Course Handbook Computer Science and Communication Systems

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Head of Studies	Prof. Dr. Markus Esch
Deputy Head of Studies	Prof. Dr. Horst Wieker
Chairman of Examination	Prof. Dr. Horst Wieker
Deputy Chairman of Examination	Prof. Dr. Thomas Kretschmer

Computer Science and Communication Systems - mandatory courses (overview)

Module name (EN)	Code	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Bachelor Thesis	KI695	6	- international course	12	Prof. Dr. Damian Weber
Business Processes in the Telecommunications Industry	KI580	5	2V	2	Prof. Dr. Horst Wieker
Communications Engineering	KI330	3	4V	5	Prof. Dr. Albrecht Kunz
Communications Technology and Systems 1	KI450	4	4V	4	Prof. Dr. Horst Wieker
Communications Technology and Systems 2	KI550	5	4V	4	Prof. Dr. Horst Wieker

Computer Networks	KI320	3	2V+2P	4	Prof. Dr. Damian Weber
Computer architecture	KI440	4	2V	2	Prof. Dr.-Ing. Jürgen Schäfer
Digital Electronics	KI370	3	4V	4	Prof. Dr. Benedikt Faupel
Digital Signal Processing	KI560	5	2V+2P	4	Prof. Dr. Martin Buchholz
Distributed Systems 1	KI410	4	2V+2P international course	4	Prof. Dr. Markus Esch
Distributed Systems 2	KI510	5	2V+2P	4	Prof. Dr. Reiner Güttler
English 1	KI190	1	2V	2	Prof. Dr. Christine Sick
English 2	KI290	2	2V	2	Prof. Dr. Christine Sick
English 3	KI390	3	2V	2	Prof. Dr. Christine Sick
Informatics 1	KI110	1	3V+1U	5	Prof. Dr. Damian Weber
Informatics 2	KI210	2	3V+1U	5	Prof. Dr. Damian Weber

Internet Technologies	KI500	5	2V+2P	4	Prof. Dr. Martina Lehser
Laboratory Course in Information and Communication	KI600	6	8P	9	Prof. Dr. Damian Weber
Mathematics 1	KI160	1	4V+2U	8	Prof. Dr. Rainer Lenz
Mathematics 2	KI260	2	4V+2U	8	Prof. Dr. Rainer Lenz
Mathematics 3	KI360	3	3V+1U	5	Prof. Dr. Barbara Grabowski
Microprocessor Systems	KI460	4	2V	2	Prof. Dr.-Ing. Jürgen Schäfer
Operating Systems	KI420	4	4V	4	Prof. Dr. Martina Lehser
Oral Presentation Skills	KI520	5	2V	2	Dr. Peter Ludwig
Physical and Technical Foundations of IT 1	KI120	1	4V	5	Prof. Dr. Horst Wieker
Physical and Technical Foundations of IT 2	KI220	2	4V	5	Prof. Dr. Horst Wieker
Programming 1	KI100	1	4V+2P	8	Prof. Dr. Martina Lehser
Programming 2	KI200	2	4V+2P	8	Prof. Dr. Helmut Folz

Protocols	KI570	5	4V	4	Prof. Dr. Horst Wieker
Software Engineering 1	KI300	3	4V	5	Prof. Dr. Helmut Folz
Software Engineering 2	KI400	4	2V+2P	4	Prof. Dr. Martina Lehser
System Management and Security	KI430	4	2V+2P	4	Prof. Dr. Damian Weber
Work Experience Phase	KI590	4	-	12	Prof. Dr. Damian Weber

(33 modules)

Computer Science and Communication Systems - optional courses (overview)

Module name (EN)	Code	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
"Engineering Visions" Intensive Program	KI606	4	2PA+1S international course	4	Prof. Dr. Martin Löffler-Mang
.NET Concepts and Tools	KI665	6	2V+2P	5	Thomas Beckert, M.Sc.
Applied Computer Science Seminar	KI594	5	2S	3	Prof. Dr.-Ing. André Miede
Automotive Engineering	KI620	6	2V	3	Prof. Dr. Horst Wieker
Basic Principles Governing the Qualification of Trainers and Instructors in Germany's Dual Education and Vocational Training System	KI611	6	2V	2	Prof. Dr.-Ing. Dietmar Brück
Broadband Technology and its Applications	KI612	6	2V	3	Prof. Dr. Horst Wieker
Chinese for Beginners I	KI572	5	2V	2	Prof. Dr. Thomas Tinnefeld
Cloud Computing	KI699	6	2V+2PA	5	Prof. Dr. Markus Esch

Compiler Design	KI675	5	2V+2P	5	Thorsten Jakobs, M.Sc.
Computer Graphics	KI676	6	2V	3	Prof. Dr. Ralf Denzer
Computer Science and Society Seminar	KI602	6	2S	3	Prof. Dr.-Ing. André Miede
Computer Science in the Media	KI697	6	2S	3	Prof. Dr. Klaus Berberich
Computer Vision	KI692	6	4V	5	N.N.
Decision Support Systems	KI650	6	4V	5	Prof. Dave Swayne
Design Patterns	KI681	6	2V	3	Prof. Dr. Helmut Folz
Digital Television Technology	KI643	6	2V	3	Prof. Dr. Martin Buchholz
Electromobility	KI617	6	2V	3	Prof. Dr. Horst Wieker
Electronic Business	KI631	6	4V	4	Prof. Dr. Klaus Huckert
Embedded Linux	KI689	6	2V+2P	4	Dipl.-Inf. Ulrich Bruch
Enterprise Java Beans	KI619	6	2V+2P	5	Prof. Dr. Helmut Folz
Enviromatics	KI677	6	2V+2P	5	Prof. Dr. Ralf Denzer

Error-Identification and Error-Correcting Codes	KI656	5	2V	3	Dipl.-Math. Wolfgang Braun
Field Bus Systems	KI654	6	2V	2	Prof. Dr.-Ing. Jürgen Schäfer
French I	KI657	5	2V	2	Prof. Dr. Christine Sick
French II	KI658	6	2V	2	Prof. Dr. Christine Sick
French for Beginners I	KI659	5	2V	2	Prof. Dr. Christine Sick
French for Beginners II	KI660	6	2V	2	Prof. Dr. Christine Sick
Functional Programming	KI571	6	2V+2P	5	Prof. Dr. Thomas Kretschmer
Future Internet: Software Defined Networking	KI596	5	4V	4	Prof. Dr. Damian Weber
GUI Programming with Qt	KI603	-	4V	5	Hong-Phuc Bui, M.Sc.
Game Design and Development	KI598	5	2V+2P international course	5	Prof. Dr.-Ing. André Miede
Human Computer Interaction	KI636	5	4V	5	Prof. Steven Frysinger
IT Contract Law	KI670	5	2V	2	RA Cordula Hildebrandt

IT Forensics	KI690	5	1V+1P	2	Prof. Dr. Damian Weber
IT Forensics Practical Course	KI601	-	2P	3	Prof. Dr. Damian Weber
Industrial Ecology	KI671	6	4V international course	5	Prof. Steven Frysinger
Information Retrieval	KI584	5	2V+2PA international course	5	Prof. Dr. Klaus Berberich
Integration Compatible Circuitry	KI667	6	4V	5	Prof. Dr. Albrecht Kunz
Intercultural Communication	KI589	6	2SU	2	Prof. Dr. Christine Sick
Internet Development with Java 1	KI581	5	2V+2P	5	Dipl.-Inf. Christopher Olbertz
Internet Development with Java 2	KI577	6	2V+2P	5	Dipl.-Inf. Christopher Olbertz
Internet and the Law	KI651	5	2V	2	RA Cordula Hildebrandt
Introduction to Astronomy	KI674	5	2V	2	Prof. Dr. Martin Löffler-Mang
Introduction to Parallel Programming with CUDA	KI593	5	1V+1P	3	Dipl.-Inform. Marion Bohr
Introduction to Project Management	KI639	5	2V+2PA	4	Dipl.-Ing. Michael Sauer

Introduction to Wireless LANs	KI632	6	2V	3	Dipl.-Math. Wolfgang Braun
Italian for Beginners 1	KI661	5	2V	2	Prof. Dr. Christine Sick
Italian for Beginners 2	KI662	6	2V	2	Prof. Dr. Christine Sick
Law for Business Founders	KI673	6	2V	2	RA Cordula Hildebrandt
Machine Learning	KI575	6	2V+2U international course	5	Prof. Dr. Klaus Berberich
Management and Communication	KI644	5	2V	2	Prof. Dr. Klaus-Jürgen Schmidt
Mathematical Software Systems and Algorithmic Applications	KI637	5	4V	5	Prof. Dr. Barbara Grabowski
Measurements and Simulations in Communications Engineering	KI698	6	2V+2P	5	Prof. Dr. Albrecht Kunz
Mentoring	KI591	5	2S	2	Prof. Dr. Simone Odierna
Methods and Applications from the Field of Artificial Intelligence for Signal and Image Processing	KI578	-	4PA	5	Prof. Dr.-Ing. Ahmad Osman
Mobile Application Development (Android)	KI599	5	2V+2P	5	Christoph Karls, M.Sc.

