
<td>6*</td>
</tr>
</tbody>
</table>

**Course objectives:**
Students will be part of the MARS research group (http://mars-group.mars.haw-hamburg.de/en/) where they will work on an individual research and development project suitable to their level. A major objective of this module is to learn how to complete collaborative research in a larger team.

Note: The classes in this module handbook are undergraduate classes. It is however possible for Master or PhD students to do a semester-long research project within the MARS group only.

**Contents:**
Self-learning materials and coaching will be provided to students during the semester. A highly experienced team is also available. The semester covers:

- an introduction to modeling & simulation
- how to sharpen the research question
- conceptual modeling
- how to select the right simulation framework
- verification & validation

**About didactics and work load distribution:**
Individual studies and collaborative project work. A research and milestone plan will be created at the beginning of the module.

* The workload of this project can be increased to 12 credits by writing a research paper, so that together with other modules it can make up a total semester workload of 30 ECTS.

**Requirements for participation:**
Successful completion of elementary studies. Interest in interdisciplinary research issues.

**Type of exam:**
Conference or journal paper draft, ready for submission

**Requirements for credit point allocation:**

**Course language:**
English

**Literature:**
-
Course Name: Operating Systems

Degree programme: Information Engineering (Bachelor)  
Responsible Lecturer: Prof. Dr.-Ing. Holger Gräßner

Work load: 180 hours  
Lecture hours per week: 3 + 1 hrs lab/week  
ECTS Credits: 6

Course objectives:
The students have
• an overview about existing operating systems and their individual characteristics,
• the ability to use different OS resources in order to program dedicated application tasks,
• the ability to design and realize complex systems using the available OS resources.

Contents:
• Multitasking methods
• Communication and synchronization
• Resource sharing and timing control
• Interaction with external signals
• I/O programming, OS driver basics
• OS comparison and selection
• Selected topics in modern OS
• Exemplary applications during the lab with in-depth system-analysis and realisation

About didactics and work load distribution:
• Lecture: Q&A, repetition, exercises, in-depth topics
• Lab exercises deepen the lecture content; working in teams of 2 students; exercises prepared before and presented during lab hours

attendance: 72h, individual study: 108h

Requirements for participation:
Basic knowledge of software construction, computer architecture (This is a 6th semester class)

Course language: English

Type of exam:
Lecture: Successful passing in written exam
Laboratory: Successful participation in lab-courses with lab preparations with reviews, functional programmes, lab reports

Code for class schedule: OS / OSL

Requirements for credit point allocation:
• Active participation in lectures and lab
• Passing lab requirements
• Passing written exam OR practical project

Literature:
• Kernighan, B.W.; Ritchie, D. M. (2000): The C-Programming Language (ANSI C), Markt+Technik Verlag
• Corbet, J. et al. (2005): Linux Device Drivers, O'Reilly
**Course Name:** Seminar (Bachelor)

**Degree programme:**
- **Computer Science** (Bachelor)

**Responsible Lecturer:** Prof. Dr. Zhen Ru Dai

**Work load:** 90 hours

**Lecture hours per week:** 2

**ECTS Credits:** 3

**Course objectives:**
- familiarization with a new computer science topic
- become acquainted with a given technical and scientific topic
- prepared presentation slides for the topic
- given an understandable presentation to an audience that is not familiar with the special computer science topic
- learned techniques about presentation, discussion and evaluation
- learned to work with presentation tools e.g. Powerpoint

**Contents:**
- This module is an excellent starting point for student research either individually or as part of a research team. Students will learn how to dive deeply into a scientific topic, present the key ideas in front of a peer group, and react to feedback.
- Presentation techniques
- Investigate a technical topic
- Tool handling
- Discussion and evaluation
- Provide feedback to presenter
- work out outline in languages English and/or German

**About didactics and work load distribution:**
- presentation of 30 minutes, discussion and feedback from the audience
- support in working out the presentation slides
- test presentation with supervisor
- write summary as outline

**Requirements for participation:**
- 4 semesters of Computer Science and higher

**Type of exam:**
- Delivery of presentation slides and abstracts

**Course language:**
- German and English
  (presentations by students depending on nationality)

**Code for class schedule:**
- TIS / AIS

**Requirements for credit point allocation:**
- compulsory attendance

**Literature:**
- Martin Hartmann, Rüdiger Funk, Horst Nietmann: Präsentieren; Beltz
- Josef W. Seifert: Visualisieren, Präsentieren, Moderieren; Gabal
- Christian W. Dawson: Computerprojekte im Klartext; Pearson Studium
Course Name: Software Construction 2

Degree programme: Information Engineering (Bachelor)  
Responsible Lecturer: Prof. Dr. Marc Hensel

<table>
<thead>
<tr>
<th>Work load: 180 hours</th>
<th>Lecture hours per week: 3 + 1 hrs lab/week</th>
<th>ECTS Credits: 6</th>
</tr>
</thead>
</table>

**Course objectives:**
The students
- understand JAVA syntax and can write a JAVA program,
- can construct classes in object oriented form using the JAVA API,
- are able to design and test JAVA programs inside a development tool,
- are able to use encapsulation and inheritance structures,
- can use packages, streams, file handling, threads, swing and other parts of the basic JAVA API,
- can construct JAVA software including a graphical user interface for small applications.

**Contents:**

**Lecture:**
- Introduction into the object oriented programming in JAVA
- The Programming environment and the fundamental programming structures in JAVA
- The object oriented programming fundamentals
- The basic usage of classes, associations, inheritance, encapsulation and other object oriented subjects
- Main libraries of the API (Application Programming Interface)
- The execution of JAVA programs using graphical user interfaces and threads

**Lab:**
During the laboratories students learn how to transfer the main parts of the object-oriented JAVA syntax into applications. The implementation of JAVA programs, the usage of JAVA classes and the usage of the JAVA software Developers Kit (SDK) is the main focus of this module.

**About didactics and work load distribution:**
- Lecture: Q&A, repetition, exercises, in-depth topics
- Lab exercises deepen the lecture content; working in teams of 2 students; exercises prepared before and presented during lab hours

Attendance: 72h, individual study: 108h

**Requirements for participation:**
Basic knowledge of software construction (This is a 2nd semester class)

**Type of exam:**
Lecture: Successful passing in written exam
Laboratory: Successful participation in the lab-courses with written reports and a final exam

**Requirements for credit point allocation:**
- Active participation in lectures and lab
- Passing lab requirements
- Passing written exam OR practical project

**Course language:**
English

**Code for class schedule:**
SO2 / SOL2

**Literature:**