UNIVERSITÄT ZU LÜBECK

Module Guide for the Study Path

Bachelor Media Informatics

Version from 4. October 2018

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CS1000-KP10, CS1000SJ14 - Introduction to Programming (EinfProg14)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	10

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (compulsory: aptitude test), foundations of computer science, 1st semester
- Bachelor Robotics and Autonomous Systems (compulsory), computer science, 1st semester
- Bachelor IT-Security (compulsory: aptitude test), computer science, 1st semester
- Bachelor Media Informatics (compulsory: aptitude test), computer science, 1st semester
- Bachelor Computer Science 2014 and 2015 (compulsory: aptitude test), foundations of computer science, 1st semester

Classes and lectures:

- Introduction to Programming (lecture, 2 SWS)
- Introduction to Programming (exercise, 1 SWS)
- Lab course Java (lecture, 1 SWS)
- Lab course Java (exercise, 2 SWS)
- Java project (programming project, 2 SWS)

Workload:

- 130 Hours private studies
- 120 Hours in-classroom work
- 30 Hours work on project
- 20 Hours exam preparation

Contents of teaching:

- Basic concepts of computer science: representation of information and numbers, hardware, software, operating systems, applications
- Algorithm, Specification, Program
- Syntax und Semantics of Programming Languages
- Basic concepts of imperative and OO programming
- Techniques of secure programming
- Programming in Java

Qualification-goals/Competencies:

- Understanding the nature of algorithms and their definition
- Basic knowledge about different programming paradigms (imperative, declarative, object-oriented, etc.)
- Profound knowledge about imperative and object-oriented programming
- Profound knowledge of syntax and semantics of programming languages
- Ability to design, to implement, and to test simple programs
- In-depth knowledge of the Java programming language
- Ability to develop and implement solutions satisfying commonly accepted quality standards
- Basic expertise to solve bigger tasks using adequate time and resources, particularly concerning the organisation of the own work and the work of other people
- Basic expertise to apply techniques for secure programming

Grading through:

- Exercises
- written exam
- successful addressing of the project goals

Is requisite for:

- Lab Course Software Engineering (CS2301-KP06, CS2301)
- Software Engineering (CS2300-KP06, CS2300SJ14)
- Algorithms and Data Structures (CS1001-KP08, CS1001)

Responsible for this module:

- Prof. Dr. Stefan Fischer

Teacher:

- Institute of Telematics
- Prof. Dr. Stefan Fischer

Literature:

- H. P. Gumm and M. Sommer: Einführung in die Informatik - Oldenbourg, 10. Auflage, 2012

- G. Goos und W. Zimmermann: Vorlesungen über Informatik (Band 1 und 2) - Springer-Verlag, 2006
- D. J. Barnes und M. Kölling: Objektorientierte Programmierung mit Java - Pearson Studium, 2003
- T. Stark und G. Krüger: Handbuch der Java-Programmierung - 5. Auflage, Addison-Wesley, 2007
- R. Sedgewick und K. Wayne: Einführung in die Programmierung mit Java - Pearson Studium

Language:

- offered only in German

CS1600-KP04, CS1600 - Introduction to Media Informatics (EinMedien)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	4

Course of study, specific field and term:

- Bachelor Media Informatics (compulsory: aptitude test), media informatics, 1st semester
- Bachelor CLS (optional subject), computer science, 5th or 6th semester
- Bachelor Computer Science before 2014 (compulsory), specialization field media informatics, 1st semester

Classes and lectures:

- Introduction to Media Informatics (lecture, 2 SWS)
- Introduction to Media Informatics (exercise, 1 SWS)

Workload:

- 55 Hours private studies
- 45 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Overview of the lecture
- Social context
- Terms and theories of media
- Milestones of media technology
- Interactive media technologies
- Multimeda applications
- Human-centered media
- Designing interactive media
- Development processes for interactive media
- Ethics of new media
- Summary

Qualification-goals/Competencies:

- The students know the structure and the most important contents of media informatics.
- They are prepared for the following media informatics lectures.
- They know the main tasks and fields of work in media informatics.
- They know the challenges and requirements of designing interactive multimedia systems.

Grading through:

- Exercises
- written exam

Is requisite for:

- Interaction Design (CS2600-KP08, CS2600SJ14)

Responsible for this module:

- Prof. Dr.-Ing. Nicole Jochems

Teacher:

- Institute for Multimedia and Interactive Systems
- Prof. Dr.-Ing. Nicole Jochems

Literature:

- M. Herczeg: Einführung in die Medieninformatik - Oldenbourg-Verlag, 2007
- R. Malaka et al.: Medieninformatik - Eine Einführung - Pearson Verlag, 2009

Language:

- offered only in German

MA1000-KP08, MA1000 - Linear Algebra and Discrete Structures 1 (LADS1)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	8

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (compulsory: aptitude test), mathematics, 1st semester
- Bachelor CLS starting 2016 (compulsory), mathematics, 1st semester
- Bachelor IT-Security (compulsory), mathematics, 1st semester
- Bachelor Robotics and Autonomous Systems (compulsory: aptitude test), mathematics, 1st semester
- Bachelor Biophysics (compulsory: aptitude test), mathematics, 1st semester
- Bachelor Medical Informatics since 2014 (compulsory: aptitude test), mathematics, 1st semester
- Bachelor MES since 2014 (compulsory: aptitude test), mathematics, 1st semester
- Bachelor Media Informatics (compulsory: aptitude test), mathematics, 1st semester
- Bachelor Computer Science 2014 and 2015 (compulsory: aptitude test), mathematics, 1st semester
- Bachelor Medical Informatics before 2014 (compulsory: aptitude test), mathematics, 1st semester
- Bachelor Computer Science before 2014 (compulsory: aptitude test), mathematics, 1st semester
- Bachelor MES before 2014 (compulsory), mathematics, 1st semester
- Bachelor CLS (compulsory), mathematics, 1st semester
- Minor in Teaching Mathematics, Bachelor of Arts (compulsory), mathematics, 3rd semester

Classes and lectures:

- Linear Algebra and Discrete Structures 1 (lecture, 4 SWS)
- Linear Algebra and Discrete Structures 1 (exercise, 2 SWS)

Workload:

- 125 Hours private studies and exercises
- 90 Hours in-classroom work
- 25 Hours exam preparation

Contents of teaching:

- Fundamentals: logic, sets, mappings
- Relations, equivalence relations, orderings
- Proof by induction
- Groups: fundamentals, finite groups, permutations, matrices
- Rings, fields, congruencies
- Complex numbers: calculus, representation, roots of unity
- Vector spaces: bases, dimension, scalar product, norms

Qualification-goals/Competencies:

- Students understand the fundamental concepts of linear algebra.
- They understand basic thought processes and methods of proof.
- They can explain fundamental relationships in linear algebra.
- They can apply fundamental concepts and methods of proof to algebraic problems.
- They have an understanding of abstract thought processes.
- Interdisciplinary qualifications:
- Students have basic competency in modelling.
- They can transfer fundamental theoretical concepts to similar applications.
- They can work on elementary mathematics problems within a team.
- They can present elementary solutions to their problems to a group.

Grading through:

- Exercises
- Presentation of one´s own solution of an exercise
- written exam
- e-tests

Responsible for this module:

- Prof. Dr. rer. nat. Jan Modersitzki

Teacher:

- Institute of Mathematics and Image Computing

- Prof. Dr. rer. nat. Jan Modersitzki
- Prof. Dr. rer. nat. Jan Lellmann

Literature:

- G. Fischer: Lineare Algebra: Eine Einführung für Studienanfänger - Vieweg+Teubner
- G. Strang: Lineare Algebra - Springer
- K. Jänich: Lineare Algebra - Springer
- D. Lau: Algebra und diskrete Mathematik I + II - Springer
- G. Strang: Introduction to Linear Algebra - Cambridge Press
- K. Rosen: Discrete Mathematics and Its Applications - McGraw-Hill

Language:

- offered only in German

Notes:

Prerequisite tasks for taking the exam can be announced at the beginning of the semester. If any prerequisite tasks are defined, they must be completed and passed before taking the exam for the first time.

MA2000-KP08, MA2000 - Analysis 1 (Ana1KP08)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	8

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (compulsory), mathematics, 1st semester
- Bachelor CLS starting 2016 (compulsory), mathematics, 1st semester
- Bachelor Robotics and Autonomous Systems (compulsory: aptitude test), mathematics, 1st semester
- Bachelor IT-Security (compulsory), mathematics, 1st semester
- Bachelor Biophysics (compulsory: aptitude test), mathematics, 1st semester
- Bachelor Medical Informatics since 2014 (compulsory), mathematics, 1st semester
- Bachelor Media Informatics (compulsory), mathematics, 1st semester
- Bachelor MES since 2014 (compulsory: aptitude test), mathematics, 1st semester
- Bachelor Computer Science 2014 and 2015 (compulsory), mathematics, 1st semester
- Bachelor Medical Informatics before 2014 (compulsory), mathematics, 3rd semester
- Bachelor CLS (compulsory), mathematics, 1st semester
- Bachelor MES before 2014 (compulsory), mathematics, 1st semester
- Bachelor Computer Science before 2014 (compulsory), mathematics, 3rd semester
- Minor in Teaching Mathematics, Bachelor of Arts (compulsory), mathematics, 5th semester

Classes and lectures:

- Analysis 1 (lecture, 4 SWS)
- Analysis 1 (exercise, 2 SWS)

Workload:

- 125 Hours private studies
- 90 Hours in-classroom work
- 25 Hours exam preparation

Contents of teaching:

- Sequences and series
- Functions and continuity
- Differentiability, Taylor series
- Multivariate differential calculus

Qualification-goals/Competencies:

- Students understand the basic concepts of analysis.
- Students understand the basic thoughts and proof techniques.
- Students can explain basic relationships in analysis.
- Students can apply the basic concepts and proof techniques.
- Students have an understanding for abstract structures.
- Interdisciplinary qualifications:
- Students have a basic competence in modeling.
- Students can transfer theoretical concepts to similar applications.
- Students can work as a group on elementary mathematical problems.
- Students can present elementary solutions to their problems in front of a group.

Grading through:

- Exercises
- written exam
- e-tests

Is requisite for:

- Analysis 2 (MA2500-MML)
- Analysis 2 (MA2502-MIW)
- Analysis 2 (MA2500-MIWSJ14)
- Analysis 2 (MA2500-KP08)
- Analysis 2 (MA2500-KP09)
- Analysis 2 (MA2500-KP04, MA2500)

Responsible for this module:

- Prof. Dr. rer. nat. Jürgen Prestin

Teacher:

- Institute for Mathematics
- Prof. Dr. rer. nat. Jürgen Prestin

Literature:

- K. Fritzsche: Grundkurs Analysis 1 +2
- H. Heuser: Lehrbuch der Analysis 1+2

Language:

- offered only in German

Notes:

Prerequisites for admission to the examination can be determined at the beginning of the semester. If such prerequisites are defined, they must have been fulfilled prior to the first attempt at the examination and must have been rated as positive.