Music and Computers	KI646	5	4V	4	Prof. Dr. Klaus Huckert
Numerical Software	KI672	6	2V+2PA	5	N.N.
Practical Circuit Design	KI653	5	4V	4	Dipl.-Ing. Hans-Joachim Bohr
Presenting a Project	KI574	6	2V	2	Prof. Dr. Christine Sick
Programming Tools	KI569	6	2V+2P	5	Prof. Dr. Reinhard Brocks
Project Management	KI567	6	2V	3	Dipl.-Ing. Michael Sauer
Real-Time Operating Systems	KI669	6	2V	2	Prof. Dr.-Ing. Jürgen Schäfer
Requirements Engineering	KI641	5	2V	2	Prof. Dr. Helmut Folz
Risk-Based Decision Making and Statistical Data Analysis	KI626	5	2V+2P	4	Melanie Kaspar, M.Sc.
Robotics Lab Course	KI627	6	2P	4	Dipl.-Ing. Dirk Ammon
Ruby on Rails	KI680	6	3V+1P	4	Dipl.-Inf. Julian Fischer
Running RoboNight Workshops	KI628	6	1PA+1S international course	3	Prof. Dr. Martina Lehser
Russian for Beginners 1	KI607	6	2SU	2	Prof. Dr. Christine Sick

Russian for Beginners 2	KI585	6	2SU	2	Prof. Dr. Christine Sick
Semiconductor Technology and Production	KI608	6	4V	5	Prof. Dr. Albrecht Kunz
Sino-German Student Club for Smart Sensors	KI696	6	1V+3PA	5	Prof. Dr. Martina Lehser
Software development for collaborative industrial robotics	KI566	5	4PA	5	Prof. Dr. Martina Lehser
Spanish for Beginners I	KI663	5	2V	2	Prof. Dr. Christine Sick
Spanish for Beginners II	KI664	6	2V	2	Prof. Dr. Christine Sick
Systems Engineering	KI583	-	2PA	3	Prof. Dr. Martin Buchholz
Technical Documentation	KI655	6	2V	2	Prof. Dr. Walter Calles
Web Security Project	KI614	6	1V+1PA	3	Prof. Dr. Damian Weber

(78 modules)

Computer Science and Communication Systems - mandatory courses

Bachelor Thesis

Module name (EN): Bachelor Thesis
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI695
Hours per semester week / Teaching method: -
ECTS credits: 12
Semester: 6
Mandatory course: yes
Language of instruction: German
Assessment: Written report/record
Curricular relevance: KI695 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, mandatory course Suitable for exchange students (learning agreement)
Workload: The total student study time for this course is 360 hours.
Recommended prerequisites (modules): None.
Recommended as prerequisite for: KI694 [*updated 18.05.2008*]

Module coordinator:
Prof. Dr. Damian Weber

Lecturer:
Professoren des Studiengangs
[*updated 10.07.2010*]

Learning outcomes:
The final-year thesis written by students for their Bachelors degree will be formally assessed. The thesis should demonstrate that the student is capable of tackling within a prescribed period of time a problem from a chosen field using established scientific and academic methods. The thesis should also cover the practical applicability of the results and should discuss aspects expected in any industrial project report (project planning, implementation and outcome).
[*updated 13.03.2007*]

Module content:
The final-year thesis is based on a project carried out in a research, industrial or commercial setting. The project can be theoretical, program-focused and/or empirical in nature. The thesis documents the students work and participation in the project.

[*updated 13.03.2007*]

Recommended or required reading:
To be provided by the project supervisor.

[*updated 13.03.2007*]

Business Processes in the Telecommunications Industry

Module name (EN): Business Processes in the Telecommunications Industry
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI580
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: KI580 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, mandatory course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Horst Wieker

Lecturer:
Prof. Dr. Horst Wieker
Joachim Adt
[*updated 01.04.2003*]

Learning outcomes:
After completing this course, students will have acquired a comprehensive understanding of the business transactions used in the telecommunications industry. Students will learn about the business relationships between a carrier and another carrier, a carrier and a private customer, and between a carrier and a business customer. The course will also discuss the products available in the telecommunications sector and the relevant statutory regulations.
[*updated 13.03.2007*]

Module content:
1. State of liberalization in the global, European and German telecommunication markets. The legal framework within Germany.
1.1......The German telecom regulator (RegTP), the German Telecommunications Act (TKG), etc.
1.2......Licensing classes
1.3......Rights and obligations of licensees
1.4......Customer protection
2. Marketing an international comparison
2.1......Positioning of providers in the market
2.2......Market data relating to market players, products and communications needs
3. Competition between network operators
3.1......Interconnection
3.2......Resale
3.3......Billing
3.4......Products (fixed network, internet, mobile networks)
4. Administrative organization of telecommunications traffic
4.1......Number management
4.2......Frequency management
5. Security in telecommunications systems
5.1......Legal framework
5.2......Technical security and privacy measures
6. Quality management
[*updated 13.03.2007*]

Recommended or required reading:
The course reading list will be issued at the beginning of the course.

[*updated 13.03.2007*]

Module offered in:
WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, ...

Communications Engineering

Module name (EN): Communications Engineering
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI330
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 5
Semester: 3
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: KI330 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 3, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for: KI576 KI698 Measurements and Simulations in Communications Engineering [*updated 13.02.2017*]

Module coordinator:
Prof. Dr. Albrecht Kunz

Lecturer:
Prof. Dr. Albrecht Kunz
Dipl.-Ing. Thomas Bertel
[*updated 22.10.2010*]

Learning outcomes:
Students will acquire an overview and a deeper understanding of modern communications engineering. The aim of this module is to teach signal and systems theory as the basis of todays communications engineering systems. Building on this foundation, the course will cover the properties and characteristics of transmission channels, modulation methods and channel coding schemes. By introducing the design concepts used in modern mobile communications systems (such as UMTS) students will also gain an appreciation of the hardware and technology in current use.
[*updated 13.03.2007*]

Module content:
1. Fundamentals of signal and systems theory
2. Transmission channels
3. Message transmission
4. Modulation techniques
4.1......Analogue modulation techniques
4.2......Digital modulation techniques
5. Channel coding
6. Concepts in mobile communications
[*updated 13.03.2007*]

Recommended or required reading:
HERTER E., LÖRCHER W., Nachrichtentechnik, Hanser
JONDRAL F., Nachrichtensysteme, J. Schlembach
JOHANN J., Modulationsverfahren, Springer
KIEF K., Weitverkehrstechnik, Vieweg
MÄUSL R., SCHLAGHECK E., Meßverfahren in der Nachrichtenübertragungstechnik, Hüthig
MÄUSL R., Analoge Modulationsverfahren, Hüthig
MÄUSL R., Digitale Modulationsverfahren, Hüthig
TORNOW W., Taschenbuch der Nachrichtentechnik, Schiele u. Schön
KAMMEYER K.D., Nachrichtenübertragung, Teubner
WERNER M., Nachrichtentechnik, Vieweg
SCHÜSSLER H.W., Netzwerke, Signale und Systeme, Band II
[*updated 13.03.2007*]

Module offered in:
WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, ...

