Module Catalogue

Hochschule für Telekommunikation Leipzig
University of Applied Sciences

on the

master program

Information and Communication Technology

10.07.2012

(valid from 01.09.2014)

Table of contents

General information and notes to the reader

What is the module catalogue?

This module catalogue contains descriptions of all modules offered in the study schedule. It provides students, applicants and other internal and external parties with information on the content of individual modules, the goals of academic qualification of each module, as well as their qualitative and quantitative requirements.

Notes to the reader:

Updated Information

An updated module catalogue reflecting the current status of module contents and requirements is published once year. The date on which the module catalogue was generated is referenced at the first page.

Non-binding Information

Module descriptions serve to increase transparency and give students an orientation with respect to course offerings. They are not legally-binding. Individual modifications of described contents may occur in praxis. Legally-binding information on all questions concerning the study program and examinations can be found in the subject-specific study and examination regulations of individual programs.

Elective modules

Please note that generally not all elective modules offered within the study program are listed in the module catalogue.

Compulsory Modules

Applied Mathematics

General Information

Responsible professor(s): Prof. Dr. Schuchardt

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students understand complex mathematical concepts from the treated topics and can do the necessary calculations. Students are able to perform basic mathematical calculations, taking into account numerical aspects dominate bases for interpolation and approximation, numerical integration and for the treatment of differential equations. They have developed an intuitive understanding of unstable DGL. Students recognize relationships with the technical subject areas and can make the transfer. You are able to evaluate results critically and interpret.

Students are able to independently, effective knowledge acquisition and have appropriate learning strategies developed. You know your limits and are able adequate support for the solution of mathematical problems to get. Students can learn from professional mathematical criticism.

Curricular content:

- Number representations and error problem
- Methods of error analysis
- Fixed point iterations and solving equations
- Numerical treatment of systems of equations
- Conditioning of equation systems
- Interpolation and compensation calculation
- Cubic spline interpolation
- Numerical Integration
- Romberg method
- Numerical treatment of DGL
- Runge-Kutta method, basic principles of multi-step methods
- Stability and rigidity of procedures or DGL

Textbooks and resources:

- Lawrence R. Harvill, Louis A. Pipes: Applied Mathematics for Engineers and Physicists: Third Edition (Dover Books on Mathematics)

IT Security

General Information

Responsible professor(s): Prof. Dr. Jean-Alexander Müller

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students will have knowledge on IT security and skills to evaluate and apply methods of privacy and security to IT systems. Students are able to make a professional and proper selection of standard mechanisms and protocols to enforce IT security with the required level. Students will also be able to develop and implement new secure systems. Participants can safely assess future developments in communication and computer networks and evaluate.

Students are able to mine new or changed state of the art in science and technology. Students are able to deal constructively with criticism in the professional context. They are able to make a proper contribution in a team and can publish and present the results of their own work appropriately.

Curricular content:

- Cryptography and cryptographic algorithms
- Security Engineering
- Security frameworks
- Digital rights management
- Computer network security
- Operation systems security

Textbooks and resources:

- Bruce Schneier: Applied Cryptography: Protocols, Algorithms, and Source Code in C
- S. Garfinkel; G. Spafford: Practical Unix & Internet Security, O'Reilly & Associates

IT Project Management

General Information

Responsible professor(s): Prof. Dr. Gunnar Auth

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

This module deepens the knowledge of IT project management. The students know and apply methods and instruments for the effective implementation and management of IT projects. They are qualified in the analysis and synthesis of relevant methods of project management for planning, managing and controlling IT-focused projects. They also know how to select and apply established project management frameworks from the corporate practice in a structured way. They use the technical terms safely.

Students are able to recognize problem situations in IT projects independently. They are able to autonomously choose relevant concepts and tools of IT project management and systematically implement them.

Curricular content:

- Plan-driven project management
- Agile project management
- Project standards and methods
- Organization and teamwork
- Process, quality, risk, and time management
- Problem solving processes
- Program and portfolio management

Textbooks and resources:

- Kerzner, H. (2013), Project Management: A Systems Approach to Planning, Scheduling, and Controlling
- OGC (ed., 2005), Managing Successful Projects with PRINCE2
- Schwaber, K.; Sutherland, J. (2013), The Scrum Guide
- Conference proceedings and scientific articles

Simulation

General Information

Responsible professor(s): Prof. Dr. Oliver Jokisch

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The students know and apply the fundamentals of applied stochastic (special areas of probability theory, Markov processes, and statistics) and simulation of stochastic discrete event systems. Students can create models, perform and evaluate the design of simulation experiments and their evaluation of simple stochastic discrete event systems.