CS1001-KP08, CS1001 - Algorithms and Data Structures (AuD)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	8

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (compulsory: aptitude test), foundations of computer science, 2nd semester
- Bachelor CLS starting 2016 (compulsory), foundations of computer science, 2nd semester
- Bachelor Robotics and Autonomous Systems (compulsory), computer science, 2nd semester
- Bachelor IT-Security (compulsory: aptitude test), computer science, 2nd semester
- Bachelor Medical Informatics since 2014 (compulsory), computer science, 2nd semester
- Bachelor MES since 2014 (optional subject), computer science and electrical engineering, 4th or 6th semester
- Bachelor Media Informatics (compulsory), foundations of computer science, 2nd semester
- Bachelor Computer Science 2014 and 2015 (compulsory: aptitude test), foundations of computer science, 2nd semester
- Bachelor Medical Informatics before 2014 (compulsory), computer science, 2nd semester
- Bachelor MES before 2014 (compulsory), foundations of computer science, 4th semester
- Bachelor CLS (compulsory), foundations of computer science, 2nd semester
- Bachelor Computer Science before 2014 (compulsory: aptitude test), foundations of computer science, 2nd semester

Classes and lectures:

- Algorithms and Data Structures (lecture, 4 SWS)
- Algorithms and Data Structures (exercise, 2 SWS)

Workload:

- 125 Hours private studies
- 90 Hours in-classroom work
- 25 Hours exam preparation

Contents of teaching:

- Introduction, algorithms, design patterns: stepwise execution, one-step execution
- Sorting with comparisons, design patterns: linear reduction principle, divide and conquer, problem complexity, asymptotic complexity of an algorithm (O notation), problem classes, heaps as data structures, stability
- Distribution sort: counting sort, radix sort, bucket sort
- Priority queues, binomial heaps, Fibonacci heaps, amortized analysis
- Selection, k-smallest element
- Sets, self-adjusting data structures, binary search trees, iterators and navigation structures, balance, self-adjusting binary search trees: splay trees (access-time adjustment), red-black trees, AVL trees (insertion-time adjustment)
- Sets of strings, tries, PATRICIA tries
- Disjoint sets, union-find data structures
- Associating objects, hash tables, dynamic hashing (separate chaining, linear probing, quadratic probing, rehashing), static hashing, universal hashing
- Graphs, operators, graph representations, breadth-first and depth-first search, connected components, shortest paths, single-source shortest paths (Dijkstra s algorithm, A* algorithm, Bellmann-Ford algorithm), all-pairs shortest paths, transitive closure, minimal spanning tree (Kruskal s algorithm, Jarnik-Prim algorithm), network flows (Ford-Fulkerson algorithm, Edmonds-Karp algorithm), bipartite matching
- Search graph for game playing, minimax search, search space construction, alpha-beta pruning, chess playing
- Pruning and subgraph isomorphism, Ullmann s algorithm, character recognition, recognition of protein structures
- Dynamic Programming principle, greedy algorithms, optimization problems, sequence alignment (longest common subsequence), knapsack problem, planning and layout problems, determining change coins, notion of completeness of algorithms
- String matching: exact algorithms (Knuth-Morris-Pratt, Boyer-Moore, Rabin-Karp, suffix trees, suffix arrays), approximate string matching with dynamic programming
- Hard problems, satisfiability of propositional logic formulas, 3-SAT, P=NP?, clique problem, problem reduction, NP-hardness, NP-completeness, algorithmic design patterns for dealing with NP-hard problems (DPLL, dependency-directed backtracking), reducing Sudoku to 3-SAT, 2-SAT, constraint satisfaction problems, reduction of backtracking with heuristics (discussed using chromatic number and n-queen problems as an example)

Qualification-goals/Competencies:

- Knowledge of the properties of elementary and frequently used algorithms
- Understanding of the impact of complexity in theory and practice
- Competence in the design and understanding of algorithms and their underlying data structures

Grading through:

- Exercises

- written exam

Is requisite for:

- Databases (CS2700-KP04, CS2700)
- Lab Course Software Engineering (CS2301-KP06, CS2301)
- Software Engineering (CS2300-KP06, CS2300SJ14)
- Theoretical Computer Science (CS2000-KP08, CS2000)
- Algorithm Design (CS3000-KP04, CS3000)

Requires:

- Introduction to Programming (CS1000-KP08, CS1000SJ14-MML/MI, CS1000SJ14-MIW)
- Introduction to Programming (CS1000-KP10, CS1000SJ14)

Responsible for this module:

- Prof. Dr. rer. nat. habil. Ralf Möller

Teacher:

- Institute of Information Systems
- Prof. Dr. rer. nat. habil. Ralf Möller

Literature:

- T. Ottmann, P. Widmayer: Algorithmen und Datenstrukturen - Spektrum, 2002
- R. Sedgewick: Algorithmen in Java Teil 1 - 4 - Pearson Studium, 2003
- S. Baase und A. Van Gelder: Computer Algorithms - 3. Auflage, Addison-Wesley, 2000

Language:

- offered only in German

CS1200-KP06, CS1200SJ14 - Fundamentals of Computer Engineering 1 (TGI1)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	6

Course of study, specific field and term:

- Bachelor Robotics and Autonomous Systems (compulsory: aptitude test), computer science, 2nd semester
- Bachelor IT-Security (compulsory), computer science, 2nd semester
- Bachelor Biophysics (optional subject), computer science, 6th semester
- Bachelor Medical Informatics since 2014 (compulsory), computer science, 2nd semester
- Bachelor Media Informatics (compulsory), computer science, 2nd semester
- Bachelor MES since 2014 (compulsory), foundations of computer science, 4th semester
- Bachelor Computer Science 2014 and 2015 (compulsory), foundations of computer science, 2nd semester
- Bachelor Computer Science since 2016 (compulsory), foundations of computer science, 2nd semester

Classes and lectures:

- Fundamentals of Computer Engineering 1 (lecture, 2 SWS)
- Fundamentals of Computer Engineering 1 (exercise, 2 SWS)

Workload:

- 100 Hours private studies
- 60 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Von-Neumann computer
- Switching algebra and switching functions
- Technological realization
- Combinatorial and sequential circuits
- Memories
- Microprocessors
- Assembler programming
- Microcontrollers
- Input/Output programming
- Basic processor architectures

Qualification-goals/Competencies:

- The students can explain the principal organization of a computer and the execution of a program according to the Von-Neumann principle.
- They can elucidate the principal functioning of combinatorial and sequential circuits and describe them formally using switching algebra.
- They can demonstrate the basic circuits for the technological realization of logic gates with bipolar and MOS transistors.
- They can explain the structure and operation of registers and memories.
- They can elucidate the instruction set of a microprocessor exemplarily and to be able to use it for assembly programming.
- Sie können die Ein/Ausgabe-Schnittstellen eines Mikrocontrollers beschreiben und in Assemblersprache programmieren (mit Polling bzw. Interrupt).
- They can program microcontrollers for simple applications in assembly language and in C.
- They can discuss and compare basic processor architectures and their instruction sets.

Grading through:

- Exercises
- continuous, successful participation in practical course
- written exam

Is requisite for:

- Embedded Systems (CS2101-KP04, CS2101)
- Computer Architecture (CS2100-KP04, CS2100SJ14)
- Fundamentals of Computer Engineering 2 (CS1202-KP06, CS1202)

Responsible for this module:

- Prof. Dr.-Ing. Mladen Berekovic

Teacher:

- Institute of Computer Engineering
- Prof. Dr.-Ing. Mladen Berekovic

Literature:

- C. Hamacher, Z. Vranesic, S. Zaky, N. Manjikian: Computer Organisation and Embedded Systems - McGraw-Hill 2012
- M. M. Mano, C. R. Kime: Logic and Computer Design Fundamentals - Pearson 2007
- D. A. Patterson, J. L. Hennessy: Computer Organisation & Design - The Hardware/Software Interface - Morgan Kaufmann 2011
- T. Ungerer, U. Brinkschulte: Mikrocontroller und Mikroprozessoren - Springer 2010

Language:

- offered only in German

CS2200-KP04, CS2200 - Software Ergonomics (SoftErgo)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	4

Course of study, specific field and term:

- Bachelor Psychology before 2016 (optional subject), computer science, arbitrary semester
- Bachelor Media Informatics (compulsory), media informatics, 2nd semester
- Bachelor Medical Informatics before 2014 (optional subject), software engineering, 4th to 6th semester
- Bachelor Computer Science before 2014 (compulsory), foundations of computer science, 2nd semester
- Bachelor Psychology since 2016 (optional subject), computer science, arbitrary semester

Classes and lectures:

- Software Ergonomics (lecture, 2 SWS)
- Software Ergonomics (exercise, 1 SWS)

Workload:

- 55 Hours private studies
- 45 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Motivation and introduction
- Work systems
- Effects of work
- Cognition and memory
- User analysis and user modeling
- Models for human-computer systems
- Temporal behavior of interactive systems
- Quality criteria for interactive systems
- Evaluation of interactive systems
- Legal conditions
- Summary

Qualification-goals/Competencies:

- The students know the basic theories, models and criteria for user- and application-centered interactive multimedia systems.
- They are able to transfer this knowledge into development processes and to evaluate interactive systems systematically.
- They can describe work systems as well as applications in education and entertainment in a user- and task-centered way.

Grading through:

- Exercises
- written exam

Is requisite for:

- Usability Engineering (CS3201-KP04, CS3201)
- Media Production and Media Programming (CS2601-KP08, CS2601SJ14)
- Interaction Design (CS2600-KP08, CS2600SJ14)

Responsible for this module:

- Prof. Dr. rer. nat. Michael Herczeg

Teacher:

- Institute for Multimedia and Interactive Systems
- Prof. Dr. rer. nat. Michael Herczeg
- Prof. Dr. rer. nat. Tilo Mentler

Literature:

- M. Herczeg: Software-Ergonomie - 4. Auflage, München: Oldenbourg-Verlag, 2018

Language:

- offered only in German

PY1710-KP04, PY1710 - Work Psychology (ArbPsy)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	4

Course of study, specific field and term:

- Master Entrepreneurship in Digital Technologies (optional subject), interdisciplinary competence, 2nd or 4th semester
- Bachelor Media Informatics (compulsory), psychology, 2nd semester

Classes and lectures:

- Work Psychology (lecture, 2 SWS)
- Work Psychology (seminar, 1 SWS)

Workload:

- 75 Hours private studies and exercises
- 45 Hours in-classroom work

Contents of teaching:

- History of work psychology
- Sociotechnical systems and work systems
- Models of work behavior
- Work analysis and evaluation
- Effects of work
- Designing work environments and tasks
- Human-machine-systems within work systems
- Training and skill development
- Work motivation and satisfaction with work

Qualification-goals/Competencies:

- The students can denote components and influential factors in work systems that include human-machine-interaction and can explain them with recourse to models especially for computer workstations and other applications of digital media in work systems.
- They are able to use psychological concepts and methods and can read and understand psychological scientific studies on applications of digital and interactive media in the context of work.
- They can cooperate effectively with psychologists and ergonomists in interdisciplinary teams.