Communications Technology and Systems 1

Module name (EN): Communications Technology and Systems 1

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI450

Hours per semester week / Teaching method: 4V (4 hours per week)

ECTS credits: 4

Semester: 4

Mandatory course: yes

Language of instruction:
German

Assessment:
Ninety-minute written exam

Curricular relevance:
KI450 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 4, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
KI550 Communications Technology and Systems 2
KI600 Laboratory Course in Information and Communication
KI612 Broadband Technology and its Applications
KI683
[*updated 01.07.2017*]

Module coordinator:
Prof. Dr. Horst Wieker

Lecturer:
Prof. Dr. Horst Wieker
Dipl.-Ing. Mirko Luzaic
[*updated 01.07.2017*]

Learning outcomes:
This course aims to provide students with a thorough understanding of communications technology. After completing the course, students will understand how different computer networks are structured. They will be able to characterize network components and their functions and be able to use this knowledge to solve networking problems.
[*updated 13.03.2007*]

Module content:
1. General principles
2. Functional processes
3. Structure of narrowband networks
4. Functional units
5. Access networks
6. Mobile networks
7. Architecture and components
[*updated 13.03.2007*]

Recommended or required reading:
SIGMUND G., Technik der Netze, Hüthing
GERKE P.R., Digitale Kommunikationsnetze, Springer
HAASS W.D., Handbuch der Kommunikationsnetze, Springer
RÖSSEL H., Jahrbuch 2001 Kommunikationsnetze, Addison-Wesley
[*updated 13.03.2007*]

Module offered in:
SS 2018, SS 2017, SS 2016, SS 2015, SS 2014, ...

Communications Technology and Systems 2

Module name (EN): Communications Technology and Systems 2
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI550
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 4
Semester: 5
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: KI550 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI450 Communications Technology and Systems 1 [*updated 01.07.2017*]
Recommended as prerequisite for: KI612 Broadband Technology and its Applications KI683 [*updated 24.01.2013*]

Module coordinator:
Prof. Dr. Horst Wieker

Lecturer:
Prof. Dr. Horst Wieker
Andreas Otte, M.Sc.
Jens Staub, M.Sc.
[*updated 01.07.2017*]

Learning outcomes:
Building on the knowledge acquired in Communications Technology and Systems 1, the communications networks covered are extended to include private networks. The main focus of the course is on the coupling between communications networks above layer 2, though SDH (Synchronous Digital Hierarchy) technology is also discussed. The SDH transport system functions as the backbone in many modern professional communications networks. Students will be able to apply their knowledge, particularly that relating to multiplex structures, pointer systems and overhead functions, to developing solutions to networking problems.
[*updated 13.03.2007*]

Module content:
1. LAN/WAN technologies (private networks)
2. Next-generation networks
3. Gateways in telecommunications networks
4. Multimedia gateways
5. Synchronous Digital Hierarchy (SDH) technology
[*updated 13.03.2007*]

Recommended or required reading:
SIGMUND G., Technik der Netze, Hüthing
GERKE P.R., Digitale Kommunikationsnetze, Springer
HAASS W.D., Handbuch der Kommunikationsnetze, Springer
RÖSSEL H., Jahrbuch 2001 Kommunikationsnetze, Addison-Wesley

[*updated 13.03.2007*]

Module offered in:
WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, ...

Computer Networks

Module name (EN): Computer Networks
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI320
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 4
Semester: 3
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: KI320 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 3, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI200 Programming 2 KI210 Informatics 2 [*updated 04.07.2009*]

Recommended as prerequisite for:
KI410 Distributed Systems 1
KI430 System Management and Security
KI500 Internet Technologies
KI590 Work Experience Phase
KI612 Broadband Technology and its Applications
KI616
KI632 Introduction to Wireless LANs
KI633
KI642 Database Management
KI680 Ruby on Rails
[*updated 15.09.2017*]

Module coordinator:
Prof. Dr. Damian Weber

Lecturer:
Prof. Dr. Damian Weber
Dipl.-Ing. Wolfgang Pauly
[*updated 01.04.2003*]

Learning outcomes:
Students will learn how the internet functions by analysing the protocol families used between the LAN and the application level. After completing this course, students will be able to implement reliable client/server programs.
[*updated 13.03.2007*]

Module content:
1. Computer communication
1.1. Models
1.2. LAN
1.3. IP
1.4. UDP
1.5. TCP
2. Client/server programming
3. Application level internet protocols
[*updated 13.03.2007*]

Recommended or required reading:
PETERSON/DAVIE, Computernetze, dpunkt Verlag
COMER D., Computernetzwerke und Internets, Prentice Hall
RIGGERT W., Rechnernetze, Carl Hanser
[*updated 13.03.2007*]

Module offered in:
WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, ...

Computer architecture

Module name (EN): Computer architecture
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI440
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 4
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: KI440 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 4, mandatory course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI370 Digital Electronics [*updated 01.04.2003*]
Recommended as prerequisite for: KI642 Database Management [*updated 05.12.2011*]

Module coordinator:
Prof. Dr.-Ing. Jürgen Schäfer

Lecturer:
Prof. Dr.-Ing. Jürgen Schäfer
[*updated 01.04.2003*]

Learning outcomes:
Students will learn about the structure, organization and operational principles of a digital computer. The architectural elements of a computer will be discussed at the register level and then combined to create a illustrative computer architecture. The processes during command execution and the addressing techniques used will also be explained. Performance enhancement methods, such as pipelining and the use of cache memory, will also be addressed.
[*updated 13.03.2007*]

Module content:
1. Number representation in computers
2. Memory components
3. Demonstration computer DemoCom
4. Von Neumann architecture
5. Microprogramming
6. Instruction-set architecture
7. Interrupt handling
8. RISC processors
9. Pipelining
10. Cache

[*updated 13.03.2007*]

Recommended or required reading:
W. Schiffmann, R. Schmitz: Technische Informatik 2, Springer-Verlag, Berlin, 1999
K. Wüst, Mikroprozessortechnik, Vieweg-Verlag, Braunschweig, 2003
H. Malz, Rechnerarchitektur, Vieweg-Verlag, Braunschweig, 2004
J. L. Hennessy, D. A. Patterson: Rechnerarchitektur Analyse, Entwurf, Implementierung und Bewertung, Vieweg-Verlag, Braunschweig, 2004
P. Herrmann : Rechnerarchitektur Aufbau Organisation und Implementierung, Vieweg-Verlag, Braunschweig, 2000
[*updated 13.03.2007*]

Module offered in:
SS 2018, SS 2017, SS 2016, SS 2015, SS 2014, ...

Digital Electronics

Module name (EN): Digital Electronics
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI370
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 4
Semester: 3
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: DFBI-343 Computer Science and Web Engineering, Bachelor, ASPO 01.10.2018, semester 6, optional course KI370 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 3, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:
KI440 Computer architecture
KI460 Microprocessor Systems
KI608 Semiconductor Technology and Production
KI653 Practical Circuit Design
KI698 Measurements and Simulations in Communications Engineering
[*updated 28.03.2016*]

Module coordinator:
Prof. Dr. Benedikt Faupel

Lecturer:
Prof. Dr. Benedikt Faupel
Prof. Dr. Albrecht Kunz
Dipl.-Ing. Philipp Reiß
Dipl.-Ing. Christoph Weingard
[*updated 22.10.2010*]

Learning outcomes:
Students will acquire an understanding of digital circuits (combinatorial and sequential circuits) and will learn how to analyse and design them. They will become acquainted with the most common technologies used to realize the most important digital functions.
[*updated 13.03.2007*]

Module content:
1. Basic terminology (analogue and digital quantities)
2. Logic operations
3. Digital circuit design
4. Boolean algebra
5. Digital circuit design (OR/AND normal forms; KV diagrams)
6. Families of circuits
7. Time-dependent binary circuits
7.1......Unclocked flip-flops
7.2......Clocked flip-flops
7.3......Edge-triggered flip-flops
7.4......Characteristic equations
8. Binary coding and number systems
9. Code and logic level converter circuits
10. Counters and frequency dividers
10.1......Asynchronous counters
10.2......Synchronous counters
10.3......Frequency dividers (asynchronous/synchronous)
11. Digital selector and connector circuits
11.1......Data selectors, multiplexers, demultiplexers
11.2......Address decoders
11.3......BUS circuits
12. Registers and memory circuits
12.1......Shift registers
12.2......Memory register (RAM, ROM)
13. Digital-to-analogue converters, analogue-to-digital converters
14. Computing circuits
14.1......Half-adders, full adders
14.2......Subtractor circuits
14.3......Multiplier circuits
[*updated 13.03.2007*]

Recommended or required reading:
BEUTH K., BEUTH A., Elektronik Bd. 4 Digitaltechnik, Vogel, 2001
URBANSKI K, WOITOWITZ R., Digitaltechnik. Ein Lehr- und Übungsbuch, Springer, 2000
LIPP M., Grundlagen der Digitaltechnik, Oldenburg, 2002
[*updated 13.03.2007*]

Module offered in:
WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, ...