The students have the ability cover technical problems with colleagues and to use their own skills to solve these problems successfully. Students are able to abstract from the presented methods of stochastic and adapt them for future developments.

Curricular content:

- Special probability distributions, functions of random variables, limit theorems, random number generation with specified distribution
- Basics of statistics and estimation theory, determination of confidence intervals
- Parameters and goodness of fit tests
- Examples for Monte Carlo simulation
- Fundamentals of stochastic processes, counting processes, Markov processes, birth and death processes
- Basics of system theory, modeling and simulation, in particular the discrete event signals and systems
- General principles of simulation, simulation as an analysis tool
- Expiration of a simulation study, verification, validation and sensitivity study
- Queuing systems and networks
- Simulation of random numbers
- Simulation of stochastic discrete event systems and examples of the simulation of discrete event systems

Textbooks and resources:

- Banks, Carson, Nelson, Nicol: Discret event system simulation

Internetworking

General Information

Responsible professor(s): Prof. Dr. Jean-Alexander Müller

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students are competent in the assessment of future developments in communication and computer networks. The students are able to apply their knowledge and scientific and analytical skills in the fields communications system design and performance analysis / implement performance / evaluation. They can publish and present the results of their own work appropriately.

Students are able to mine new or changed state of the art in science and technology. Students are able to deal constructively with criticism in the professional context. They are able to make a proper contribution in a team.

Curricular content:

- Network Calculus
- Queuing and queuing theory
- QoS Architectures and Protocols (DiffServ, Traffic Engineering, Carrier Ethernet, ...)
- Algorithmic aspects of networks
- Introduction of tools for performance analysis
- current research and development projects in the field of networks: Future Internet, SDN, Protocol Detection and Engineering

Textbooks and resources:

- T. Braun, T. Staub: End-to-end quality of service over heterogeneous networks, Springer
- Jean-Yves Le Boudec, Patrick Thiran: Network Calculus, Springer R. Jain. The Art of Computer Systems Performance Analysis. Wiley
- Conference proceedings and articles published via IEEExplorer

IT Law

General Information

Responsible professor(s): Prorektor Studium und Forschung in cooperation with Dr. Jens Uelner

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students have knowledge of IT law especially in telecommunications, copyright, and data protection law. They have knowledge on design of contractual arrangements regarding to IT services and software to transfer. Students have the expertise to solve simple cases.

Students have the ability to develop knowledge by themselves. Students are able to deal constructively with criticism in the professional context. They are able to make a proper contribution in a team.

Curricular content:

- Basic concepts of IT law
- Contract Law for IT products & services
- Intellectual Property
- Legal regulatory areas for communication networks and services

Textbooks and resources:

- Ian Lloyd; Information Technology Law; Oxford University Press

Information and communication technology lab

General Information

Responsible professor(s): Prof. Dr. Frank Porzig

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The students are qualified for the assessment of applied and future developments in telecommunications technologies. The participants are able to implement practical solutions using their previously acquired knowledge from the competence fields of networks, signal and system theory and transmission technology. The students are competent to document their individual results, and they can professionally evaluate the results.

The students can independently expand their knowledge, and they are able to apply their expertise in small teams. The participants receive methodological skills for solving engineering problems. They can professionally deal with the different technical resources and the possible fields of application.

Curricular content:

- Analysis and presentation of telecommunication signals
- Signal transmission in telecommunication networks (Ethernet, Carrier-Grade Ethernet and SDH)
- X-DSL technologies
- Voice over IP
- NET 1 laboratory
- NET 2 laboratory.

Textbooks and resources:

- Several lab exercise manuals including their specific bibliographies

ICT Consulting

General Information

Responsible professor(s): Prof. Dr. Frank Bensberg

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The students have current conceptual and methodological knowledge of ICT consulting in order to successfully manage and control enterprise transformation. They are familiar with the specific core and support processes of consulting organizations in the ICT sector and can actively accompany and influence these processes. In particular, students are enabled to handle substantial planning and decision problems in the design and implementation of consulting services.

The students are enabled to document and visualize the results of consultation processes customised and tailored to the requirements of the stakeholders addressed. Beyond that, the students have the necessary sensitivity to critically question the economic and non-economic consequences of consulting services in business and society.