Grading through:

- written exam

Responsible for this module:

- Prof. Dr. rer. nat. Thomas Franke

Teacher:

- Institute for Multimedia and Interactive Systems
- Prof. Dr. rer. nat. Thomas Franke

Literature:

- F. W. Nerdinger, G. Blickle & N. Schaper: Arbeits- und Organisationspsychologie (3. Auflage) - Berlin, Heidelberg: Springer, 2014
- K. Sonntag, E. Frieling & R. Stegmaier: Lehrbuch Arbeitspsychologie (3. Auflage) - Bern: Hans Huber, 2012

Language:

- offered only in German

PY1801-KP08 - Empirical methodology and statistics (EmpStat)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	8

Course of study, specific field and term:

- Bachelor Media Informatics (compulsory), psychology, 2nd semester

Classes and lectures:

- Statistics I (lecture, 2 SWS)
- Evaluation and Research Methodology (lecture, 2 SWS)
- Research Methodology (exercise, 2 SWS)

Workload:

- 150 Hours private studies and exercises
- 90 Hours in-classroom work

Contents of teaching:

- DESCRIPTIVE STATISTICS:
- measures of central tendency and dispersion
- data visualization and interpretation
- descriptive univariate analyses of data with different levels of measurement
- descriptive analysis of bivariate distributions
- statistical measures and effect sizes
- INFERENTIAL STATISTICS
- introduction to probability
- from population to sample and vice versa
- analysis of relationships in frequency data
- principles of statistical hypotheses testing: significance test
- statistical techniques to explore relationships between variables
- statistical techniques to compare groups (parametric statistics) Evaluation und Research Methodology
- EVALUATION AND RESEARCH METHODS
- basic understanding of science
- theories and literature
- understanding empirical studies
- operationalization and data collection methods
- designs and research plans
- sampling
- planning, procedure, organization
- ethics
- data entry and cleaning
- data analysis
- interpretation and discussion of results

Qualification-goals/Competencies:

- Students understand and can critically evaluate the basic concepts of quantitative data analysis with psychological data
- They can apply this knowledge to statistical tasks
- They have a basic understanding of how to use statistics software like SPSS or R
- They are able to discuss statistical results on their own
- They have a basic understanding of evaluation and research methods

Grading through:

- Exercises
- written exam

Responsible for this module:

- Prof. Dr. rer. nat. Thomas Franke

Teacher:

- Institute for Psychology I
- Institute for Multimedia and Interactive Systems

- Dr. rer. nat. Daniel Wessel

- Prof. Dr. rer. nat. Jonas Obleser

Literature:

- Eid, M., Gollwitzer, M. & Schmitt, M.: Statistik und Forschungsmethoden. - Beltz. 1. Auflage, 2010
- Wirtz, M., Nachtigall, C: Deskriptive Statistik. Statistische Methoden für Psychologen Teil 1 - Beltz Juventa. 6. Auflage, 2012
- Motulsky, H.: Intuitive Biostatistics - Oxford University Press. 3. Auflage, 2014

Language:

- offered only in German

CS1601-KP04, CS1601 - Basics of Multimedia Systems (MMTechnik)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	4

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (optional subject), major subject informatics, arbitrary semester
- Bachelor Robotics and Autonomous Systems (optional subject), computer science, 4th or 6th semester
- Bachelor IT-Security (optional subject), computer science, arbitrary semester
- Bachelor Media Informatics (compulsory), media informatics, 3rd semester
- Bachelor Computer Science 2014 and 2015 (optional subject), central topics of computer science, 5th semester
- Bachelor Computer Science before 2014 (optional subject), central topics of computer science, 6th semester
- Bachelor CLS (optional subject), computer science, 6th semester
- Bachelor Computer Science before 2014 (compulsory), specialization field media informatics, 2nd semester

Classes and lectures:

- Basics of Multimedia Systems (lecture, 2 SWS)
- Basics of Multimedia Systems (exercise, 1 SWS)

Workload:

- 55 Hours private studies
- 45 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Sensation and Perception
- Analog Media Technology
- Digitalisation
- Digital Audio, Image and Video Technology
- Haptical Technologies
- Foundations of Data Compression
- Storage Media
- Media Transmission (Broadcast / Streaming)

Qualification-goals/Competencies:

- Students are able to present to essential functions and principles of multimedia systems.
- They are able to judge possibilities and limitations of human perception.
- They are able to classify the conditions and technologies for capturing, processing, storing, transmitting and perception of multimedia.
- They can balance the specific advantages and disadvantages of analog and digital media technology.
- They are able to apply appropriate technical components and processes for the design of multimedia systems.

Grading through:

- Exercises
- Written or oral exam as announced by the examiner

Responsible for this module:

- Prof. Dr.-Ing. Andreas Schrader

Teacher:

- Institute of Telematics
- Prof. Dr.-Ing. Andreas Schrader

Literature:

- Thomas Görne: Tontechnik - Hanser 2011
- Ulrich Schmidt: Professionelle Videotechnik - Springer 2009

Language:

- English, except in case of only German-speaking participants

CS2000-KP08, CS2000 - Theoretical Computer Science (TI)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	8

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (compulsory), foundations of computer science, 3rd semester
- Bachelor Robotics and Autonomous Systems (optional subject), computer science, 5th or 6th semester
- Bachelor IT-Security (compulsory), computer science, 3rd semester
- Bachelor MES before 2014 (optional subject), computer science, 5th semester
- Bachelor Medical Informatics since 2014 (compulsory), computer science, 3rd semester
- Bachelor Computer Science 2014 and 2015 (compulsory), foundations of computer science, 3rd semester
- Bachelor Media Informatics (compulsory), computer science, 3rd semester
- Bachelor Medical Informatics before 2014 (compulsory), computer science, 3rd semester
- Bachelor Computer Science before 2014 (compulsory), foundations of computer science, 3rd semester

Classes and lectures:

- Theoretical Computer Science (lecture, 4 SWS)
- Theoretical Computer Science (exercise, 2 SWS)

Workload:

- 135 Hours private studies and exercises
- 90 Hours in-classroom work
- 15 Hours exam preparation

Contents of teaching:

- Formalization of problems using languages
- formal grammars
- regular languages, finite automata
- context free language, push down automata
- sequential computational models: Turing machines, register machines
- sequential complexity classes
- simulations, reductions, completeness
- satisfiability problem, NP-completeness
- (In-)decidability and enumerability
- halting problem and Church-Turing thesis

Qualification-goals/Competencies:

- Students are able to present the theoretical foundation of syntax and operational semantics of programming languages
- They are able to transform formalizations using theorems of theoretical computer science.
- They can classify problems according to their computational complexity
- They are able to model algorithmic problems and solve them using appropriate tools
- They can judge what computer science can and cannot achieve in principle

Grading through:

- exercises and project assignments
- written exam and course achievements

Is requisite for:

- Algorithm Design (CS3000-KP04, CS3000)
- Parallel Computing (CS3051-KP04, CS3051)

Requires:

- Introduction to Programming (CS1000-KP08, CS1000SJ14-MML/MI, CS1000SJ14-MIW)
- Introduction to Programming (CS1000-KP10, CS1000SJ14)
- Algorithms and Data Structures (CS1001-KP08, CS1001)

Responsible for this module:

- Prof. Dr. Rüdiger Reischuk

Teacher:

- Institute for Theoretical Computer Science

- Prof. Dr. Rüdiger Reischuk
- Prof. Dr. rer. nat. Till Tantau
- Prof. Dr. Maciej Liskiewicz

Literature:

- J. Hopcroft, R. Motwani, J. Ullman: Introduction to Automata Theory, Languages and Computation - Addison Wesley, 2001

Language:

- offered only in German

CS2300-KP06, CS2300SJ14 - Software Engineering (SWEng14)

Duration:	Turnus of offer:	Credit points:	Max. group size:
1 Semester	each winter semester	6	12

Course of study, specific field and term:

- Bachelor Robotics and Autonomous Systems (compulsory), computer science, 3rd semester
- Bachelor IT-Security (compulsory), computer science, 3rd semester
- Bachelor Biophysics (optional subject), computer science, 5th semester
- Bachelor Computer Science since 2016 (compulsory), foundations of computer science, 3rd semester
- Bachelor Media Informatics (compulsory), foundations of computer science, 3rd semester
- Bachelor Medical Informatics since 2014 (compulsory), computer science, 3rd semester
- Bachelor Computer Science 2014 and 2015 (compulsory), foundations of computer science, 3rd semester

Classes and lectures:

- Software Engineering (lecture, 3 SWS)
- Software Engineering (exercise, 1 SWS)

Workload:

- 100 Hours private studies and exercises
- 60 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- overview on major fields of software engineering
- Software development, software process models
- Project plan and workload estimation
- Software management and quality assurance
- Syste,m Analysis and requirements analysis
- Basics of UML
- Software architectures and design patterns
- Validation and verification
- Legal aspects: copyright, standards, liability, licenses

Qualification-goals/Competencies:

- The students understand software design as an engineering process.
- They can argue about major software process models.
- They can explain important techniques and factors of software management.
- They can describe and evaluate measures for quality ensurance.
- They are able to model software systemson different levels of abtraction.
- They can apply the basic concepts of object-oriented modelling and design.
- They are able to apply design patterns in a useful way.
- They can discuss about legal aspects of software development.

Grading through:

- Exercises
- Written or oral exam as announced by the examiner

Is requisite for:

- Safe Software (CS3250-KP08)
- Lab Course Software Engineering (CS2301-KP06, CS2301)

Requires:

- Algorithms and Data Structures (CS1001-KP08, CS1001)
- Introduction to Programming (CS1000-KP10, CS1000SJ14)

Responsible for this module:

- Prof. Dr. Martin Leucker

Teacher:

- Institute of Software Technology and Programming Languages
- Prof. Dr. Martin Leucker

Literature:

- H. Balzert: Lehrbuch der Software-Technik: Software-Entwicklung - Spektrum Akademischer Verlag 2001
- B. Brügge, A. H. Dutoit: Objektorientierte Softwaretechnik mit UML, Entwurfsmustern und Java - Pearson Studium 2004
- I. Sommerville: Software Engineering - Addison-Wesley 2006
- B. Oestereich: Analyse und Design mit der UML 2.1 - Objektorientierte Softwareentwicklung - Oldenbourg 2006
- D. Bjorner: Software Engineering 1-3 - Springer 2006

Language:

- offered only in German

Notes:

For participating in CS2301-KP06 Lab Course Software Engineering it is necessary to pass the exam for CS2300-KP06 Software Engineering before.

CS2601-KP08, CS2601SJ14 - Media Production and Media Programming (MedienProd)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	8

Course of study, specific field and term:

- Bachelor Media Informatics (compulsory), media informatics, 3rd semester

Classes and lectures:

- Media Production and Media Programming (lecture, 3 SWS)
- Media Production and Media Programming (exercise, 3 SWS)

Workload:

- 120 Hours private studies
- 90 Hours in-classroom work
- 30 Hours exam preparation

Contents of teaching:

- Introduction and Overview
- Media production: Graphics and Images
- Media production: Movies and Animations
- Media production: Audio
- Media production: 3D-Modelling
- Media production: Hypermedia
- Media production: Content-Management-Systems
- Media programming: Models and architectures
- Media programming: Interfaces
- Media programming: Languages and libraries
- Media programming: Web programming
- Media programming: Programming for mobile devices
- Summary and Outlook

Qualification-goals/Competencies:

- Students can evaluate technical production methods and tools for programming and production of interactive multimedia computer applications.
- Students can develop and prototype problem-oriented concepts for interactive multimedia computer applications.

Grading through:

- Exercises
- written exam

Requires:

- Software Ergonomics (CS2200-KP04, CS2200)

Responsible for this module:

- Prof. Dr. rer. nat. Michael Herczeg

Teacher:

- Institute for Multimedia and Interactive Systems
- Prof. Dr. rer. nat. Michael Herczeg
- Prof. Dr.-Ing. Nicole Jochems
- MitarbeiterInnen des Instituts

Literature:

- M. Herczeg: Interaktionsdesign - München: Oldenbourg-Verlag, 2006
- M. Herczeg: Software-Ergonomie: Grundlagen der Mensch-Computer-Kommunikation - 3. Auflage, München: Oldenbourg-Verlag, 2009

Language:

- offered only in German

PY2210-KP04, PY2210 - Psychology of Perception and Cognition (KogPsy)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	4

Course of study, specific field and term:

- Bachelor Media Informatics (compulsory), psychology, 3rd semester

Classes and lectures:

- Psychology of Perception and Cognition (lecture, 2 SWS)
- Psychology of Perception and Cognition (seminar, 1 SWS)

Workload:

- 75 Hours private studies and exercises
- 45 Hours in-classroom work

Contents of teaching:

- History of cognitive psychology
- Methods in cognitive psychology and cognitive neuroscience
- Perception
- Attention
- Psychophysics
- Learning, memory, and knowledge
- Language
- Reasoning and problem solving
- Judgment, decision making, and action control

Qualification-goals/Competencies:

- The students can understand, classify, and use psychological scientific contributions.
- They are able to describe processes of media use and human-machine-interaction referring to basic cognitive functions, to judge demands to users and users needs, and to account for them in the design of media and technological systems.
- They know how to evaluate technological systems and interactive media with methods from cognitive psychology.