Digital Signal Processing

Module name (EN): Digital Signal Processing

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI560

Hours per semester week / Teaching method: 2V+2P (4 hours per week)

ECTS credits: 4

Semester: 5

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
KI560 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, mandatory course
KIB-DSIG Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI160 Mathematics 1
KI260 Mathematics 2
KI360 Mathematics 3
[*updated 01.04.2003*]

Recommended as prerequisite for:
KI578 Methods and Applications from the Field of Artificial Intelligence for Signal and Image Processing
[*updated 03.02.2017*]

Module coordinator:
Prof. Dr. Martin Buchholz

Lecturer:
Prof. Dr. Martin Buchholz
[*updated 01.04.2003*]

Learning outcomes:
After successfully completing this module, students will be able to carry out digital signal processing and analyze telecommunications signals and systems. They will know the different structures of discrete time systems and can analyze them analytically with the help of the discrete Fourier transform and the Z-transform. Students will know how to examine digital systems using Matlab and be familiar with the basic features of a simulation tool such as Simulink and SPW (Signal Processing Workstation). The acquired skills in designing digital algorithms and filters will be intensified in an FPGA as part of the simulation and implementation.
Students will thus, be able to apply their knowledge to complex telecommunication systems and implement the required digital algorithms independently in their later professional life or during the Master program.
[*updated 19.02.2018*]

Module content:

1. Introduction
Ideal and real sampling, sampling theorems, practical aspects of scanning
2. Discrete time signals and systems
   Discrete folding, FIR and IIR systems
3. Structure of discrete time systems
4. Representation of discrete time signals and systems in the frequency domain
5. The Z-transform
   Stability
6. Simulation of algorithms for digital signal processing
7. Implementation in hardware

Matlab examples and exercises will be provided for all chapters.
[*updated 19.02.2018*]

Teaching methods/Media:
Script, projector, Matlab and SPW Simulation software in the PC room, implementation in FPGA evaluation boards
[*updated 19.02.2018*]

Recommended or required reading:
Oppenheim, A. V.; Schafer, R. W.: Zeitdiskrete Signalverarbeitung, Oldenbourg Verlag, 1999
Stearns, S.D.; Hush D.R.: Digitale Vararbeitung analoger Signale, Oldenbourg, 1999
Von Grünigen, D. Ch.: Digitale Signalverarbeitung, Carl-Hanser Verlag, 2004
Kammeyer, K.-D. / Kroschel K.: Digitale Signalverarbeitung _ Filterung und Spektralanalyse, Teubner
Goetz, H.: Einführung in die digitale Signalverarbeitung, Teubner Verlag, 1998
Werner, M.: Digitale Signalverarbeitung mit Matlab, Intensivkurs mit 16 Versuchen, Vieweg, 2006
Brigham, E.O.: FFT Anwendungen, Oldenbourg, 1997
[*updated 19.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

Distributed Systems 1

Module name (EN): Distributed Systems 1
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI410
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 4
Semester: 4
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: KI410 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 4, mandatory course Suitable for exchange students (learning agreement)
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI200 Programming 2 KI320 Computer Networks [*updated 15.09.2017*]

Recommended as prerequisite for:
KI510 Distributed Systems 2
KI604
KI699 Cloud Computing
[*updated 15.09.2017*]

Module coordinator:
Prof. Dr. Markus Esch

Lecturer:
Prof. Dr. Reiner Güttler
Dipl.-Ing. Michael Sauer (practical training)
[*updated 20.06.2013*]

Learning outcomes:
Topics covered in this course include: Significance and complexity of distributed systems especially at the application level; Understanding the problem of integration; What are client/server systems?; Understanding the importance of protocol definition and software architecture at the application level.; Technical infrastructure (TCP/IP) with special focus on the program interface; Tools based on transport protocol.
[*updated 13.03.2007*]

Module content:
1. Approximately ten example applications including discussion of their distributedness
2. The client/server principle (iterative servers, parallel servers, communication)
3. Integration (heterogeneity, dynamics, autonomy)
4. Analysis of the technical infrastructure (TCP/IP)
5. The TCP/IP programming interface including programming exercises
6. Tools with fixed functionality (ftp, remote login, remote shell, etc.)
7. Programming tools (RPC, RMI, CORBA)
8. Software architecture for distributed applications (introduction)

[*updated 13.03.2007*]

Recommended or required reading:
COMER D., Computernetzwerke und Internets, Prentice Hall
STEVENS R., UNIX Networks Programming, Prentice Hall
HENNEKEUSER J., PETER G., Rechnerkommunikation für Anwender, Springer
[*updated 13.03.2007*]

Module offered in:
SS 2018, SS 2017, SS 2016, SS 2015, SS 2014, ...

Distributed Systems 2

Module name (EN): Distributed Systems 2
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI510
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 4
Semester: 5
Mandatory course: yes
Language of instruction: German
Assessment: Graded project work + presentation
Curricular relevance: KI510 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, mandatory course PIBWI15 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI410 Distributed Systems 1 [*updated 01.04.2003*]
Recommended as prerequisite for: KI699 Cloud Computing [*updated 15.09.2017*]

Module coordinator:
Prof. Dr. Reiner Güttler

Lecturer:
Prof. Dr. Reiner Güttler
[*updated 01.04.2003*]

Learning outcomes:
This course offers students the opportunity to carry out a complete software project (client-server application). Particular emphasis is placed on team work and the project management skills needed in software development projects.
[*updated 13.03.2007*]

Module content:
1. Introduction to the basic techniques of distributed application systems
    - CORBA
    - SOAP
    - XML
    - JDBC

2. Developing a client/server application with associated project planning
    - Development stages
    - Project schedule
    - Documentation

3. Project acceptance
4. Presentation to the group
[*updated 08.05.2008*]

Recommended or required reading:
COMER D.: Computernetzwerke und Internets, Prentice Hall
STEVENS R.: UNIX Networks Programming, Prentice Hall
[*updated 08.05.2008*]

Module offered in:
WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, ...

English 1

Module name (EN): English 1
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI190
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 1
Mandatory course: yes
Language of instruction: English
Assessment: 120-minute written exam
Curricular relevance: KI190 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 1, mandatory course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for: KI290 English 2 KI584 Information Retrieval KI598 Game Design and Development KI606 "Engineering Visions" Intensive Program [*updated 18.03.2015*]

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Marina Hefti, M.A.
[*updated 01.04.2003*]

Learning outcomes:
The students, who have widely varying levels of language proficiency, will be introduced to those aspects of the language that are of relevance to their future careers. This will require repetition and extension of a students existing language skills. Building on this foundation, students will practice career-related situations such as telephoning, making arrangements and other general communicative skills. The main focus of the course is on improving the students oral expression and listening comprehension. Parallel to this, the course aims to expand the students technical vocabulary and to acquaint them with those aspects of business English required by todays engineers. Before taking this course, students should have acquired English language proficiency equivalent to Level B1 (Threshold) of the Common European Framework, corresponding to the language skills of those who have attained a German intermediate school leaving certificate (mittlerer Bildungsabschluss / Realschulabschluss).
[*updated 13.03.2007*]

Module content:
1. Communicating in English: Socializing and telephoning
1.1......Introducing yourself and others
1.2......Speaking about yourself (education, vocational training, studying, etc.)

1.3......Small talk
1.4......Communicating on the phone: arranging an appointment, travel arrangements, getting information, etc.

2. Grammar and vocabulary
2.1......Repetition of basic grammatical structures
2.2......Basic vocabulary
3. Presentation of multimedia language teaching and learning software

[*updated 13.03.2007*]

Recommended or required reading:
A list of recommended texts for the three compulsory courses will be issued.
[*updated 13.03.2007*]

Module offered in:
WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, WS 2012/13, ...