Curricular content:

- Goals and tasks of consulting in the ICT sector
- Domains, services and methods of consulting
- Innovation and knowledge management processes in consulting organizations
- Methods for the development and implementation of consulting services
- Design and management of consulting processes
- Sales and marketing processes for consulting services
- Human resource management in consulting organizations
- Criteria and methods for the selection of consulting service providers

Textbooks and resources:

- Block, P. (2011), Flawless Consulting – A Guide to getting your expertise used, 3rd ed., San Francisco 2011.
- Weiss, A. (2011), The Consulting Bible – Everything you need to Know to create and expand a seven-figure consulting practice, Hoboken 2011.

Working in projects

General Information

Responsible professor(s): Prorektor Studium und Forschung (Prof. Dr. Jean-Alexander Müller)

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students are able to plan, conduct and complete projects independently and in teams. They are able to select, project management methods and tools depending on individual project factors and safe to use. Analysis and evaluation of completed projects as well as transfer of knowledge to future projects within the meaning of the project life cycle model dominates as important elements of their strategies for improvement. Students are able to represent and present the results achieved recipient needs.

The students are able to independently plan and perform projects and to take appropriate measures for comprehensive target achievement. Students may take different roles in the team and are able to selectively enhance their skills.

Curricular content:

- Support and coaching in project s
- Application of methods of analysis and problem solving
- Project oriented work in a team
- Identification of problem-solving deficits
- Development of technical solutions taking economical restrictions into account
- Development of implementation proposals

Textbooks and resources:

- Scripts from the module 'IT project management'

Master's thesis

General Information

Responsible professor(s): Prorektor Studium und Forschung (Prof. Dr. Jean-Alexander Müller)

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students can apply their technical and methodological skills in the context of a scientific problem of information and communication technologies and to familiarize themselves with new topics. Students are able to work out the state of the art and, based on applying known methods and to create new knowledge and to comply with scientific standards. They master the publication and presentation of results.

Students know their technical and methodological limitations, can learn from experience and are able to deal constructively with criticism. Students are able to do scientific work independently, set priorities and make decisions. They are able to withstand stress and are able to build and use a professional- or subject-related social network.

Curricular content:

- Principles of scientific and engineering work
- defence of the master thesis

Textbooks and resources:

- Gibaldi, Joseph : MLA Handbook for Writers of Research Papers, 7th edition

Elective Modules

The following modules are optional modules. An assignment of the modules to one of two profiles can be found in the curriculum. Students can pick modules of the two sets individually to achieve their desired academic qualification.

System Theory 1

General Information

Responsible professor(s): Prof. Dr. Ines Rennert, Prof. Dr. Oliver Jokisch

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The students are qualified to apply their previous signal theory knowledge – imparted content from Bachelor courses – on selected aspects of signal description, analysis and processing. The participants obtain expertise in processing analog, real- and complex-valued signals by digital systems. They understand essential tasks – such as sampling, reconstruction, modification of sampling rate and interpolation. The students can identify and analyze interrelations in a stationary random process. They are able to apply the introduced methods and procedures on complex processes, in particular in telecommunication engineering.

The students are qualified to work on complex, subject-specific topics. They can independently extend and integrate their knowledge. The students can create new expertise by using scientific methods.

Curricular content:

- Recapitulation of essential terms and algorithms in the description of analog and time-discrete signals and systems
- Symmetric features in frequency spectra of real- and complex-valued signals
- Sampling of real-valued low- and band-pass signals but also complex-valued signals
- Modification of sampling rate
- Reconstruction und interpolation of analog and time-discrete signals
- Hilbert transform
- Statististical description of signals and systems; signal and system analysis
- Signal detection.

Textbooks and resources:

- Lathi, B. P.: Signal Processing and linear Systems, Oxford University Press, Oxford, 2000
- Narayana, Y.: Signals and Systems, Cengage Learning India Pvt. Ltd; Delhi 2011
- Prandoni, P.; Vetterli, M.: Signal Processing for Communication, EPFL Press, Italy, 2008
- Accompanying scripts of the lecture (in German)

System Theorie 2

General Information

Responsible professor(s): Prof. Dr. Ines Rennert, Prof. Dr. Oliver Jolisch, Prof. Dr. Tilo Strutz

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The students dispose of special expertise in both, linear and selected nonlinear systems. They obtain a basic comprehension of the multitude and heterogeneity in nonlinear systems including their characteristics, mathematical descriptions and occurrences. The students are able to apply their knowledge in a professional context. They can analytically deal with selected applications using the introduced methods and techniques. The participants are also capable to solve synthesis tasks.