Grading through:

- Written or oral exam as announced by the examiner

Responsible for this module:

- Prof. Dr. rer. nat. Thomas Franke

Teacher:

- Institute for Multimedia and Interactive Systems
- Dr. rer. nat. Daniel Wessel

Literature:

- J.R. Anderson: Kognitive Psychologie (7. Auflage) - Heidelberg: Spektrum, 2013
- E. B. Goldstein: Wahrnehmungspsychologie (9. Auflage) - Heidelberg: Spektrum, 2014

Language:

- offered only in German

CS2150-KP08, CS2150SJ14 - Operating Systems and Networks (BSNetze14)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	8

Course of study, specific field and term:

- Bachelor Robotics and Autonomous Systems (compulsory), computer science, 4th semester
- Bachelor IT-Security (compulsory), computer science, 4th semester
- Bachelor Media Informatics (compulsory), foundations of computer science, 4th semester
- Bachelor Medical Informatics since 2014 (compulsory), computer science, 4th semester
- Bachelor Computer Science 2014 and 2015 (compulsory), foundations of computer science, 4th semester
- Bachelor Computer Science since 2016 (compulsory), foundations of computer science, 4th semester

Classes and lectures:

- Operating Systems and Networks (lecture, 4 SWS)
- Operating Systems and Networks (exercise, 2 SWS)

Workload:

- 130 Hours private studies
- 90 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Tasks and Structure
- Historical Overview of Computer and Operating Systems
- Coding of Symbols and Numbers
- Foundations of Operating Systems
- Processes, Inter-Process Communication and Process Management
- Storage Management
- Input / Output
- Files and File Systems
- Examples (UNIX, Windows, mobile OS)
- Computer Networks and the Internet
- Application Layer
- Transport Layer
- Network Layer
- Link and Physical Layer

Qualification-goals/Competencies:

- Students know about the main concepts of operating systems.
- Students are able to judge, which OS concepts can be appropriately applied to novel computing architectures.
- Students are able to apply the most important strategies and algorithms for operating systems.
- At the end of the course, students know the most important concepts ofcomputer networks
- Students know the importance of the different layers of the OSI andInternet protocol suite along with the most important protocols and services of each layer
- The students are able decide which network technologies to use to meetthe requirements of any given application scenario
- The students know how the Internet works and are able to program smallapplications
- Students can apply the most important methods and algorithms from thefield of networks

Grading through:

- Exercises
- written exam

Responsible for this module:

- Prof. Dr. Stefan Fischer

Teacher:

- Institute of Telematics
- Prof. Dr. Stefan Fischer
- Prof. Dr.-Ing. Andreas Schrader

Literature:

- Andrew S. Tanenbaum: Moderne Betriebssysteme - 3., aktualisierte Auflage, Pearson, April 2009
- James Kurose, Keith Ross: Computer Networking - Der Top-Down-Ansatz - Pearson Studim, 2012
- Andrew S. Tanenbaum: Computernetzwerke - Pearson Studium, 2012

Language:

- offered only in German

CS2301-KP06, CS2301 - Lab Course Software Engineering (SWEngPrakt)

Duration:	Turnus of offer:	Credit points:	Max. group size:
1 Semester	each summer semester	6 (Typ A)	12

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (compulsory), foundations of computer science, 4th semester
- Bachelor Robotics and Autonomous Systems (compulsory), computer science, 4th semester
- Bachelor IT-Security (compulsory), computer science, 4th semester
- Bachelor Media Informatics (compulsory), foundations of computer science, 4th semester
- Bachelor Medical Informatics since 2014 (compulsory), computer science, 4th semester
- Bachelor Computer Science 2014 and 2015 (compulsory), foundations of computer science, 4th semester

Classes and lectures:

- Lab Course Software Engineering (practical course, 4 SWS)

Workload:

- 60 Hours in-classroom work
- 60 Hours group work
- 50 Hours work on project
- 10 Hours oral presentation and discussion (including preparation)

Contents of teaching:

- Realization of a software system
- Project management and team work
- Design, implementation and testing

Qualification-goals/Competencies:

- The students are able to systematically design software systems whose implemention meets the requirements, using object oriented techniques.
- They can use UML and CASE tools.
- They can decide how to advance their software in a sensible way.
- They can contribute their experience in the realization of a software development project in further projects.
- They have the qualification to present artefacts, to comply tostandards and to observe time limits.
- They are qualified to work in a team and to reflect their social skills.

Grading through:

- continuous, successful participation in practical course
- presentation
- successful addressing of the project goals
- documentation

Requires:

- Introduction to Programming (CS1000-KP10, CS1000SJ14)
- Algorithms and Data Structures (CS1001-KP08, CS1001)
- Software Engineering (CS2300-KP06, CS2300SJ14)

Responsible for this module:

- Prof. Dr. Martin Leucker

Teacher:

- Institute of Software Technology and Programming Languages
- Prof. Dr. Martin Leucker

Literature:

- H. Balzert: Lehrbuch der Softwaretechnik: Softwaremanagement - Spektrum Akademischer Verlag 2008
- B. Brügge, A. H. Dutoit: Objektorientierte Softwaretechnik mit UML, Entwurfsmustern und Java - Pearson Studium 2004
- I. Sommerville: Software Engineering - Addison-Wesley 2012
- B. Oestereich: Analyse und Design mit der UML 2.3 - Objektorientierte Softwareentwicklung - Oldenbourg 2009

Language:

- offered only in German

Notes:

For participating in CS2301-KP06 Lab Course Software Engineering it is necessary to pass the exam for CS2300-KP06 Software Engineering before.

CS2600-KP08, CS2600SJ14 - Interaction Design (IDE)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	8

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (optional subject), major subject informatics, arbitrary semester
- Bachelor Robotics and Autonomous Systems (optional subject), computer science, 5th or 6th semester
- Bachelor Computer Science 2014 and 2015 (optional subject), central topics of computer science, 6th semester
- Bachelor Media Informatics (compulsory), media informatics, 4th semester

Classes and lectures:

- Interaction Design (lecture, 3 SWS)
- Interaction Design (practical course, 3 SWS)

Workload:

- 140 Hours group work
- 40 Hours in-classroom work
- 40 Hours written report
- 20 Hours oral presentation (including preparation)

Contents of teaching:

- Introduction and overview
- Basic models of multimedia and interactive systems
- System paradigms
- Design patterns
- Modalities of interaction
- Information output and output devices
- Information input and input devices
- Help systems
- History systems
- Activity management systems
- Individualization of interactive systems
- Summary

Qualification-goals/Competencies:

- The students are able to use systematically and theoretically founded methods for the design of user interfaces of interactive systems.
- Besides the psychological and computer science basics they build up knowledge about methods from the areas of graphic design and communication design.
- They are capable of categorizing existing systems and develop concepts for improving them.

Grading through:

- exercises, project, oral or written exam

Requires:

- Software Ergonomics (CS2200-KP04, CS2200)
- Introduction to Media Informatics (CS1600-KP04, CS1600)

Responsible for this module:

- Dr. Thomas Winkler

Teacher:

- Institute for Multimedia and Interactive Systems
- Dr. Thomas Winkler

Literature:

- M. Herczeg: Interaktionsdesign - Oldenbourg-Verlag, 2006
- B. Shneiderman, C. Plaisant: Designing the User Interface - Addison-Wesley, 2009

Language:

- offered only in German

CS2700-KP04, CS2700 - Databases (DB)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	4

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (compulsory), foundations of computer science, 4th semester
- Bachelor Robotics and Autonomous Systems (optional subject), computer science, 5th or 6th semester
- Bachelor IT-Security (compulsory), computer science, 4th semester
- Bachelor Biophysics (optional subject), computer science, 6th semester
- Bachelor MES before 2014 (optional subject), computer science, 4th or 6th semester
- Bachelor Medical Informatics since 2014 (compulsory), computer science, 4th semester
- Bachelor MES since 2014 (optional subject), computer science and electrical engineering, 4th or 6th semester
- Bachelor Media Informatics (compulsory), foundations of computer science, 4th semester
- Bachelor Computer Science 2014 and 2015 (compulsory), foundations of computer science, 4th semester
- Bachelor Medical Informatics before 2014 (compulsory), computer science, 2nd semester
- Master CLS (optional subject), computer science, 2nd semester
- Bachelor CLS (optional subject), computer science, 6th semester
- Bachelor Computer Science before 2014 (compulsory), foundations of computer science, 4th semester

Classes and lectures:

- Databases (lecture, 2 SWS)
- Databases (exercise, 1 SWS)

Workload:

- 55 Hours private studies
- 45 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Introduction, conceptual view of database systems, conceptual data modeling with the Entity-Relationship (ER) modeling language
- The relational data model* Referential integrity, keys, foreign keys, functional dependencies (FDs)* Canonical mapping of entity types and relationships into the relational data model* Update, insertions, and deletion anomalies* Relational algebra as a query language* Database normalization, closure w.r.t. FD set, canonical cover of FD sets, normal forms, correct and dependency preserving decomposition of relation schemata, multi-value dependencies, inclusion dependencies
- Practical query language: SQL* Selection, projection, join, aggregation, grouping, sorting, difference, relational algebra in SQL* Data management* Integrity constraints
- Storage structures and database architecture* Characteristics of storage media, I/O complexity* DBMS architecture: disk space manager, buffer manager, files and access methods, record allocation strategies (row-wise, column-wise, mixed)
- Query processing* Indexing techniques, ISAM index, B+-tree index, hash index* Sorting: Two-way merge sort, blockwise processing, selection trees, query execution plans, join operator: nested loops join, blockwise nested loops join, index-based joins, sort-merge join, partition-based join with hashing* Addition operators: grouping and duplicate elimination, selection, projection, pipeline principle
- Query optimization* Cost metrics, Estimating sizes of intermediate tables, selectivity* Join optimization, physical plan properties, interesting orders, query transformation* Index cuts, bitmap indexes
- Transactions and recovery* ACID, anomalies, serializability, locks, 2-phase commit protocol, concurrent access to index structures, isolation levels* Implementation of transaction w.r.t. ACID, shadow pages, write ahead log, snapshots

Qualification-goals/Competencies:

- Basic understanding of database principles
- Knowledge about relational database design
- Knowledge of database query languages such as relational algebra and SQL
- Knowledge about principles of concurrent data access
- Introduction of database implementation techniques to allow for estimating resources required for answering queries

Grading through:

- Exercises
- written exam

Is requisite for:

- Nonstandard Database Systems (CS3202-KP04, CS3202)

Requires:

- Introduction to Programming (CS1000-KP08, CS1000SJ14-MML/MI, CS1000SJ14-MIW)
- Introduction to Programming (CS1000-KP10, CS1000SJ14)

Responsible for this module:

- Prof. Dr. rer. nat. habil. Ralf Möller

Teacher:

- Institute of Information Systems
- Prof. Dr. rer. nat. habil. Ralf Möller

Literature:

- A. Kemper, A, Eickler: Datenbanksysteme - Eine Einführung - Oldenbourg-Verlag

Language:

- offered only in German

PY2904-KP04, PY2904 - Media Psychology (MedienPsy)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	4

Course of study, specific field and term:

- Bachelor Psychology before 2016 (optional subject), psychology, arbitrary semester
- Bachelor Biophysics (optional subject), no specific field, 6th semester
- Bachelor Psychology since 2016 (optional subject), psychology, arbitrary semester
- Bachelor Media Informatics (compulsory), psychology, 4th semester

Classes and lectures:

- Media Psychology (lecture, 2 SWS)
- Media Psychology (seminar, 1 SWS)

Workload:

- 75 Hours private studies and exercises
- 45 Hours in-classroom work

Contents of teaching:

- History of media psychology
- Areas of application (human-computer-interaction, computer-mediated communication, infotainment and edutainment, video- and computer games, visualisation systems, e-learning, social networks)
- Methods for analysis and evaluation
- Multimedia interaction
- Multimodal interaction
- Media selection and media use
- Media reception
- Media effects
- Media socialisation and media competency

Qualification-goals/Competencies:

- The students can explicate theories of media psychology using digital media as examples.
- They are able to draw conclusions from media psychology s scientific contributions regarding multimedia and interactive media and to judge media use and media effects based on knowledge of media psychology.
- They are able to analyse and to evaluate digital media with methods from media psychology.
- They can cooperate effectively in interdisciplinary teams.