English 2

Module name (EN): English 2
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI290
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 2
Mandatory course: yes
Language of instruction: English
Assessment: 120-minute written exam
Curricular relevance: KI290 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 2, mandatory course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI190 English 1 [*updated 01.04.2003*]

Recommended as prerequisite for:
KI390 English 3
KI584 Information Retrieval
KI598 Game Design and Development
KI606 "Engineering Visions" Intensive Program
[*updated 18.03.2015*]

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Marina Hefti, M.A.
[*updated 01.04.2003*]

Learning outcomes:
English 2 builds on the skills and knowledge acquired in the module English 1. As the students will now have approximately the same level of language proficiency, this module focuses on improving their speaking, writing and listening skills. During this module, the students will concentrate on written correspondence and on enhancing their proficiency in oral communication.
[*updated 13.03.2007*]

Module content:
1. Business correspondence:
   Business letters (requests for information, replies, letters of complaint, etc.)
   Fax and e-mail
2. Oral communication
   Telephoning II
   Presentations: Introduction to the structure and vocabulary of presentations
3. Grammar and vocabulary
   Deepening and broadening of basic grammar and vocabulary topics

[*updated 13.03.2007*]

Recommended or required reading:
A list of recommended texts for the three compulsory courses will be issued.
[*updated 13.03.2007*]

Module offered in:
SS 2017, SS 2016, SS 2015, SS 2014, SS 2013, ...

English 3

Module name (EN): English 3
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI390
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 3
Mandatory course: yes
Language of instruction: English
Assessment: 120-minute written exam
Curricular relevance: KI390 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 3, mandatory course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI290 English 2 [*updated 01.04.2003*]
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Christine Sick

Lecturer:
Marina Hefti, M.A.
[*updated 01.04.2003*]

Learning outcomes:
Students will build on what they learned in the modules English 1 and 2 and will study areas relevant to them in their later careers. English 3 focuses on writing skills for job applications and acquiring the communicative skills needed for job interviews. Students will also be required to prepare and hold short presentations. After completing this module, students should have reached a proficiency in vocational English equivalent to Level B2 (Vantage) of the Common European Framework.
[*updated 13.03.2007*]

Module content:
1. Job applications: CV/résumé, letter of application, job interview
2. Presentations II: Presenting technical topics
3. Grammar and vocabulary: More advanced treatment of selected basic topics to meet specific student needs
[*updated 13.03.2007*]

Recommended or required reading:
A list of recommended texts for the three compulsory courses will be issued.
[*updated 13.03.2007*]

Module offered in:
WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, ...

Informatics 1

Module name (EN): Informatics 1
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI110
Hours per semester week / Teaching method: 3V+1U (4 hours per week)
ECTS credits: 5
Semester: 1
Mandatory course: yes
Language of instruction: German
Assessment: Written exam
Curricular relevance: KI110 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 1, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:
KI210 Informatics 2
KI575 Machine Learning
KI579 Simulation of Discrete Systems with AnyLogic
KI584 Information Retrieval
KI590 Work Experience Phase
KI593 Introduction to Parallel Programming with CUDA
KI691
[*updated 11.10.2017*]

Module coordinator:
Prof. Dr. Damian Weber

Lecturer:
Prof. Dr. Damian Weber
Dipl.-Inform. Marion Bohr
Sarah Theobald, M.Sc.
[*updated 15.01.2016*]

Learning outcomes:
Students will be taught the elementary operations that a computer can perform. Students will learn how to structure simple algorithmic problems, develop suitable data structures for solving specific problems, specify the solution in terms of an algorithm and estimate the computational effort associated with a particular solution.

The problem-solving sessions are used to teach students the requisite problem-solving techniques.

[*updated 13.03.2007*]

Module content:
1. Mathematical basics
1.1......Sets and relations
1.2......Number systems
1.3......Boolean algebra
2. A model of a computing system (random-access machine)
3. Algorithms
3.1......Data types and variables
3.2......Control structures
3.3......Runtime
3.4......Data structures
3.5......Sorting algorithms
[*updated 13.03.2007*]

Recommended or required reading:
CORMEN T., LEISERSON, C., RIVEST R., STEIN, C.:, Introduction to Algorithms, Second Edition
[*updated 13.03.2007*]

Module offered in:
WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, WS 2012/13, ...

Informatics 2

Module name (EN): Informatics 2
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI210
Hours per semester week / Teaching method: 3V+1U (4 hours per week)
ECTS credits: 5
Semester: 2
Mandatory course: yes
Language of instruction: German
Assessment: Written exam
Curricular relevance: KI210 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 2, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI100 Programming 1 KI110 Informatics 1 KI160 Mathematics 1 [*updated 11.10.2017*]

Recommended as prerequisite for:
KI300 Software Engineering 1
KI320 Computer Networks
KI420 Operating Systems
KI579 Simulation of Discrete Systems with AnyLogic
KI590 Work Experience Phase
KI675 Compiler Design
KI691
[*updated 22.01.2018*]

Module coordinator:
Prof. Dr. Damian Weber

Lecturer:
Prof. Dr. Damian Weber
Dipl.-Inform. Marion Bohr
Sarah Theobald, M.Sc.
[*updated 11.10.2017*]

Learning outcomes:
After completing this course, students will be able to use algorithms to solve graph problems. The solutions will involve the knowledge and methods learned in the module Informatics 1. Students will acquire the skills necessary to analyse algorithms.

They will also learn how to represent a real practical problem as graph problem and thus generate a solution to the original problem from the solution to the underlying graph problem.

In addition, the course will provide an intuitive introduction to important complexity classes as the basis for understanding the algorithmic solvability of problems. By analysing the resource consumption of algorithms, students will be able to decide whether there is an efficient, exact or heuristic method for solving a specific problem.
[*updated 13.03.2007*]

Module content:
1. Graphs
1.1......Data structures
1.2......Algorithms
1.3......Automata theory and formal languages
2. Problem-solving techniques
2.1......Recursion
2.2......Dynamic programming
2.3......Greedy algorithms
3. Computability and complexity theory
[*updated 06.05.2007*]

Recommended or required reading:
CORMEN T., LEISERSON, C., RIVEST R., STEIN, C.: Introduction to Algorithms, Second Edition.
[*updated 13.03.2007*]

Module offered in:
SS 2017, SS 2016, SS 2015, SS 2014, SS 2013, ...

Internet Technologies

Module name (EN): Internet Technologies

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI500

Hours per semester week / Teaching method: 2V+2P (4 hours per week)

ECTS credits: 4

Semester: 5

Mandatory course: yes

Language of instruction:
German

Assessment:
Graded project work + presentation

Curricular relevance:
DFBI-347 Computer Science and Web Engineering, Bachelor, ASPO 01.10.2018, semester 3, optional course, informatics specific
KI500 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, mandatory course
PIBWI30 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI320 Computer Networks
KI400 Software Engineering 2
KI420 Operating Systems
KI430 System Management and Security
[*updated 07.07.2014*]

Recommended as prerequisite for:
KI665 .NET Concepts and Tools
[*updated 10.02.2017*]

Module coordinator:
Prof. Dr. Martina Lehser

Lecturer:
Prof. Dr. Martina Lehser
Thomas Beckert, M.Sc.
[*updated 07.07.2014*]

Lab:
Communication Systems Lab (5204)

Learning outcomes:
This course aims to acquaint students with the fundamental concepts and technologies used in the internet and related applications. Particular focus is placed on the suitability and applicability of these technologies in developing web-based information systems. Students will tackle a relatively large project to create an internet application and the experience gained will enable them to use appropriate software tools to design and implement larger, more complex internet applications.
[*updated 08.05.2008*]

Module content:
1. Internet application basics
2. Hypertext and hypermedia
3. XML fundamentals
4. Client-side page generation
5. Server-side page generation
6. CGI, Servlets, JavaServer Pages
7. Database interfacing

[*updated 08.05.2008*]

Recommended or required reading:
D. Comer: Computernetzwerke und Internets, Pearson Studium 2004
A. Eberhart, S. Fischer: Web Services, Hanser 2003
O. Avci et al.: Web-Programmierung, Vieweg 2003
S. Niedermeier: Cocoon 2 und Tomcat, Galileo 2006
B. Daum et al.: Web-Entwicklung mit Eclipse, dpunkt 2005
M. Hall: Core Servlets und JavaServer Pages, Sun - M&T 2003
V. Turau: JavaServer Pages und J2EE, dpunkt-Verlag 2001
V. Turau: Web-basierte Anwendungen mit JSP 2, dpunkt-Verlag 2004
[*updated 08.05.2008*]

Module offered in:
WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, ...