Students are able to deal with complex subject-related topics, and expand as well as integrate their knowledge independently. They are able to create new knowledge with the help of scientific methods.

Curricular content:

- Adaptive Systems
    - Methods of least squares
    - Linear and non-linear optimization
    - gradient descent method
    - Gauss-Newton method
    - Levenberg-Marquardt method
    - introduction to digital filters
    - adaptive digital filter (Wiener filter, the LMS filter, Levinson-Durbin algorithm)
    - learning systems
    - neural networks
    - self-organizing maps (Kohonen map)
    - method of simulated annealing
- Fuzzy systems
    - fuzzy set theory
    - fuzzification, defuzzification
    - rule-based systems and interference scheme
    - selected examples and applications
- Chaotic systems
    - prerequisites and indications of chaotic processes
    - description in the state space
    - selected examples and applications

Textbooks and resources:

- Strutz, T.: Data Fitting and Uncertainty, Vieweg+Teubner, 2010
- Widrow,B; Walach, E.: Adaptive inverse control., IEEE Press, John Wiley & Sons, 2007
- IEEE papers (Transactions on Circuits and Systems und Transactions on Fuzzy Systems)
- Accompanying scripts of the lecture (in German)

Coding Theory

General Information

Responsible professor(s): Prof. Dr. habil. Tilo Strutz

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The students have advanced knowledge of data-compression basics. They understand their application in modern compression systems and standards for still image compression and image-sequence compression.

The students become acquainted with state-of-the-art methods of forward error correction. They are able to assess these methods for different application scenarios.

The students are able to deal with complex issues, to set priorities and to make decisions.

Curricular content:

- Data compression
    - Entropy coding (Golomb-Rice coding, arithmetic coding)
    - Precoding (block sorting, tag trees)
    - Data reduction (sub-sampling, quantisation)
    - Decorrelation (DCT, wavelet transformation, filter banks, lifting scheme)
    - Standards (JPEG2000, MPEG-1/2, H.264)
- Error control coding
    - Basics of linear block codes,
    - Convolutional codes (recursive, non-recursive), interleaving,
    - Turbo codes
    - Turbo decoding
    - LDPC codes

Textbooks and resources:

- Sayood, K.: Introduction to Data Compression, Morgan Kaufmann, 3rd edition
- Pennebaker, W.B.; Mitchell, J.L.: JPEG, Kluwer Academic Publishers, 1993
- Richardson, I.E.; The H.264 advanced video compression standard. Wiley, 2nd edition
- Cover, Th.M., Thomas, J.A.: Elements of Information Theory, Wiley-Interscience, 2nd edition
- Moreira, J.C.; Farrell, P.G.: Essentials of Error-Control Coding, Wiley
- Strutz: Bilddatenkompression, Springer-Fachmedien, 4.Auflage
- Strutz: LDPC-Tutorial, 2013

Wireless Communications

General Information

Responsible professor(s): Prof. Dr. Thomas Schneider

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students know the interaction of a wave with their environment and the resulting consequences for wireless transmission systems, such as the cellular mobile and wireless. From these basics propagation models are derived, so that students get a basic understanding of the simulation programs and their application used by mobile phone suppliers. Students are able to determine the properties of the channel from the parameters of the mobile multipath channel and to compare them. Students master deriving methods to improve transmissions and thus to increase the transmittable data rate.

By integrating the latest research findings, which the students identify partly by itsself, they are able to learn from experience and to acquire new knowledge on creative ways. Students will be able to evaluate research results and to draw conclusions in the subject area of the module regarding to their practical work.

Curricular content:

- Interaction of a wave with their environment
- Large Scale Fading
- Empirical and physical propagation models
- Small-Scale Fading
- Shading
- The mobile multipath channel
- Doppler shift
- Flat and Frequency Selective Fading
- Ways to improve the transmission at Small Scale Fading
- MIMO equalizer, Rake Receiver
- Implementation in wireless systems

Textbooks and resources:

- S. A. Saunders Antennas an Propagation, J. Wiley & Sons New York
- T. Schneider, Nonlinear Optics in Telecommunications, Springer, New York
- J. G. Proakis, Digital Communications, Mc Graw-Hill, New York
- Journals via IEEEexplore

Optical Transmission Systems

General Information

Responsible professor(s): Prof. Dr. Christan-Alexander Bunge

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The students know the fundamental methods for the signal generation, transmission and reception in high-speed optical transmission systems. They can assess the complexity and performance of modern transmission schemes, modulation formats and receiver technologies so that they can choose the most suitable approach under given circumstances. They know the most important aspects and the fundamental approach to design a high-speed optical transmission system.