Grading through:

- written exam

Responsible for this module:

- Prof. Dr. rer. nat. Thomas Franke

Teacher:

- Institute for Multimedia and Interactive Systems
- Dr. rer. nat. Daniel Wessel

Literature:

- B. Batinic & M. Appel (Hrsg.): Medienpsychologie - Heidelberg: Springer, 2008
- S. Trepte & L. Reinecke: Medienpsychologie - Stuttgart: Kohlhammer, 2013
- M. Herczeg: Einführung in die Medieninformatik - München: Oldenburg, 2006
- :

Language:

- offered only in German

CS1002-KP04, CS1002 - Introduction to Logics (Logik)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	4

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (compulsory), foundations of computer science, 3rd semester
- Bachelor Robotics and Autonomous Systems (optional subject), computer science, 5th or 6th semester
- Bachelor IT-Security (compulsory), computer science, 3rd semester
- Bachelor Medical Informatics since 2014 (compulsory), computer science, 3rd semester
- Bachelor Computer Science 2014 and 2015 (compulsory), foundations of computer science, 3rd semester
- Bachelor Medical Informatics before 2014 (compulsory), computer science, 1st semester
- Bachelor MES before 2014 (optional subject), computer science, 3rd semester
- Bachelor CLS (optional subject), computer science, 6th semester
- Bachelor Computer Science before 2014 (compulsory), foundations of computer science, 1st semester
- Bachelor Media Informatics (optional subject), computer science, 5th or 6th semester

Classes and lectures:

- Logic (lecture, 2 SWS)
- Logic (exercise, 1 SWS)

Workload:

- 65 Hours private studies and exercises
- 45 Hours in-classroom work
- 10 Hours exam preparation

Contents of teaching:

- Key concepts of syntax: alphabet, string, term, formula
- Key concepts of semantics: assignment, structure, model
- Key concepts of proof calculus: axioms, proofs
- Formlization and coding of problems
- Validating correctness and satisfiability of formalizations
- Syntax and semantics of propositional logic
- Syntax and semantics of predicate logig
- Proof caculi

Qualification-goals/Competencies:

- Students are abel to explain the concepts of syntax and semantics for the examples of prepositional and predicate logic
- They are able to apply formal systems and proof systems
- They are able to transfer methods of mathematical logic to simple practical problems
- They are abel to formalize discrete problems
- They are able to modify proof templates in order to create simple proofs

Grading through:

- Exercises
- written exam

Responsible for this module:

- Prof. Dr. rer. nat. Till Tantau

Teacher:

- Institute for Theoretical Computer Science
- Prof. Dr. rer. nat. Till Tantau
- Prof. Dr. Rüdiger Reischuk

Literature:

- Uwe Schöning: Logik für Informatiker - Spektrum Verlag, 1995
- Kreuzer, Kühlig: Logik für Informatiker - Pearson Studium, 2006

Language:

- offered only in German

CS1202-KP06, CS1202 - Fundamentals of Computer Engineering 2 (TGI2)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	6

Course of study, specific field and term:

- Bachelor Robotics and Autonomous Systems (compulsory), computer science, 3rd semester
- Bachelor Medical Informatics since 2014 (optional subject), computer science, 5th or 6th semester
- Bachelor Media Informatics (optional subject), computer science, 5th or 6th semester
- Bachelor MES since 2014 (compulsory), foundations of computer science, 5th semester
- Bachelor Computer Science 2014 and 2015 (compulsory), foundations of computer science, 3rd semester
- Bachelor Computer Science since 2016 (compulsory), foundations of computer science, 3rd semester

Classes and lectures:

- Fundamentals of Computer Engineering 2 (lecture, 2 SWS)
- Fundamentals of Computer Engineering 2 (exercise, 2 SWS)

Workload:

- 100 Hours private studies
- 60 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Design of combinatorial circuits
- Design of sequential circuits
- Hardware description languages
- Register-transfer languages
- Data paths
- Control units
- Microprogramming
- CPUs
- Semiconductor components and circuit families
- Integrated circuits
- Programmable logic (CPLDs, FPGAs)
- CAD-tools for circuit design

Qualification-goals/Competencies:

- The students can formally describe and design combinatorial and sequential circuits on gate level.
- They can use hardware description languages, particularly VHDL, for the modelling of simple circuits.
- They can formally describe and design sequential circuits with control unit and data path on register-transfer level.
- They can exploit microprogramming for the realization of control units.
- They can design simple processors (CPUs).
- They can elucidate and judge the most important technologies for the realization of simple digital circuits (bipolar, MOS, CMOS).
- They can describe and judge integrated circuits, in particular programmable logic like FPGAs.
- They can use CAD-tools to design, to simulate and to implement digital circuits on FPGAs.

Grading through:

- Exercises
- continuous, successful participation in practical course
- written exam

Is requisite for:

- Computer-Aided Design of Digital Circuits (CS3110-KP04, CS3110)

Requires:

- Fundamentals of Computer Engineering 1 (CS1200-KP06, CS1200SJ14)

Responsible for this module:

- Prof. Dr.-Ing. Mladen Berekovic

Teacher:

- Institute of Computer Engineering

- Prof. Dr.-Ing. Mladen Berekovic

Literature:

- T.L. Floyd: Digital Fundamentals - A Systems Approach - Pearson 2012
- M. M. Mano, C. R. Kime: Logic and Computer Design Fundamentals - Pearson 2007
- C. H. Roth, L.L. Kinney: Fundamentals of Logic Design - Cengage Learning 2009

Language:

- offered only in German

CS2450-KP02, CS2450 - Tools for scientific practice (Werkzeuge)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	2

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (compulsory), interdisciplinary competence, 3rd semester
- Bachelor Interdisciplinary Courses (optional subject), Interdisciplinary modules, arbitrary semester
- Bachelor Media Informatics (optional subject), interdisciplinary competence, 5th or 6th semester
- Bachelor Computer Science 2014 and 2015 (compulsory), interdisciplinary competence, 3rd semester

Classes and lectures:

- Tools for scientific practice (seminar / practical course / exercise, 2 SWS)

Workload:

- 45 Hours private studies
- 15 Hours in-classroom work

Contents of teaching:

- software for version control
- type setting software (LaTeX)
- computer algebra systems (Matlab, Mathematica, Maple)
- statistics software (SPSS)
- digital libraries search (DBLP, ACM, IEEE)
- conformance to good scientific practice (software for plagiarism detection)

Qualification-goals/Competencies:

- knowing technical tools for scientific work
- experience with applying technical tools
- being able to select appropriate tools

Grading through:

- exercises and project assignments

Is requisite for:

- Bachelor Seminar Informatics (CS3702-KP04, CS3702)

Responsible for this module:

- Studiengangsleitung Informatik

Teacher:

- Institute for Theoretical Computer Science
- Alle prüfungsberechtigten Dozentinnen/Dozenten des Studienganges

Language:

- German and English skills required

CS3050-KP04, CS3050 - Coding and Security (CodeSich)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	4

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (optional subject), major subject informatics, arbitrary semester
- Bachelor Computer Science since 2016 (optional subject), Canonical Specialization Web and Data Science, 2nd semester
- Bachelor Computer Science since 2016 (optional subject), Canonical Specialization SSE, 2nd semester
- Bachelor Robotics and Autonomous Systems (optional subject), computer science, 5th or 6th semester
- Bachelor IT-Security (compulsory), IT-Security, 2nd semester
- Bachelor Medical Informatics since 2014 (optional subject), computer science, 5th or 6th semester
- Bachelor Media Informatics (optional subject), computer science, 5th or 6th semester
- Bachelor Computer Science 2014 and 2015 (optional subject), central topics of computer science, 6th semester
- Bachelor Computer Science 2014 and 2015 (compulsory), specialization field IT security and safety, 2nd semester
- Master Computer Science before 2014 (optional subject), advanced curriculum security, 2nd semester
- Bachelor Computer Science before 2014 (compulsory), specialization field IT security and safety, 2nd semester
- Bachelor Medical Informatics before 2014 (optional subject), computer science, 4th to 6th semester
- Master CLS (optional suject), computer science, arbitrary semester
- Bachelor Computer Science before 2014 (optional subject), central topics of computer science, 5th or 6th semester

Classes and lectures:

- Coding and Security (lecture, 2 SWS)
- Coding and Security (exercise, 1 SWS)

Workload:

- 65 Hours private studies and exercises
- 45 Hours in-classroom work
- 10 Hours exam preparation

Contents of teaching:

- information, entropie
- discrete sources and channels
- coding systems, error-tolerant codes
- codes for digital media, compression
- threats to IT-systems
- formal definition of security properties
- security primitives

Qualification-goals/Competencies:

- detailed knowledge of the basics of information and coding theory
- deep knowledge of the concept of information
- being able to model information sources and communication networks
- being able to formalize the security of IT-systems
- knowing scenarios of attacks and protection methods

Grading through:

- Exercises
- Viva Voce or test

Responsible for this module:

- Prof. Dr. Rüdiger Reischuk

Teacher:

- Institute for Theoretical Computer Science
- Prof. Dr. Rüdiger Reischuk
- Prof. Dr. Maciej Liskiewicz

Literature:

- R. Roth: Introduction to Coding Theory - Cambridge Univ. Press 2006
- D. Salomon: Coding for Data and Computer Communications - Springer 2005
- D. Salomon: Data Privacy and Security - Springer 2003

- Pieprzyk, Hardjono, Seberry: Fundamentals of Computer Security - Springer 2003
- M. Stamp: Information Security: Principles and Practice - Wiley 2006

Language:

- German and English skills required

CS3052-KP04, CS3052 - Programming Languages and Type Systems (ProgLan14)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	4

Course of study, specific field and term:

- Bachelor Media Informatics (optional subject), computer science, 5th or 6th semester
- Bachelor Computer Science since 2016 (optional subject), major subject informatics, arbitrary semester
- Bachelor Computer Science since 2016 (compulsory), Canonical Specialization SSE, 3rd semester
- Bachelor Computer Science before 2014 (optional subject), central topics of computer science, 5th or 6th semester
- Bachelor Computer Science before 2014 (compulsory), specialization field IT security and safety, 4th semester
- Master Computer Science before 2014 (compulsory), advanced curriculum programming, 2nd or 3rd semester
- Bachelor IT-Security (optional subject), computer science, arbitrary semester
- Bachelor CLS (optional suject), computer science, 5th or 6th semester
- Bachelor Computer Science 2014 and 2015 (optional subject), central topics of computer science, 5th semester
- Bachelor Computer Science 2014 and 2015 (compulsory), specialization field IT security and safety, 5th semester

Classes and lectures:

- Progamming Languages and Type Systems (lecture, 2 SWS)
- Progamming Languages and Type Systems (exercise, 1 SWS)

Workload:

- 60 Hours private studies and exercises
- 45 Hours in-classroom work
- 15 Hours exam preparation

Contents of teaching:

- Overview on programming languages
- Syntactic description of programming languages
- Language elements for data structures
- Type systems for programming languages
- Language elements for control structures
- Language elements for abstraction and modularization
- Typing and type systems
- Semantics of programming languages
- Language paradigms
- Language elements for concurrent programming
- Tools for programming languages

Qualification-goals/Competencies:

- The students can characterize major programming languages and can compare their application domains.
- They can understand, adapt and extend syntacic and semantic descriptions of programming languages.
- They can analyse the structure and principles of programming languages.
- They can learn on their own and classify new language elements.
- They can argue on the support of type systems for writing correct programs.
- The can evaluate possible programming languages for an application.