Laboratory Course in Information and Communication

Module name (EN): Laboratory Course in Information and Communication
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI600
Hours per semester week / Teaching method: 8P (8 hours per week)
ECTS credits: 9
Semester: 6
Mandatory course: yes
Language of instruction: German
Assessment:
Curricular relevance: KI600 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, mandatory course
Workload: 120 class hours (= 90 clock hours) over a 15-week period. The total student study time is 270 hours (equivalent to 9 ECTS credits). There are therefore 180 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI300 Software Engineering 1 KI430 System Management and Security KI450 Communications Technology and Systems 1 KI570 Protocols [*updated 01.04.2003*]
Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Damian Weber

Lecturer:
Prof. Dr. Damian Weber
Prof. Dr. Horst Wieker
Dipl.-Inform. Marion Bohr
[*updated 01.04.2003*]

Learning outcomes:
Students taking this lab course will gain practical experience in solving both IT-related problems (algorithms, software development, TCP/IP) and telecommunications-specific exercises (protocol analysis, No. 7 interface, TMN/SDH).
[*updated 13.03.2007*]

Module content:
Students work in small groups to develop solutions to IT- and telecommunications-specific problems.
[*updated 13.03.2007*]

Recommended or required reading:
Background literature relevant to specific problems will be announced during the course.
[*updated 13.03.2007*]

Module offered in:
SS 2020, SS 2019, SS 2018, SS 2017, SS 2016, ...

Mathematics 1

Module name (EN): Mathematics 1
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI160
Hours per semester week / Teaching method: 4V+2U (6 hours per week)
ECTS credits: 8
Semester: 1
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: KI160 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 1, mandatory course
Workload: 90 class hours (= 67.5 clock hours) over a 15-week period. The total student study time is 240 hours (equivalent to 8 ECTS credits). There are therefore 172.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:
KI210 Informatics 2
KI260 Mathematics 2
KI560 Digital Signal Processing
KI575 Machine Learning
KI579 Simulation of Discrete Systems with AnyLogic
KI584 Information Retrieval
KI637 Mathematical Software Systems and Algorithmic Applications
KI672 Numerical Software
KI676 Computer Graphics
KI691
KI692 Computer Vision
KI693
[*updated 11.10.2017*]

Module coordinator:
Prof. Dr. Rainer Lenz

Lecturer:
Prof. Dr. Barbara Grabowski
Prof. Dr. Rainer Lenz
Dipl.-Ing. Dirk Ammon (exercise)
[*updated 06.10.2010*]

Learning outcomes:
After completing this course, students will be have acquired an understanding of vector calculus, systems of linear equations and the fundamentals of analysis.
[*updated 13.03.2007*]

Module content:
1. Vector calculus
1.1......Basic terminology of vector calculus
1.2......Vectors in an orthogonal coordinate system
1.3......The scalar product
1.4......The vector product
2. Systems of linear equations
2.1......Matrices
2.2......Determinants
2.3......Systems of linear equations
3. Fundamentals of analysis
3.1......Functions
3.2......Special functions
3.3......Complex numbers and functions
3.4......Loci
[*updated 13.03.2007*]

Recommended or required reading:
PAPULA L., Mathematik für Ingenieure und Naturwissenschaftler, Vieweg, 2000
PAPULA L., Mathematische Formelsammlung für Ingenieure und Naturwissenschaftler, Vieweg, 2000
BRONSTEJN I., MUSIOL G., MÜHLIG H., Taschenbuch der Mathematik, Deutsch, 2000
[*updated 13.03.2007*]

Module offered in:
WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, WS 2012/13, ...

Mathematics 2

Module name (EN): Mathematics 2
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI260
Hours per semester week / Teaching method: 4V+2U (6 hours per week)
ECTS credits: 8
Semester: 2
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: KI260 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 2, mandatory course
Workload: 90 class hours (= 67.5 clock hours) over a 15-week period. The total student study time is 240 hours (equivalent to 8 ECTS credits). There are therefore 172.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI160 Mathematics 1 [*updated 01.04.2003*]

Recommended as prerequisite for:
KI360 Mathematics 3
KI430 System Management and Security
KI560 Digital Signal Processing
KI575 Machine Learning
KI579 Simulation of Discrete Systems with AnyLogic
KI584 Information Retrieval
KI637 Mathematical Software Systems and Algorithmic Applications
KI672 Numerical Software
KI676 Computer Graphics
KI691
KI692 Computer Vision
KI693
[*updated 02.03.2017*]

Module coordinator:
Prof. Dr. Rainer Lenz

Lecturer:
Prof. Dr. Barbara Grabowski
Prof. Dr. Rainer Lenz
Dipl.-Ing. Dirk Ammon (exercise)
[*updated 06.10.2010*]

Learning outcomes:
After completing this course, students will be have acquired an understanding of differential calculus, integral calculus and infinite series.
[*updated 13.03.2007*]

Module content:
1. Differential calculus
1.1......The concept of derivative
1.2......Basic rules of differentiation
1.3......Derivatives of elementary functions
1.4......The differential of a function
1.5......The mean value theorem of differential calculus
1.6......Computing boundary values
2. Integral calculus
2.1......Indefinite integrals
2.2......Definite integrals
2.3......The application of integral calculus in geometry
2.4......Techniques of integration
2.5......Applications of integral calculus
2.6......Numerical integration
2.7......Improper integrals
3. Infinite series
3.1......Series with constant terms
3.2......Sequences and series of functions
3.3......Power series
3.4......Taylor series
3.5......Fourier series
4. Differential equations
[*updated 13.03.2007*]

Recommended or required reading:
PAPULA L., Mathematik für Ingenieure und Naturwissenschaftler, Vieweg, 2000
PAPULA L., Mathematische Formelsammlung für Ingenieure und Naturwissenschaftler, Vieweg, 2000
BRONSTEJN I., MUSIOL G., MÜHLIG H., Taschenbuch der Mathematik, Deutsch, 2000
[*updated 13.03.2007*]

Module offered in:
SS 2017, SS 2016, SS 2015, SS 2014, SS 2013, ...

Mathematics 3

Module name (EN): Mathematics 3

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI360

Hours per semester week / Teaching method: 3V+1U (4 hours per week)

ECTS credits: 5

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Ninety-minute written exam

Curricular relevance:
KI360 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 3, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI260 Mathematics 2
[*updated 01.04.2003*]

Recommended as prerequisite for:
KI560 Digital Signal Processing
KI575 Machine Learning
KI584 Information Retrieval
KI605
KI691
KI692 Computer Vision
KI693
[*updated 02.03.2017*]

Module coordinator:
Prof. Dr. Barbara Grabowski

Lecturer:
Prof. Dr. Barbara Grabowski
[*updated 01.04.2003*]

Lab:
Applied Mathematics, Statistics, and eLearning (5306)

Learning outcomes:
After completing this course, students will be have acquired an understanding of Fourier and Laplace transformations and of functions of several independent variables.
[*updated 13.03.2007*]

Module content:
1. Fourier and Laplace transformations
1.1......The Fourier transformation
1.2......The Laplace transformation
1.3......Back transformation methods
1.4......Applications
2. Functions with several independent variables
2.1......n-dimensional space
2.2......Multivariate functions
2.3......Differential calculus
2.4......Multiple integrals
[*updated 13.03.2007*]

Recommended or required reading:
PAPULA L., Mathematik für Ingenieure und Naturwissenschaftler, Vieweg, 2000
PAPULA L., Mathematische Formelsammlung für Ingenieure und Naturwissenschaftler, Vieweg, 2000
BRONSTEJN I., MUSIOL G., MÜHLIG H., Taschenbuch der Mathematik, Deutsch, 2000
[*updated 13.03.2007*]

Module offered in:
WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, ...

