HAW HAMBURG

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)

Degree programme: **Computer Science** (Bachelor)	Responsible Lecturer: Prof. Dr. Thomas Clemen

Work load: 180 hrs	**Lecture hours per week:** 2 hrs + 2 hrs lab	**ECTS Credits:** 6

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 preseantation

Literature:

1. Daniel Kahnemann "Thinking, Fast and Slow" Penguin Books, 2012
2. Stuart Russell, Peter Norvig "Artificial Intelligence: A Modern Approach" Pearson Global Edition, 2016

Course Name: Databases

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

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

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

Code for class schedule:

DB / DBL

Requirements for credit point allocation:

- Active participation in lectures and lab
- Passing lab requirements & written exam

Literature:

- Kähler, W.-M. (2008): SQL mit ORACLE, Vieweg Verlag
- • Heuer, A. (2000): Datenbanken Konzepte und Sprachen, mitp Verlag

Course Name: Modelling & Simulation Research Project (interdisciplinary)		
Degree programme: **Computer Science** (Bachelor/Master/PhD students)	Responsible Lecturer: Prof. Dr. Thomas Clemen	
Work load: 180 hours*	**Lecture hours per week:** N/A	**ECTS Credits:** 6*

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.

Course language:

English

Type of exam:

Conference or journal paper draft, ready for submission

Requirements for credit point allocation:

-

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:

- Tanenbaum, A.S. (2009): Modern Operating Systems, Prentice Hall
- Kernighan, B.W.; Ritchie, D. M. (2000): The C-Programming Language (ANSI C), Markt+Technik Verlag
- Kerrisk, M. (2010): The Linux Programming Interface, No Starch Press
- 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:

On completion of the seminar the student will have

- 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
- Christian W. Dawson: Projects in Computing and Information Systems, Pearson

Course Name: Software Construction 2

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

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

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 inheritage 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 the 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)

Course language:

English

Type of exam:

Lecture: Successful passing in written exam

Laboratory: Successful participation in the lab-courses with written reports and a final exam

Code for class schedule:

SO2 / SOL2

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

Literature:

- Haines, S.; Potts, S. (2002): Java 2 Primer Plus, SAMS Publishing
- Flanagan, D. (2005): JAVA in a Nutshell, A Desktop Quick Reference, O'Reilly
- Horstmann, C.S.; Cornell, G. (2003): Core Java 2, Volume I-Fundamentals, Sun Microsystems Press
- Esser, F. (2001): Java 2, Designmuster und Zertifizierungswissen, Galileo Press
- Eckel, B. (2006): Thinking in Java, Prentice Hall
- Arnold, K.; Gosling, J.; Holmes, D. (2001): The Java Programming Language Third Edition, Addison-Wesley