Grading through:

- Exercises
- Written or oral exam as announced by the examiner

Requires:

- Linear Algebra and Discrete Structures 1 (MA1000-KP08, MA1000)
- Algorithms and Data Structures (CS1001-KP08, CS1001)
- Introduction to Programming (CS1000-KP10, CS1000SJ14)

Responsible for this module:

- Prof. Dr. Martin Leucker

Teacher:

- Institute of Software Technology and Programming Languages
- Dr. Annette Stümpel

- Prof. Dr. Martin Leucker

Literature:

- K.C. Louden: Programming Languages: Principles and Practice - Course Technology 2011
- J.C. Mitchell: Concepts in Programming Languages - Cambridge University Press 2003
- T.W. Pratt, M.V. Zelkowitz: Programming Languages: Design and Implementation - Prentice Hall 2000
- R.W. Sebesta: Concepts of Programming Languages - Pearson Education 2012
- R. Sethi: Programming Languages: Concepts and Constructs - Addison-Wesley 2003
- D.A. Watt: Programming Language Design Concepts - John Wiley & Sons 2004
- G. Winskel: The Formal Semantics of Programming Languages - MIT Press 1993

Language:

- German and English skills required

Notes:

CS2000 Theoretical Computer Science is a recommended companion.

CS3100-KP08, CS3100SJ14 - Signal Processing (SignalV14)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	8

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (compulsory), Canonical Specialization Bioinformatics, 5th semester
- Bachelor Computer Science since 2016 (optional subject), major subject informatics, arbitrary semester
- Bachelor Computer Science since 2016 (compulsory), Canonical Specialization Web and Data Science, 5th semester
- Master CLS starting 2016 (compulsory), mathematics, 1st semester
- Bachelor Robotics and Autonomous Systems (compulsory), Robotics and Autonomous Systems, 5th semester
- Bachelor IT-Security (optional subject), computer science, arbitrary semester
- Bachelor Computer Science 2014 and 2015 (compulsory), specialization field bioinformatics, 5th semester
- Bachelor Biophysics (compulsory), computer science, 5th semester
- Bachelor Medical Informatics since 2014 (compulsory), computer science, 5th semester
- Bachelor MES since 2014 (compulsory), computer science, 5th semester
- Bachelor Media Informatics (optional subject), computer science, 5th or 6th semester
- Bachelor Computer Science 2014 and 2015 (optional subject), central topics of computer science, 5th semester
- Bachelor Computer Science 2014 and 2015 (compulsory), specialization field robotics and automation, 5th semester

Classes and lectures:

- Signal Processing (lecture, 2 SWS)
- Signal Processing (exercise, 1 SWS)
- Image Processing (lecture, 2 SWS)
- Image Processing (exercise, 1 SWS)

Workload:

- 110 Hours private studies
- 90 Hours in-classroom work
- 40 Hours exam preparation

Contents of teaching:

- Linear time-invariant systems
- Impulse response
- Convolution
- Fourier transform
- Transfer function
- Correlation and energy density of deterministic signals
- Sampling
- Discrete-time signals and systems
- Discrete-time Fourier transform
- z-Transform
- FIR and IIR filters
- Block diagrams
- FIR filter design
- Discrete Fourier transform (DFT)
- Fast Fourier transform (FFT)
- Characterization and processing of random signals
- Introduction, interest of visual information
- Fourier transformatio
- 2D Sampling
- Image enhancement
- Edge detection
- Multiresolution concepts: Gaussian and Laplacian Pyramid, wavelets
- Principles of image compression
- Segmentation
- Morphological image processing

Qualification-goals/Competencies:

- Students are able to explain the fundamentals of linear system theory.
- They are able to define and competently explain the essential elements of signal processing mathematically.
- They will have a command of mathematical methods for the description and analysis of continuous-time and discrete-time signals and systems.
- They are able to design digital filters and know various structures for their implementation.

- They are able to explain the basic techniques for describing and processing of random signals.
- They will have basic knowledge of two-dimensional system theory.
- They are able to describe the main techniques for image analysis and image enhancement.
- They are able to apply the learned principles in practice.

Grading through:

- Exercises
- Written or oral exam as announced by the examiner

Requires:

- Analysis 1 (MA2000-KP08, MA2000)

Responsible for this module:

- Prof. Dr.-Ing. Alfred Mertins

Teacher:

- Institute for Signal Processing
- Prof. Dr.-Ing. Alfred Mertins

Literature:

- A. Mertins: Signaltheorie: Grundlagen der Signalbeschreibung, Filterbänke, Wavelets, Zeit-Frequenz-Analyse, Parameter- und Signalschätzung - Springer-Vieweg, 3. Auflage, 2013
- A. K. Jain: Fundamentals of Digital Image Processing - Prentice Hall, 1989
- Rafael C. Gonzalez, Richard E. Woods: Digital Image Processing - Prentice Hall 2003

Language:

- offered only in German

CS3130-KP08 - Nonstandard Databases and Data Mining (NDBDM)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	8

Course of study, specific field and term:

- Bachelor IT-Security (optional subject), computer science, arbitrary semester
- Bachelor Computer Science since 2016 (optional subject), major subject informatics, arbitrary semester
- Bachelor Computer Science since 2016 (compulsory), Canonical Specialization Web and Data Science, 5th semester
- Bachelor Media Informatics (optional subject), computer science, 5th or 6th semester

Classes and lectures:

- Nonstandard Databases and Data Mining (lecture, 4 SWS)
- Nonstandard Databases and Data Mining (exercise, 2 SWS)

Workload:

- 110 Hours private studies
- 90 Hours in-classroom work
- 40 Hours exam preparation

Contents of teaching:

- Extensions to the relational model:* Reachability queries, Datalog, recursion: safety criterion, negation: stratified queries, semi-naïve query evaluation, magic-set transformation for queries with constants* Distributed databases, federated databases, data integration, elasticity for cloud-based query answering* Multidimensional index structures, first-n, top-k, and skyline queries* Semi-structured data models (e.g., JSON, XML), Path queries: query answering algorithms and index structures
- Information Retrieval:* Full test queries, inverted index, TF-IDF features for text data, vector space model* Latent semantic indexing: SVD dimension reduction, relevance feedback: Rocchio algorithm for query transformation* Instance-based learning for feature vector clustering, index structures for querying similar feature vectors
- Uncertain data:* Bayesian networks, compact representations of joint distributions, exact and approximate query answering algorithms, learning of Bayesian networks, maximum likelihood method, EM algorithm* Probabilistic information retrieval* Generalization of Bayesian networks: probabilistic graphical models (PGMs)* Probabilistic databases (PDBs), query answering algorithms, query transformation rules for producing safe queries, lineage structures und general query answering techniques for PDBs, learning of tuple probabilities, top-k queries and open-world assumptions in PDBs* Probabilistic clustering, learning of mixed models, online kernel density estimation and query answering methods
- Temporal Databases: * Probabilistic temporal data models and query answering algorithms, learning probabilistic temporal models* Stream databases, continuous queries, principles of window-based incremental query answering, approximation techniques for answering continuous queries on streams of data (e.g., most-frequent item queries), learning PGMs from stream data* Spatio-temporal queries, query answering algorithms and index structures
- From NoSQL to NewSQL databases, CAP theorem, blockchain data management
- Graph databases (GDBs):* Approximation techniques for answering graph queries, pattern identification and recognition in GDBs

Qualification-goals/Competencies:

- Knowledge: Students can name the main features of standard databases and, in addition, can explain which nonstandard database models emerge if certain features are dropped. Students can describe the main ideas behind nonstandard databases presented in the course by explaining the main features of respective query languages (syntax and semantics) as well as the most important implementation techniques used for their practical realization.
- Skills: Students can apply query languages for nonstandard data models introduced in the course to retrieve desired structures from sample datasets for satisfying human information needs. Students will be enabled to represent data in the relational data model using encoding techniques presented in the course such that they can demonstrate how new formalisms relate to or can be implemented in SQL (SQL-2011). In case an SQL transformation cannot be found, students can explain and apply dedicated algorithms for query answering. Students can demonstrate how index structures help answering queries fast by showing how index structures are built, updated, and exploited for query answering. The participants of the course can derive query answers by evaluating queries step by step and by deriving optimized query execution plans.
- Social skills: Students work in teams to handle assignments, and they are encouraged to present their solution to other students in small presentations (in lab classes). In addition, self-dependence is fostered by giving pointers to query evaluation engines for various formalism presented in the lecture such that students get familiar with data models and query languages by self-controlled work.

Grading through:

- Exercises
- Written or oral exam as announced by the examiner

Requires:

- Databases (CS2700-KP04, CS2700)

Responsible for this module:

- Prof. Dr. rer. nat. habil. Ralf Möller

Teacher:

- Institute of Information Systems
- Prof. Dr. rer. nat. habil. Ralf Möller

Literature:

- S. Abiteboul, P. Buneman, D. Suciu: Data on the Web - From Relations to Semistructured Data and XML - Morgan-Kaufmann, 1999
- Ch. Aggarwal: Data Mining - The Textbook - Springer, 2015
- S. Chakravarthy, Q. Jiang: Stream Data Processing - A Quality of Service Perspective - Springer, 2009
- J. Leskovec, A. Rajaraman: Mining of Massive Datasets - Cambridge University Press, 2012
- P. Revesz: Introduction to Databases: From Biological to Spatio-Temporal - Springer 2010
- P. Rigaux, M. Scholl, A. Voisard: Spatial Databases With Applications to GIS - Morgan-Kaufmann, 2001
- D. Suciu, D. Olteanu, Chr. Re, Chr. Koch: Probabilistic Databases - Morgan & Claypool, 2011

Language:

- offered only in German

CS3202-KP04, CS3202 - Nonstandard Database Systems (NDB)

Duration:	Turnus of offer:	Credit points:
1 Semester	not available anymore	4

Course of study, specific field and term:

- Bachelor IT-Security (optional subject), computer science, arbitrary semester
- Bachelor Medical Informatics since 2014 (optional subject), computer science, 5th or 6th semester
- Bachelor Media Informatics (optional subject), computer science, 5th or 6th semester
- Bachelor Computer Science 2014 and 2015 (optional subject), central topics of computer science, 5th or 6th semester
- Bachelor Medical Informatics before 2014 (optional subject), applied computer science, 4th to 6th semester
- Master Computer Science before 2014 (optional subject), specialization field media informatics, 2nd or 3rd semester
- Master CLS (optional suject), computer science, arbitrary semester
- Bachelor CLS (optional subject), computer science, 6th semester
- Master Computer Science before 2014 (optional subject), advanced curriculum distributed information systems, 2nd or 3rd semester
- Bachelor Computer Science before 2014 (optional subject), central topics of computer science, 5th or 6th semester

Classes and lectures:

- Nonstandard Database Systems (lecture, 2 SWS)
- Nonstandard Database Systems (exercise, 1 SWS)

Workload:

- 65 Hours private studies
- 45 Hours in-classroom work
- 10 Hours exam preparation

Contents of teaching:

- introduction
- semistructured databases
- Temporal and spatial databases (temporally restricted validity, multidimensional index structures)
- Sequence Databases
- Databases for data streams (window concept)
- Databases for incomplete information (e.g., constraint databases)
- Probabilistic databases
- Databases with answer ranking (top-k queries)

Qualification-goals/Competencies:

- Knowledge:Students can name the main features of standard databases and, in addition, can explain which non-standard database models emerge if features are dropped. They can describe the main ideas behind non-standard databases presented in the course by explaining the main features of respective query languages (syntax and semantics) as well as the most important implementation techniques used for their practical realization.
- Skills:Students can apply query languages for non-standard data models introduced in the course to retrieve desired structures from sample datasets in order to satisfy information needs specified textually in natural language. Students are able to represent data in the relational data model using encoding techniques presented in the course such that they can demonstrate how new formalisms relate to or can be implemented in SQL (in particular, SQL-99). In case an SQL transformation cannot be found, students can explain and apply dedicated algorithms for query answering. Students can demonstrate how index structures help answering queries fast by showing how index structures are built, updated, and exploited for query answering. The participants of the course can derive query answers by evaluating queries step by step and by deriving optimized query execution plans.
- Social skills:Students work in teams to handle assignments, and they are encouraged to present their solution to other students in small presentations (in lab classes). In addition, self-dependence is fostered by giving pointers to query evaluation engines for various formalism presented in the lecture such that students get familiar with data models and query languages by self-controlled work.