Microprocessor Systems

Module name (EN): Microprocessor Systems
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI460
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 4
Mandatory course: yes
Language of instruction: German
Assessment: Klausur 120 min.
Curricular relevance: KI460 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 4, mandatory course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI370 Digital Electronics [*updated 17.06.2015*]
Recommended as prerequisite for: KI669 Real-Time Operating Systems [*updated 01.02.2007*]

Module coordinator:
Prof. Dr.-Ing. Jürgen Schäfer

Lecturer:
Prof. Dr.-Ing. Jürgen Schäfer
[*updated 01.04.2003*]

Learning outcomes:
Students will acquire a detailed understanding of the use of microprocessors in telecommunications. An important element in this course is the relationship between hardware design and its subsequent implementation. To illustrate the principles involved, students will study the design of an access unit of the type typically found in embedded systems. A particular aim of this course is to teach students about the different (telecommunication and microprocessor) clock systems.
[*updated 13.03.2007*]

Module content:
1. General structure of a telecommunications system
2. Application of microprocessors as illustrated by a controller unit in an optical network

3. Structure and functionality of a microprocessor
4. Structure of PCM-30 systems
5. Use of HDLC controllers
6. Integration of memory time switch devices (interface components)
7. ISDN chipset (Basic Access) / POTS (analogue telephone)
8. Interrelationship between HW and SW architectures
9. Telecommunications software in detail
10. Bus applications in telecommunications systems
12. Dual-clock systems (microprocessor, PCM)
[*updated 13.03.2007*]

Recommended or required reading:
SCHIEF R., Einführung in die Mikroprozessoren und Mikrocomputer, Attempto, 1997

SCHMITT G., Mikrocomputertechnik mit 8086-Prozessoren, Oldenburg
[*updated 13.03.2007*]

Module offered in:
SS 2018, SS 2017, SS 2016, SS 2015, SS 2014, ...

Operating Systems

Module name (EN): Operating Systems
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI420
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 4
Semester: 4
Mandatory course: yes
Language of instruction: German
Assessment: Written examination 90 min.
Curricular relevance: DFBI-422 Computer Science and Web Engineering, Bachelor, ASPO 01.10.2018, semester 4, mandatory course KI420 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 4, mandatory course PIB410 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 4, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI210 Informatics 2 [*updated 01.04.2003*]

Recommended as prerequisite for:
KI500 Internet Technologies
KI593 Introduction to Parallel Programming with CUDA
KI633
KI669 Real-Time Operating Systems
KI679
KI690 IT Forensics
KI699 Cloud Computing
[*updated 15.09.2017*]

Module coordinator:
Prof. Dr. Martina Lehser

Lecturer:
Prof. Dr. Martina Lehser
[*updated 01.04.2003*]

Learning outcomes:
Students will acquire an understanding of the typical structures and principles underlying computer operating systems and will learn about alternative development strategies. The course also covers resource management strategies and inter-process communication mechanisms. After completing this course, students will be able to apply the knowledge acquired in this course to real-time operating systems and their scheduling procedures.
[*updated 08.05.2008*]

Module content:
1. Introduction, history, operating system tasks, design concepts
2. Processes, interprocess communication, competing processes
3. Process scheduling, deadlocks
4. Memory management
5. File systems
6. Fundamental principles of real-time operating systems
[*updated 13.03.2007*]

Recommended or required reading:
A. Tanenbaum, A. Woodhull: Operating Systems Design and Implementation, Prentice Hall, 2006
P. Marwedel: Eingebettete Systeme, Springer 2007
A. Tanenbaum: Moderne Betriebssysteme, Pearson Studium 2002
R. Brause: Betriebssysteme, Springer 2004
A. Silberschatz et al.: Operating System Concepts, Wiley, 2005
W. Stallings: Operating Systems, Pearson 2005
E. Ehses et al.: Betriebssysteme, Pearson 2005
E. Glatz: Betriebssyteme, dpunkt 2006
[*updated 08.05.2008*]

Module offered in:
SS 2018, SS 2017, SS 2016, SS 2015, SS 2014, ...

Oral Presentation Skills

Module name (EN): Oral Presentation Skills
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI520
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: yes
Language of instruction: German
Assessment: Final student presentation (approx. 20 min.)
Curricular relevance: KI520 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, mandatory course MST.RPR Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, optional course, non-technical MST.RPR Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, optional course, non-technical MST.RPR Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, optional course, non-technical
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:

Module coordinator:
Dr. Peter Ludwig

Lecturer:
Dr. Peter Ludwig
[*updated 01.04.2003*]

Learning outcomes:
The aim of this course is broaden, deepen and consolidate the students skills in the following areas:

- Finding and strengthening your personal style of communication
- Developing and strengthening your own rhetorical skills
- Structuring and coordinating information
- Assessing communication partners and communicative situations
- Giving and receiving feedback
- Deploying presentation techniques effectively

[*updated 13.03.2007*]

Module content:
1. Communication concepts
2. Elocution and oratory
3. Reading aloud, breathing and pitch exercises, speaking freely
4. Organizational preparation, gathering materials, written preparation
5. Intonation
6. Verbal thought
7. The beginning and end, phraseology and style (part 1)
8. Phraseology and style (part 2)
9. Visualization
10. Argumentation, figures of speech, agreement, slip-ups, communication
11. Telephoning, asking questions, negotiating and selling
12. Discussions, group moderation, meetings
13. Handling and resolving conflicts

[*updated 13.03.2007*]

Recommended or required reading:
SCHULZ VON THUN F., Miteinander reden Bd. 1 ... 3, Rowohlt, 1981
SCHULZ VON THUN F., RUPPEL J., STRATMANN R., Miteinander reden. Kommunikationspsychologie für Führungskräfte, Rowohlt, 1981
WATZLAWICK P., BEAVIN J.H., JACKSON D.D., Menschliche Kommunikation. Formen, Störungen, Paradoxien, Huber, 2000
[*updated 13.03.2007*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

Physical and Technical Foundations of IT 1

Module name (EN): Physical and Technical Foundations of IT 1
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI120
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 5
Semester: 1
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: KI120 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 1, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for: KI220 Physical and Technical Foundations of IT 2 KI576 KI590 Work Experience Phase [*updated 13.02.2017*]

Module coordinator:
Prof. Dr. Horst Wieker

Lecturer:
Prof. Dr. Horst Wieker
Dipl.-Ing. Harald Krauss
[*updated 01.04.2003*]

Learning outcomes:
This course of lectures introduces students to the physical and technical foundations necessary for understanding electrical engineering processes in information technology systems. The course aims to teach the basic information, ideas and applications that are important to understanding the fundamentals of electrical engineering and electronics.
[*updated 13.03.2007*]

Module content:
1. Fundamentals of electrical engineering
1.1......Electric charge
1.2......Electric current
1.3......Voltage
1.4......Resistance (DC and AC resistance)
1.5......The electric field
1.6......The magnetic field
1.7......Power and energy
1.8......Theory of direct current systems
1.9......Theory of alternating current systems

2. Fundamentals of electronics
2.1......Semiconductor components
2.2......Mechanisms of current conduction
2.3......The pn-junction
2.4......Diodes
2.5......Transistors
2.6......Basic circuits
[*updated 13.03.2007*]

Recommended or required reading:
To be announced during the course.
[*updated 13.03.2007*]

Module offered in:
WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, WS 2012/13, ...

Physical and Technical Foundations of IT 2

Module name (EN): Physical and Technical Foundations of IT 2

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI220

Hours per semester week / Teaching method: 4V (4 hours per week)

ECTS credits: 5

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Ninety-minute written exam

Curricular relevance:
KI220 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI120 Physical and Technical Foundations of IT 1
[*updated 01.04.2003*]

Recommended as prerequisite for:
KI576
KI590 Work Experience Phase
KI608 Semiconductor Technology and Production
KI667 Integration Compatible Circuitry
[*updated 13.02.2017*]

Module coordinator:
Prof. Dr. Horst Wieker

Lecturer:
Prof. Dr. Horst Wieker
Dipl.-Ing. Harald Krauss
[*updated 01.04.2003*]

Learning outcomes:
This module aims to broaden the knowledge acquired in the first part of the course (KI120) by teaching students about the physical and technical foundations of digital and analogue telecommunication and signal-transmission systems used in information technology.
[*updated 13.03.2007*]

Module content:
1. Introduction to information and communications technology
2. Signal levels and transmission media
3. Interference and distortion
4. Filters
5. Oscillators
6. Amplifiers
7. Electroacoustic transducers/memory
8. Modulation
9. Wave propagation and receiver systems
10. Data and networks

[*updated 13.03.2007*]

Recommended or required reading:
To be announced during the course.

[*updated 13.03.2007*]

Module offered in:
SS 2017, SS 2016, SS 2015, SS 2014, SS 2013, ...