The students can elaborate on technical aspects and describe solutions in front of an audience. They can work in groups and can design and document technological approaches. The students are able to discern the problems on their own and can learn the state of the art of a limited topic on the basis of their already existing knowledge.

Curricular content:

Multiplexing techniques for very high data rates, direct and external modulation, optical amplitude and phase modulators as well as IQ-modulators, optical transmitter and receiver structures for amplitde, phase, and differential-phase shift keying, coherent homodyne and heterodyne detection, digital equalisation, non-linear transmission effects in optical transmission systems (Kerr non-linearities), techniques for their suppression and compensation, power and dispersion profile and design of a transmission line applying dispersion-compensation schemes, polarisation-mode dispersion (PMD).
The student project is a group work of up to three students and consists of a literature research, learing the aspects of the topic, solving a particular problem/studying a particular aspect of the sytem, practical implementation of the solution, and final presentation of the project work and the obtained results.

Textbooks and resources:

- O. Ziemann et al.: POF–Manual, Springer 2007
- G. Agraval: Optical Transmission Systems, Academics Press, 2009

Optical Access Networks and Interconnection

General Information

Responsible professor(s): Prof. Dr. Christian-Alexander Bunge

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The students understand the fundamental principles of optical access networks and short-reach interconnection. They know the basic components, their operation principles, fundamental limitations and operational conditions. They can assess technological approaches for optical access networks regarding complexity, scalability, robustness, and economics. They can describe limiting linear and non-linear effects in such optical networks and method for their suppression.

The students can elaborate on technical aspects and describe solutions in front of an audience. They can work in groups and can design and document technological approaches. The students are able to discern the problems on their own and can learn the state of the art of a limited topic on the basis of their already existing knowledge.

Curricular content:

Technical and economical conditions in optical access networks and short-reach interconnections, topologies and comparison between passive and active optical networks, multiple-access and modulation techniques, special components for the optical access network: transmitter, receiver, couplers, monitoring and measurement techniques, development towards larger reach, higher data rates and larger splitting ratio/user count, in-house networks and their particular requirements regarding components, fibre technology for reduced bending-loss sensitivity, connectors and parallel transmission, non-linear effects during modulation and transmission with special attention to intermodulation products and Rayleigh as well as Brillouin scattering, compensation/suppression methods.

Textbooks and resources:

- G. Keiser: FTTX Concepts and Applications, John Wiley and Sons, 2008.
- J. Prat (Ed.), Next-Generation FTTH Passive Optical Networks: Research towards unlimited bandwidth access, Springer Netherlands, 2008.
- B. Chomycz: Planning Fiber Optic Networks, McGraw Hill, New York, 2009.
- M. Bass (Ed.), Fiber Optics Handbook – Fibers, Devices and Systems for Optical Communications, McGraw Hill, New York, 2002.
- O. Ziemann et al.: POF–Manual, Springer 2007

Electromagnetic compatibility

General Information

Responsible professor(s): Prof. Dr. Detlef Schlayer

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students understand the hierarchy of EMC-standardization and transfer the knowledge in practice. Students will have knowledge of EMC-specific materials and components. Students are able to analyze and assess electromagnetic couplings and their mathematical description. They will be qualified to perform EMC tests with special measuring equipment.

Students are able to recognize and handle, prioritize and prepare appropriate decisions relevant technical issues independently. They are able to solve problems from the ground up, including the structured enrichment of their knowledge.

Curricular content:

- Introduction and standardization in the EMC
- Electromagnetic couplings
- Measures for compliance with the EMC
- Measuring and testing methods of the EMC
- EMC laboratory:
- Electrostatic discharge (ESD)
- Immunity tests (conducted, radiated)
- Emission tests
- EMC filter

Textbooks and resources:

- Schlayer: Scripts and Exercises

Introduction into field theory

General Information

Responsible professor(s): Prof. Dr. Detlef Schlayer

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students learn the basics of vector analysis. Students are able to apply the mathematical foundations of the system of Maxwell's equations and the theory of electromagnetic fields. Using examples, the field-theoretical relationships are strengthened. The students are able to develop approaches for numerical solution methods.

Students can independently acquire new knowledge in the field of electromagnetic fields and know their own approaches to knowledge acquisition. They are able to solve problems from the ground up, including the structured enrichment of thier knowledge.