Grading through:

- Exercises
- Written or oral exam as announced by the examiner

Requires:

- Databases (CS2700-KP04, CS2700)

Responsible for this module:

- Prof. Dr. rer. nat. habil. Ralf Möller

Teacher:

- Institute of Information Systems
- Prof. Dr. rer. nat. habil. Ralf Möller

Literature:

- S. Abiteboul, P. Buneman, D. Suciu: Data on the Web - From Relations to Semistructured Data and XML - Morgan Kaufmann, 1999
- J. Chomicki, G. Saake (Eds.): Logics for Databases and Information Systems - Springer, 1998
- P. Rigaux, M. Scholl, A. Voisard: Spatial Databases With Applications to GIS - Morgan Kaufmann, 2001
- P. Revesz: Introduction to Constraint Databases - Springer, 2002
- P. Revesz: Introduction to Databases- From Biological to Spatio-Temporal - Springer 2010
- S. Ceri, A. Bozzon, M. Brambilla, E. Della Valle, P. Fraternali, S. Quarteroni: Web Information Retrieval - Springer, 2013
- S. Chakravarthy, Q. Jiang: Stream Data Processing A Quality of Service Perspective - Springer, 2009
- D. Suciu, D. Olteanu, Chr. Re, Chr. Koch: Probabilistic Databases - Morgan & Claypool, 2011

Language:

- offered only in German

CS3204-KP04, CS3204 - Artificial Intelligence 1 (KI1)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	4

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (optional subject), major subject informatics, arbitrary semester
- Bachelor Computer Science since 2016 (compulsory), Canonical Specialization Web and Data Science, 6th semester
- Bachelor Robotics and Autonomous Systems (compulsory), Robotics and Autonomous Systems, 6th semester
- Bachelor IT-Security (optional subject), computer science, arbitrary semester
- Bachelor Biophysics (optional subject), computer science, 6th semester
- Bachelor Medical Informatics since 2014 (optional subject), computer science, 5th or 6th semester
- Bachelor Media Informatics (optional subject), computer science, 5th or 6th semester
- Bachelor Computer Science 2014 and 2015 (optional subject), central topics of computer science, 6th semester
- Bachelor Computer Science 2014 and 2015 (compulsory), specialization field robotics and automation, 6th semester
- Bachelor Medical Informatics before 2014 (optional subject), applied computer science, 4th to 6th semester
- Bachelor CLS (optional subject), computer science, 6th semester
- Bachelor MES before 2014 (optional subject), Medical Engineering Science, 6th semester
- Bachelor Computer Science before 2014 (compulsory), specialization field robotics and automation, 4th semester
- Bachelor Computer Science before 2014 (optional subject), central topics of computer science, 5th or 6th semester
- Bachelor MES since 2014 (optional subject), computer science and electrical engineering

Classes and lectures:

- Artificial Intelligence (lecture, 2 SWS)
- Artificial Intelligence (exercise, 1 SWS)

Workload:

- 55 Hours private studies
- 45 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Part 1: Search strategiesAs an introduction and a prerequisite for most of the principles of artificial intelligence search strategies are introduced and explained. We will introduce uninformed, informed, local search, adversial search as well as heuristic search. The concept of agents will be presented.
- Part 2: Learning and reasoningRevision of the foundations of mathematical logic and probability. Principles of machine learning (supervised and unsupervised) are introduced. An introduction to fuzzy logic is also included.
- Part 3: Applications of artificial intelligenceTypical applications in the fields or robotics, machine vision, and industrial image and data processing are identified. Ethical issues and risks of the development of artificial intelligence are discussed.

Qualification-goals/Competencies:

- The students are able to handle scope-oriented tutorials with a mathematical background in a team, and timely.
- They have developed an understanding for the benefits and disadvantages of the different search and problem solving techniques.
- The students are in a position to choose and apply independently appropriate algorithms for search and learning issues.
- They have gained an insight into the complex development of systems with artificial intelligence and the distinction of its various forms.
- The students have an understanding of the risks and possible technological consequences of the development of systems with strong AI.

Grading through:

- written exam

Is requisite for:

- Artificial Intelligence 2 (CS5204-KP04, CS5204)

Responsible for this module:

- Prof. Dr.-Ing. Achim Schweikard

Teacher:

- Institute for Robotics and Cognitive Systems
- Prof. Dr.-Ing. Achim Schweikard
- MitarbeiterInnen des Instituts

- Prof. Dr. rer. nat. Floris Ernst

Literature:

- G. Görz (Hrsg.): Handbuch der Künstlichen Intelligenz - München: Oldenbourg Wissenschaftsverlag, 2003
- C-M. Bishop: Pattern Recognition and Machine Learning - Springer Verlag, 2007
- Russell/Norvig: Artificial Intelligence: a modern approach - (3rd Ed.), Prentice Hall, 2009
- Mitchell: Machine Learning - McGraw-Hill, 1997
- Luger: Artificial Intelligence: Structures and Strategies for Complex Problem Solving - (6th Ed.), Addison-Wesley, 2008

Language:

- offered only in German

Notes:

Desirable pre-condition for a CS3701 Project in the field of Artificial Intelligence

CS3230-KP04 - Design thinking in practice (DeThPr)

Duration:	Turnus of offer:	Credit points:
1 Semester	irregularly in the winter semester	4

Course of study, specific field and term:

- Bachelor Media Informatics (optional subject), media informatics, 5th or 6th semester

Classes and lectures:

- Design Thinking in Practice (block practical course, 3 SWS)

Workload:

- 45 Hours in-classroom work
- 35 Hours private studies
- 20 Hours oral presentation (including preparation)
- 20 Hours written report

Contents of teaching:

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Qualification-goals/Competencies:

-
-

Grading through:

- exercises and project assignments
- colloquium

Responsible for this module:

- Prof. Dr.-Ing. Nicole Jochems

Teacher:

- Institute for Multimedia and Interactive Systems

Literature:

- :
- :

Language:

- German, except in case of only English-speaking participants

CS3240-KP04 - New web technologies and use in practice (WebTecPr)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	4

Course of study, specific field and term:

- Bachelor Media Informatics (optional subject), media informatics, 5th or 6th semester

Classes and lectures:

- New webtechnologies and usage in practice (lecture, 2 SWS)
- New webtechnologies and usage in practice (exercise, 1 SWS)

Workload:

- 70 Hours private studies
- 50 Hours in-classroom work

Contents of teaching:

- Introduction and overview
- Valuation and improvement of existing code
- Code debugging
- Development of a client-server architecture
- Handling of HTML, CSS and Javascript
- Design and development of different websites
- Handling of Javascript and CSS-Frameworks

Qualification-goals/Competencies:

- The students are able to analyse and improve existing web source code
- They have knowledge of different web technologies and their useful application
- They have the skills to independently develop a web project
- They have the skills to use methods of web technologies

Grading through:

- exercises and project assignments

Responsible for this module:

- Prof. Dr.-Ing. Nicole Jochems

Teacher:

- Institute for Multimedia and Interactive Systems

Language:

- German, except in case of only English-speaking participants

CS5610 - Computer-Supported Teaching and Learning (CGLehrLern)

Duration:	Turnus of offer:	Credit points:
1 Semester	every summer semester	4

Course of study, specific field and term:

- Bachelor Media Informatics (optional subject), computer science, 5th or 6th semester
- Master Computer Science before 2014 (optional subject), specialization field media informatics, 2nd and 3rd semester

Classes and lectures:

- Computer-Supported Teaching and Learning (lecture with exercises, 3 SWS)

Workload:

- 55 Hours private studies
- 45 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Introduction and overview
- Educational basics
- Psychological foundations
- Learning spaces
- Multimedia learning spaces
- Virtual reality as a learning space
- Computer-Supported Cooperative Learning (CSCL)
- Development tools and platforms
- Development processes
- Evaluation of e-learning systems

Qualification-goals/Competencies:

- Students are able to summarize fundamentals, principles and applications of computer-based teaching and learning systems (E-Learning).
- They can denominate and categorize representative e-learning platforms and e-learning systems.
- They can analyze and evaluate development opportunities and dead ends of development, based on a historically well-founded knowledge.

Grading through:

- Written or oral exam as announced by the examiner

Responsible for this module:

- Prof. Dr. rer. nat. Michael Herczeg

Teacher:

- Institute for Multimedia and Interactive Systems

- Prof. Dr. rer. nat. Michael Herczeg
- Prof. Dr.-Ing. Nicole Jochems

Literature:

- H. Kritzenberger: Multimediale und Interaktive Lernräume - München: Oldenbourg, 2005
- J. Haake, G. Schwabe & M. Wessner: CSCL-Kompendium 2.0 - München: Oldenbourg, 2012

Language:

- offered only in German

CS5615-KP04, CS5615 - Computer-Supported Cooperative Work (CSCW) in Safety-Critical Contexts (CGKoop)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	4

Course of study, specific field and term:

- Bachelor Media Informatics (optional subject), media informatics, 5th or 6th semester
- Master Computer Science before 2014 (optional subject), specialization field media informatics, 2nd or 3rd semester
- Bachelor IT-Security (optional subject), computer science, arbitrary semester

Classes and lectures:

- Computer-Supported Cooperative Work (CSCW) in Safety-Critical Contexts (lecture with exercises, 3 SWS)

Workload:

- 55 Hours private studies
- 45 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Introduction
- Socio-technical systems
- Designing groupware
- Classifying groupware
- Supporting awareness
- Supporting communication
- Supporting coordination
- Supporting teams
- Supporting communities
- Technical integration
- User interfaces for groupware

Qualification-goals/Competencies:

- The students know the basics, principles and applications of computer-supported cooperative work (CSCW) and how to apply them.
- They can describe representative platforms and systems for CSCW.
- They are able to analyze, design, implement and evaluate CSCW systems in an application- and user-oriented way.

Grading through:

- Written or oral exam as announced by the examiner

Responsible for this module:

- Prof. Dr. rer. nat. Tilo Mentler

Teacher:

- Institute for Multimedia and Interactive Systems
- Prof. Dr. rer. nat. Tilo Mentler

Literature:

- :
- :
- :
- :
- :

Language:

- offered only in German

CS5660 - Music and Computer (MusikComp)

Duration:	Turnus of offer:	Credit points:
1 Semester	every summer semester	4

Course of study, specific field and term:

- Bachelor Media Informatics (optional subject), computer science, 5th or 6th semester
- Master Computer Science before 2014 (optional subject), specialization field media informatics, 2nd or 3rd semester

Classes and lectures:

- Music and Computer (lecture with exercises, 3 SWS)

Workload:

- 55 Hours private studies
- 45 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Introduction, Overview, Scientific, Artificial and Ordinary Background
- History of Music Technology
- Analog and Digital Soundrecording
- Audio-Software (theory and practice)
- Analog Soundproduction, Electrical Instruments, Electronic Music aud Synthesizer
- Digital Soundsynthesis, Virtual Studio Technology (theory and practice)
- nalog and Digital Soundcontrolling, MIDI-Technology
- MIDI-Software, esp. Sequenzer (theory and practice)
- Musical Programming, Interactive Performance (theory and practice)
- Interface-Technology
- Digital Performance

Qualification-goals/Competencies:

- The students know the theories, methods and technologies for digital music and its production.
- They can analyse, plan, implement and evaluate applications of digital music together with musicians as well as with experts from musical science and from audio technology.