Curricular content:

- Multiple integrals – calculation and application
- Curves and surface integrals
- Vector analysis, nabla operator, Gauss and Stokes theorems
- Static and stationary fields
- Time-varying fields
  - quasi-stationary fields
  - wave fields
- Numerical methods of field calculation

Textbooks and resources:

- Schlayer: Scripts and Exercises

Operating Systems 1

General Information

Responsible professor(s): Prof. Dr. Michael Meßollen

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students know the characteristics of real-time systems and real-time operating systems and have the corresponding knowledge. They are able to abstract this knowledge and apply it in contexts outside of the module. The students use subject-specific problem-solving methods that can be applied with colleagues in the team.

Students can learn from own experiences and are able to combine domain-specific knowledge. In the integrated exercises, students learn how to handle specific loads.

Curricular content:

- Introduction and Classification
- Time (clock, time standards, synchronization, Global Time)
- Terms and definitions, periodic task model, precedents, task graph
- Scheduling, Scheduling periodic tasks (eg EDF, LRT, LST)
- Time Based Scheduling: Task model, usage, structure of cyclic schedules
- Scheduling problem as a network flow
- Priority based scheduling period. Tasks (such as RMS, DMS, EDF, LST)
- Resources access control (NPCS, BPI, BPC)
- Resource Management (hard drives, memory, caches)
- Real time communication (real-time capability in the network, communication mechanisms and protocols, bus systems)

Textbooks and resources:

- Jane W. S. Liu: Real-Time Systems; Prentice Hall 2000
- Hermann Kopetz: Real-Time Systems. Design Principles for Distributed Embedded Applications; Kluwer Academic Publishers 1997
- C.M. Krishna, Kang G. Shin: Real-Time Systems; McGraw-Hill 1997
- Wayne Wolf: Computers as Components – Principles of Embedded Computing Design; Morgan Kaufmann Publishers 2000

Operating Systems 2

General Information

Responsible professor(s): Prof. Dr. Michael Meßollen

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The students have expertise in the field of real-time systems and are able to reflect and further develop this expertise independently. They can criticize and apply scientific methods. Students are able to expand their knowledge with the help of scientific methods.

Students are able to deal constructively and use this to their own advantage with criticism in the professional context. The students are able to make their proper contribution in a team.

Curricular content:

The seminar is a reference to primary literature and presents various issues from the complex real-time systems. Topics may include:

- Management of the resource CPU
- Memory management for embedded and realtime systems
- Real-time communication, group communication
- Fault tolerance in embedded and realtime systems
- Real time Suitable communication mechanisms and protocols
- Distributed Real-Time Systems

The exact topics to be discussed and the literature will be announced in due time.

Textbooks and resources:

The module will work with current primary literature (ie latest published research). The students are informed of the title of technical texts in the module, they will receive guaranteed access to literature.

Software Engineering

General Information

Responsible professor(s): Prof. Dr. Sabine Wieland

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students manage basics of software engineering. Based on the knowledge about the software life cycle, participants can apply current methods and models for the systematic development of high quality software. The focus is on concepts which are in the design, implementation and testing of software systems, so that the inner phases of the software life cycle are covered.

Students can make their contribution appropriately in a team and break down in a team with their skills. They are able to perceive different roles and know their personal limits. The students dominate the self-directed knowledge acquisition.

Curricular content:

- Concepts and tools for software development according to the State of the Art
- Case examples and case studies for software engineering from industrial practice
- Current approaches to industrialization automation and standardization of software production
- Optimization of Software Systems
- Software Quality
- concepts and approaches for software testing
- Software maintenance
- Software Security

Textbooks and resources:

- Handbook of Software Quality Assurance Hardcover – September 30, 2007 by G. Gordon Schulmeyer (Editor), Language: English, ISBN-10: 1450421040, ISBN-13: 978-1450421041, ASIN: 1596931868
- Metrics and Models in Software Quality Engineering (2nd Edition) Hardcover – September 26, 2002 by Stephen H. Kan, Publisher: Addison-Wesley Professional; 2 edition (September 26, 2002), Language: English, ISBN-10: 0201729156, ISBN-13: 978-0201729153
- The Economics of Software Quality (Englisch) Gebundene Ausgabe – 22. Juli 2011 von Capers Jones (Autor), Jitendra Subramanyam (Autor), Olivier Bonsignour (Autor), Verlag: Prentice Hall; Auflage: New. (22. Juli 2011), Sprache: Englisch, ISBN-10: 0132582201, ISBN-13: 978-0132582209

Software Management

General Information

Responsible professor(s): Prof. Dr. Sabine Wieland

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Based on the module software engineering such topics are given like:
serving the management of software production and thus support the informational foundation of the necessary planning, management and control processes within the software life cycle.

Students are made aware of the key success factors of industrial software production processes and can evaluate concepts of software management critical. They are also sensitized for the economic aspects of software as an economically relevant resource in the global networked knowledge society.

Curricular content:

- Characteristics of software management and fundamentals of software economics
- Institutional, functional and instrumental aspects of software management
- Methods for collection, analysis and validation of customer requirements (requirements engineering)
- Models and methods for effort and cost estimation (eg functional size measurement)
- Selected process, project and quality models for development and integration projects (eg CMMI)
- Security aspects

Textbooks and resources:

- Applied Software Project Management Paperback – November 25, 2005, Andrew Stellman, Jennifer Greene, O'Reilly Media; 1 edition (November 25, 2005), Language: English, ISBN-10: 0596009488, ISBN-13: 978-0596009489
- Software Requirements 2– March 26, 2003, by Karl Wiegers, Microsoft Press; 2 edition (March 26, 2003), Language: English, ISBN-10: 0735618798, ISBN-13: 978-0735618794
- Visual Models for Software Requirements (Developer Best Practices)– July 25, 2012 Anthony Chen, Joy Beatty Publisher: Microsoft Press; 1 edition (July 25, 2012) Language: English ISBN-10: 9780735667723 ISBN-13: 978-0735667723
- Software Project Survival Guide (Developer Best Practices)– October 25, 1997 Steve McConnell Microsoft Press; 1 edition (October 25, 1997) Language: English ISBN-10: 1572316217 ISBN-13: 978-1572316218
- Mastering Software Project Management: Best Practices, Tools and Techniques– July 27, 2010 Murali K. Chemuturi, Thomas M. Cagley Jr. Publisher: J. Ross Publishing (July 27, 2010), Language: English, ISBN-10: 1604270349, ISBN-13: 978-1604270341

Enterprise applications

General Information

Responsible professor(s): Prof. Dr. Thomas Meier

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students understand the different possibilities for the design and distribution of business components and are able to design suitable application architectures. Students are skilled to practically apply the different technologies of the Java Enterprise world to solve each different tasks specific. Students learn effective techniques for the implementation of enterprise components and can independently deal with appropriate tools.

Students can structure their work itself and independently develop topics in small teams. They can make their own and proper contribution and use their skills for the team objective targeted. They are able to learn from experience and to expanding his/her social and methodological competences as well as their expertise.

Curricular content:

- Introduction to the development of distributed applications with Java EE
- Java Enterprise Application Server
- Business logic (enterprise beans)
- Persistence
- Transactions
- Messaging
- Web Services
- Web front ends
- SW Patterns for Enterprise Applications
- Special features of the software development of distributed applications
- Practical implementation and illustrative example of a continuous during
- Project work / exercise as well as for self-study by students

Textbooks and resources:

- G. Hohpe, B. Woolf, Enterprise Integration Patterns, Addison-Wesley, 2004

Theoretical fundamentals in computer science

General Information

Responsible professor(s): Prof. Dr. Michael Meßollen

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students will be able to computational models, computability, and complexity. They can apply these principles to the operation of communication systems using formal descriptive languages and protocol development tools.

Students are able to deal constructively and use this to their own advantage with criticism in the professional context. The students are able to make their proper contribution in a team.

Curricular content:

- Broad Automata Theory and Formal Languages
    - Alphabet, grammar
    - Finite automata, pushdown automata, Turingmaschienen, etc.
    - Chomsky hierarchy
    - Church-Turing thesis
- predictability
    - Church's thesis
    - Non-computable functions, decision problem, halting problem
    - Set of Rise
- time complexity
    - deterministic, non-deterministic Turing machine
    - Time complexity, P, NP
    - Decidability

Textbooks and resources:

- John E Hopcroft and Jefrey D Ullman – Introduction to Automata theory, Languages and Computation – Narosa Publication House, 2004

Enterprise Database Management Systems

General Information

Responsible professor(s): Prof. Dr. Andreas Thor

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

This course builds upon the knowledge of basic courses on data management and relational database management systems (RDBMS). Students learn functionality and working principles of standardized extensions of modern RDBMS. They can efficiently and effectively employ RDBMS in complex enterprise environments.

Students combine their experiences on data management with specific knowledge on state-of-the-art techniques. They carry out solutions in teams for specific and practical data management challenges.