Grading through:

- Written or oral exam as announced by the examiner

Responsible for this module:

- Prof. Dr. rer. nat. Michael Herczeg

Teacher:

- Institute for Multimedia and Interactive Systems
- PD Dr. habil. Joachim Stange-Elbe

Literature:

- Peter Manning: Electronic and Computer Music - Oxford University Press, 2013

Language:

- offered only in German

PY3210-KP04 - Gamification (Gamific)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	4

Course of study, specific field and term:

- Bachelor Media Informatics (optional subject), psychology, 5th or 6th semester

Classes and lectures:

- Gamification (lecture with seminar, 2 SWS)

Workload:

- 75 Hours work on an individual topic with written and oral presentation
- 30 Hours in-classroom work
- 15 Hours oral presentation (including preparation)

Contents of teaching:

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Qualification-goals/Competencies:

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Grading through:

- Marked presentation with written report

Responsible for this module:

- Prof. Dr. rer. nat. Thomas Franke

Teacher:

- Institute for Multimedia and Interactive Systems
- Dr. rer. nat. Daniel Wessel

Literature:

- :
- :

Language:

- German and English skills required

RO5300-KP06 - Humanoid Robotics (HumRob)

Duration:	Turnus of offer:	Credit points:
1 Semester	every second semester	6

Course of study, specific field and term:

- Bachelor Medical Informatics since 2014 (optional subject), Robotics and Autonomous Systems, 5th or 6th semester
- Bachelor Media Informatics (optional subject), Robotics and Autonomous Systems, 5th or 6th semester
- Bachelor IT-Security (optional subject), Robotics and Autonomous Systems, arbitrary semester
- Bachelor Robotics and Autonomous Systems (optional subject), Robotics and Autonomous Systems, 5th or 6th semester

Classes and lectures:

- Humanoid Robotics (lecture, 2 SWS)
- Humanoid Robotics (exercise, 2 SWS)

Workload:

- 100 Hours private studies
- 60 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

Qualification-goals/Competencies:

Grading through:

- Written or oral exam as announced by the examiner

Responsible for this module:

- Prof. Dr.-Ing. Achim Schweikard

Teacher:

- Institute for Robotics and Cognitive Systems
- Prof. Dr.-Ing. Achim Schweikard

Language:

- offered only in English

CS3201-KP04, CS3201 - Usability Engineering (UsabEng)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	4

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (optional subject), major subject informatics, arbitrary semester
- Bachelor Computer Science since 2016 (compulsory), Canonical Specialization SSE, 5th semester
- Bachelor Robotics and Autonomous Systems (optional subject), computer science, 5th or 6th semester
- Bachelor IT-Security (optional subject), computer science, arbitrary semester
- Bachelor Media Informatics (compulsory), media informatics, 5th semester
- Bachelor Computer Science 2014 and 2015 (optional subject), central topics of computer science, 5th semester
- Bachelor Medical Informatics before 2014 (optional subject), software engineering, 4th to 6th semester
- Bachelor Computer Science before 2014 (compulsory), specialization field media informatics, 6th semester
- Bachelor Computer Science before 2014 (optional subject), central topics of computer science, 6th semester

Classes and lectures:

- Usability Engineering (lecture, 2 SWS)
- Usability-Engineering (exercise, 1 SWS)

Workload:

- 55 Hours private studies
- 45 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Introduction and motivation
- Systems Engineering
- Software Engineering
- Usability Engineering
- Media Engineering
- Interdisciplinary teams and social processes
- Task analysis
- User analysis
- Organizational and contextual analysis
- Modeling and design of interactive systems
- Criteria for interactive systems
- Evaluation of interactive systems
- Summary

Qualification-goals/Competencies:

- Students are able to explain the basic user-centered development processes for interactive multimedia systems.
- They are able to apply and adapt basic processes for specific projects and needs.
- They are able to explain that these processes are influenced by formal und informal requirements as well as social structures and behaviors.

Grading through:

- exercises and project assignments
- Written or oral exam as announced by the examiner

Requires:

- Software Ergonomics (CS2200-KP04, CS2200)

Responsible for this module:

- Prof. Dr. rer. nat. Tilo Mentler

Teacher:

- Institute for Multimedia and Interactive Systems
- Prof. Dr. rer. nat. Tilo Mentler

Literature:

- Deborah J. Mayhew: The Usability Engineering Lifecycle - Morgan Kaufmann Publ., 1999

- Mary B. Rosson, John M. Carroll: Usability Engineering: Scenario-Based Development of Human-Computer Interaction - Morgan Kaufmann Publ., 2002
- Karen Holtzblatt, Hugh Beyer: Contextual Design. Defining Customer-Centered Systems - Morgan Kaufmann Publ., 1997

Language:

- offered only in German

CS3210-KP08, CS3210 - Bachelor Project UI and Media Design (BProDesign)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	8

Course of study, specific field and term:

- Bachelor Media Informatics (compulsory), media informatics, 5th semester

Classes and lectures:

- Bachelor Project UI and Media Design (project work, 6 SWS)

Workload:

- 180 Hours group work
- 40 Hours written report
- 20 Hours oral presentation (including preparation)

Contents of teaching:

- Team-based planning and realization of a user-centered system design process ranging from analyzing the context of use to deployment while observing standards and deadlines
- Practice of text-, image-, video-, audio- and 3D-animation processing as well as corresponding tools and programming languages
- Documentation and presentation of project work

Qualification-goals/Competencies:

- The students are able to accomplish a complete development process for the production of an interactive multimedia systems in practice.
- They are able to assess and apply media- and interaction-related methods and tools.
- They have the methodological competence to analyze complex tasks, divide them into sub-tasks and implement them based on division of labor.
- They possess the communication skills to write down and present their results in an appropriate way.

Grading through:

- oral presentation
- Written report
- successful addressing of the project goals

Requires:

- Software Ergonomics (CS2200-KP04, CS2200)

Responsible for this module:

- Prof. Dr.-Ing. Nicole Jochems

Teacher:

- Institute for Multimedia and Interactive Systems
- Prof. Dr.-Ing. Nicole Jochems
- MitarbeiterInnen des Instituts

Literature:

- M. Burhardt: Einführung in das Projektmanagement - Publicis Publ. 2013
- M. B. Rosson & J. M. Carroll: Usability engineering. Scenario-based development of human-computer interaction - Morgan Kaufmann series in interactive technologies, 1st ed. San Fancisco: Academic Press, 2002

Language:

- offered only in German

CS3220 - Scientific Working (WissArbeit)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	3 (Typ B)

Course of study, specific field and term:

- Bachelor Media Informatics (compulsory), interdisciplinary competence, 5th semester

Classes and lectures:

- Scientific Working (seminar, 2 SWS)

Workload:

- 55 Hours private studies
- 30 Hours in-classroom work

Contents of teaching:

- Scientific work and research
- Developing ideas
- Process-oriented work
- Research and review
- Written work
- Evaluation and empiricism
- Presentation and speech

Qualification-goals/Competencies:

- The students can obtain a solid grounding a scientific topic, from literature research till evaluation.
- They are able to present the results in a written documentation and in a talk in an understandable way.
- The can present and discuss a scientific topic.

Grading through:

- continuous, successful participation in course

Is requisite for:

- Bachelor Thesis Media Informatics (CS3992)

Responsible for this module:

- Prof. Dr.-Ing. Nicole Jochems

Teacher:

- Institute for Multimedia and Interactive Systems
- MitarbeiterInnen des Instituts
- Prof. Dr.-Ing. Nicole Jochems
- Prof. Dr. rer. nat. Michael Herczeg

Language:

- offered only in German

CS3280-KP04, CS3280 - Bachelor Seminar Media Informatics (BSemMedien)

Duration:	Turnus of offer:	Credit points:
1 Semester	each winter semester	4 (Typ B)

Course of study, specific field and term:

- Bachelor Media Informatics (compulsory), interdisciplinary competence, 5th semester

Classes and lectures:

- Bachelor Seminar (seminar, 2 SWS)

Workload:

- 60 Hours work on an individual topic with written and oral presentation
- 30 Hours in-classroom work
- 30 Hours private studies

Contents of teaching:

- Familiarization in a scientific topic
- Working on a scientific topic and its answers for problems
- Presentation and discussion of the topic

Qualification-goals/Competencies:

- The students can obtain a solid grounding a scientific topic.
- They are able to present the results in a written documentation and in a talk in an understandable way.
- They can present and discuss a scientific topic.

Grading through:

- oral presentation
- term paper

Responsible for this module:

- Prof. Dr. rer. nat. Michael Herczeg

Teacher:

- Institute for Multimedia and Interactive Systems
- Alle prüfungsberechtigten Dozentinnen/Dozenten des Studienganges

Literature:

- Topic and literature are chosen indiviually.:

Language:

- German and English skills required

CS3205-KP04, CS3205 - Computer Graphics (CompGrafik)

Duration:	Turnus of offer:	Credit points:
1 Semester	each summer semester	4

Course of study, specific field and term:

- Bachelor Computer Science since 2016 (optional subject), major subject informatics, arbitrary semester
- Bachelor Robotics and Autonomous Systems (optional subject), computer science, 5th or 6th semester
- Bachelor IT-Security (optional subject), computer science, arbitrary semester
- Bachelor Medical Informatics since 2014 (optional subject), computer science, 5th or 6th semester
- Bachelor MES since 2014 (optional subject), computer science and electrical engineering, 4th or 6th semester
- Bachelor Media Informatics (compulsory), media informatics, 6th semester
- Bachelor Computer Science 2014 and 2015 (optional subject), central topics of computer science, 5th or 6th semester
- Bachelor Medical Informatics before 2014 (optional subject), computer science, 4th to 6th semester
- Master Computer Science before 2014 (optional subject), advanced curriculum imaging systems, 2nd or 3rd semester
- Bachelor CLS (optional subject), mathematics, 6th semester
- Bachelor Computer Science before 2014 (optional subject), central topics of computer science, 5th or 6th semester
- Master CLS (optional subject), mathematics, 2nd semester
- Bachelor Computer Science before 2014 (compulsory), specialization field media informatics, 5th or 6th semester

Classes and lectures:

- Computer Graphics (lecture, 2 SWS)
- Computer Graphics (exercise, 1 SWS)

Workload:

- 55 Hours private studies
- 45 Hours in-classroom work
- 20 Hours exam preparation

Contents of teaching:

- Homogeneous coordinates and geometrical transformations
- Planar and perspective projections
- Polygon meshes
- Bezier curves and surfaces
- B-spline curves and surfaces
- Culling and Clipping
- Hidden surface removal
- Raster graphics algorithms
- Illumination and shading

Qualification-goals/Competencies:

- Knowledge and understanding of the basic concepts, algorithms and methods
- Ability to implement the basic algorithms
- Ability to assess the possibilities and limitations of the learned techniques

Grading through:

- Exercises
- written exam

Requires:

- Linear Algebra and Discrete Structures 1 (MA1000-KP08, MA1000)

Responsible for this module:

- Prof. Dr. rer. nat. habil. Heinz Handels

Teacher:

- Institute of Medical Informatics
- Dr. rer. nat. Jan Ehrhardt

Literature:

- Foley et. al: Grundlagen der Computergrafik - Addison-Wesley, 1994

Language:

- offered only in German

CS3992 - Bachelor Thesis Media Informatics (BScMedien)

Duration:	Turnus of offer:	Credit points:
1 Semester	each semester	15

Course of study, specific field and term:

- Bachelor Media Informatics (compulsory), media informatics, 6th semester

Classes and lectures:

- Bachelor Thesis Media Informatics (supervised self studies, 1 SWS)
- Colloquium (presentation (incl. preparation), 1 SWS)

Workload:

- 400 Hours work on an individual topic (research and development) and written elaboration
- 50 Hours oral presentation and discussion (including preparation)

Contents of teaching:

- independent scientific work on a limited task in media informatics and its applications
- scientific presentation on the problem and the solution developed

Qualification-goals/Competencies:

- The students are able to apply the expertise acquired to new problems using established methods and solve them independently.
- They possess the communication skills to write down and present their results in an appropriate way.

Grading through:

- oral presentation
- Written report

Responsible for this module:

- Studiengangsleitung Medieninformatik

Teacher:

- Institute for Multimedia and Interactive Systems
- Institutes of the Department of Computer Science/ Engineering
- Alle prüfungsberechtigten Dozentinnen/Dozenten des Studienganges

Literature:

- is selected individually:

Language:

- thesis can be written in German or English