Curricular content:

- Concepts of procedural programming with databases
- Object-relational Mapping
- Object-oriented Databases
- Object-relational Databases
- Data Warehousing
- XML-Data-Processing with relational Databases

Textbooks and resources:

- Script
- Garcia-Molina, Ullman, Widom.: Database Systems: The Complete Book. Prentice Hall, 2nd edition, 2008
- Jarke, Lenzerini, Vassiliou, Vassiliadis: Fundamentals of Data Warehouses, Springer 2nd Edition, 2003
- Melton, Buxton: Querying XML, : XQuery, XPath, and SQL/XML in context, Morgan Kaufmann, 2006

Computer Network Management

General Information

Responsible professor(s): Prof. Dr. Sabine Wieland, Dr. Rico Radeke

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The students have in-depth knowledge about the management of distributed systems, taking into account aspects of convergence and interaction of telecommunications technologies and IT. They have skills and abilities to apply their knowledge and can safely deal with relevant IT technology, active networking equipment and software.

Students can independently acquire new knowledge in the field of network management and know

doing their own borders. Students learn to make his/her contribution to a team properly and are able integrate their skills into the process.

Curricular content:

- Network management standards
  - SNMP (Simple Network Management Protocol)
  - ISO OSI management
  - TMN (Telecommunication Management Network)
  - OAM (Operation Administration Maintenance)
  - BYOD (Bring Your Own Device)
- Exercises on selected topics of network management
  - Fault Management
  - Security Management
  - Performance Management
  - Configuration management
- Converting theoretical knowledge into practice

Textbooks and resources:

- Thomas Plevyak: Next Generation Telecommunications Networks, Services, and Management (IEEE Press Series on Network Management)

- Dinesh Chandra Verma: Principles of Computer Systems and Network Management
- Script and Standards

Distributed Systems

General Information

Responsible professor(s): Prof. Dr. Sabine Wieland, Prof. Dr. Thomas Meier

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

Students are familiar with enterprise tools for the development and analysis of distributed applications as well as architectures of distributed applications. They are familiar with problems, concepts and approaches to the development of distributed systems. Based on this, they are able to analyze the requirements of a distributed application, to evaluate existing solutions, and to develop a concept for software engineers.

Students can learn from their experience and are able to combine domain-specific knowledge. Students are able to deal with specific and practical challenges as well as work on specific tasks within the team.

Curricular content:

- UML in conjunction with BPEL
- Principles and technologies of GRID and cloud concepts
- Principles of service-oriented architectures
- Ways of working and deployment in SOA and other distributed systems
- Security aspects in operation and design of distributed applications
- Suitability of CS and P2P architectures
- Integration of heterogeneous distributed applications
- Mobility concepts of distributed applications

Textbooks and resources:

- Szyperski, C.; Gruntz, D. & Murer, S.: ComponentSoftware -Beyond Object-OrientedProgramming. Addison-WesleyLongman, Amsterdam, 2002
- TheGrid: A New Infrastructure for 21st Century SciencePhysicsToday, 2002
- Steinmetz, R. & Wehrle, K.: Peer-to-PeerSystems and Applications. Springer, Berlin, 2005
- Alonso, G., Casati, F., Kuno, H., Machiraju, V.: Web Services: Concepts, Architectures and Applications (Data-Centric Systems and Applications) Springer, Berlin, 2004

Web Programming

General Information

Responsible professor(s): Prof. Dr. Matthias Krause

ECTS-Credits: 5 ECTS

Objectives – competences, learning targets and intended qualifications

The Students know different web technologies. They master these technologies in different contexts (Usage of Frameworks/Design of Applications) and are able to find solutions for pertinent problems. They master methods for analysis, evaluation and implementation. The students are able to design client-/server-systems in the web area. In the context of the evaluation of modern frameworks and technologies the students are skilled in search and knowledge acquisition.

Students are able to recognize their own person as an important tool for the professional activities, know their limits and know how to extend their abilities. On the one hand students are working independently, plan their work and set priorities, on the other hand they are team player and able to contribute their person adequately in a team.

Curricular content:

- Modern technologies and frameworks, XML, Ajax
- Client-side technologies: designing websites with markup languages (XHTML, HTML5 , CSS, SVG), JavaScript and DOM
- Server-side technologies: CGI, Perl, PHP, JavaScript, Servlets/ JSP/ JavaBeans, session handling, client-server communication

Textbooks and resources:

- Lecture notes
- Manuals, tutorials and language descriptions
- standards (XML , Javascript)