Programming 1

Module name (EN): Programming 1
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI100
Hours per semester week / Teaching method: 4V+2P (6 hours per week)
ECTS credits: 8
Semester: 1
Mandatory course: yes
Language of instruction: German
Assessment: Written exam
Curricular relevance: KI100 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 1, mandatory course
Workload: 90 class hours (= 67.5 clock hours) over a 15-week period. The total student study time is 240 hours (equivalent to 8 ECTS credits). There are therefore 172.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:
KI200 Programming 2
KI210 Informatics 2
KI568
KI576
KI579 Simulation of Discrete Systems with AnyLogic
KI581 Internet Development with Java 1
KI584 Information Retrieval
KI590 Work Experience Phase
KI593 Introduction to Parallel Programming with CUDA
KI598 Game Design and Development
KI603 GUI Programming with Qt
KI615 Portal Components in JAVA
KI675 Compiler Design
KI678 Embedded Computing
KI680 Ruby on Rails
KI691
KI696 Sino-German Student Club for Smart Sensors
[*updated 30.03.2018*]

Module coordinator:
Prof. Dr. Martina Lehser

Lecturer:
Prof. Dr. Martina Lehser (lecture)
Dipl.-Inform. Marion Bohr (practical training)
Dipl.-Ing. Michael Sauer (practical training)
[*updated 14.02.2012*]

Lab:
Communication Systems Lab (5204)

Learning outcomes:
After completing this course, students will be able to explain the concepts of procedural programming and data abstraction and implement them using the object-oriented programming language C++. Students will be able to apply standard program design methods to develop solutions. Having developed an understanding of programming techniques, students will be in a position to write well-structured and well-documented programs using basic software development tools. The lab course provides students with an opportunity to learn how to present their programs and the underlying solution design.
[*updated 13.03.2007*]

Module content:
1. Procedural programming / Data abstraction: Fundamental data types, operators, control structures, functions, pointers and arrays, scope and lifetime of objects, classes

2. Design methods: Program flow charts, structure diagrams, UML class diagrams

3. Programming techniques: Modularization, separation of interface and implementation, data structures and algorithms

4. Software development tools: Preprocessors, compilers, linkers, shells, shell scripts, makefiles, debuggers

[*updated 13.03.2007*]

Recommended or required reading:
Reference books
- Kernighan, Ritchie: Programmieren in C, Carl Hanser Verlag 1988, ISBN 3-446-15497-3
- Stroustrup, B.: Die C++ Programmiersprache, 4. aktualisierte Auflage, Addison-Wesley 2000, ISBN 3-8273-1660-X

Textbooks and workbooks
- May, Dietrich: Grundkurs Software-Entwicklung mit C++, Vieweg 2003, ISBN 3-528-05859-5
- Prinz, P., Kirch-Prinz, U.: C++ Lernen und professionell anwenden, MITP-Verlag 1999, ISBN 3-8266-0423-7
- Prinz, P., Kirch-Prinz, U.: C++, Das Übungsbuch, MITP-Verlag 2004
- Erlenkötter, H.: C++, Objektorientiertes Programmieren von Anfang an, rororo 2000, ISBN 3-499-60077-3

Lecture notes
- Brocks, R.: Lecture notes
- Folz, H.G.: Programmiersprachen 1, Einführung in C++, Course notes WS 1999/2000, HTW des Saarlandes
- Folz, H.G.: Programmiersprachen 2, Objektorientierte Softwareentwicklung mit C++, Course notes SS 2000, HTW des Saarlandes
[*updated 13.03.2007*]

Module offered in:
WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, WS 2012/13, ...

Programming 2

Module name (EN): Programming 2

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI200

Hours per semester week / Teaching method: 4V+2P (6 hours per week)

ECTS credits: 8

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
KI200 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 2, mandatory course

Workload:
90 class hours (= 67.5 clock hours) over a 15-week period.
The total student study time is 240 hours (equivalent to 8 ECTS credits).
There are therefore 172.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI100 Programming 1
[*updated 26.07.2012*]

Recommended as prerequisite for:
KI320 Computer Networks
KI410 Distributed Systems 1
KI579 Simulation of Discrete Systems with AnyLogic
KI581 Internet Development with Java 1
KI584 Information Retrieval
KI588
KI590 Work Experience Phase
KI598 Game Design and Development
KI603 GUI Programming with Qt
KI615 Portal Components in JAVA
KI619 Enterprise Java Beans
KI665 .NET Concepts and Tools
KI675 Compiler Design
KI680 Ruby on Rails
KI691
[*updated 22.01.2018*]

Module coordinator:
Prof. Dr. Helmut Folz

Lecturer:
Prof. Dr. Helmut Folz (lecture)
Dipl.-Inform. Marion Bohr (practical training)
[*updated 14.02.2012*]

Lab:
Communication Systems Lab (5204)

Learning outcomes:
In this course, students will be able to consolidate their understanding of procedural programming and data abstraction acquired in the earlier course KI100. They will be able to apply the basic concepts of object-oriented and generic programming in C++ and use the description language UML (Unified Modelling Language) for designing small projects. In the lab course, students will make more extensive use of basic software development tools and will learn to present programs and the concepts underlying a particular software solution.
[*updated 13.03.2007*]

Module content:
- Object-oriented and generic programming: Overloading operators, inheritance, exception handling, templates, strings, streams, standard template library
- Design methods: UML class diagrams, UML sequence diagrams
- Programming techniques and design patterns: e.g. Singleton, Wrapper, Visitor, Command
- Software development tools: Integrated development environment, UML Design Tool, version management, software documentation
[*updated 10.03.2010*]

Recommended or required reading:
Reference books
- Kernighan, Ritchie: Programmieren in C, Carl Hanser Verlag 1988, ISBN 3-446-15497-3
- Stroustrup, B.: Die C++ Programmiersprache, 4. aktualisierte Auflage, Addison-Wesley 2000, ISBN 3-8273-1660-X
Textbooks and workbooks
- May, Dietrich: Grundkurs Software-Entwicklung mit C++, Vieweg 2003, ISBN 3-528-05859-5
- U. Breymann: Die C++ Standard Template Library, Addison-Wesley 1996, ISBN 3-8273-1067-9
- Prinz, P., Kirch-Prinz, U.: C++ Lernen und professionell anwenden, MITP-Verlag 1999, ISBN 3-8266-0423-7
- Prinz, P., Kirch-Prinz, U.: C++, Das Übungsbuch, MITP-Verlag 2004
- Erlenkötter, H.: C++, Objektorientiertes Programmieren von Anfang an, rororo 2000, ISBN 3-499-60077-3

Lecture notes
- Brocks, R.: Lecture notes
- Folz, H.G.: Programmiersprachen 1, Einführung in C++, course notes WS 1999/2000, HTW des Saarlandes
- Folz, H.G.: Programmiersprachen 2, Objektorientierte Softwareentwicklung mit C++, course notes SS 2000, HTW des Saarlandes
[*updated 13.03.2007*]

Module offered in:
SS 2017, SS 2016, SS 2015, SS 2014, SS 2013, ...

Protocols

Module name (EN): Protocols
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI570
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 4
Semester: 5
Mandatory course: yes
Language of instruction: German
Assessment: Ninety-minute written exam
Curricular relevance: KI570 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for: KI600 Laboratory Course in Information and Communication KI629 [*updated 22.01.2012*]

Module coordinator:
Prof. Dr. Horst Wieker

Lecturer:
Prof. Dr. Horst Wieker
[*updated 30.06.2017*]

Learning outcomes:
This course aims to provide students with a thorough understanding of communication protocols. Students will acquire an understanding of the structure of interfaces and related protocols. Particular attention will be given to teaching the corresponding reference models. Understanding protocols is an important prerequisite for developing the protocol stacks that allow heterogeneous environments to communicate with one another.
[*updated 13.03.2007*]

Module content:
1. General principles
2. ISDN-DSS1 (EURO ISDN)
3. OSI model
4. Collision bus
5. Frame relay
6. Management No. 7, Protocols beyond the OSI model
7. Reference model for private networks (TCP/IP)
8. The ATM reference model
9. The mobile to narrow-band gateway reference model
10. H 3xx standards
[*updated 13.03.2007*]

Recommended or required reading:
SIGMUND G., Technik der Netze, Hüthing
BARZ H.W., Kommunikation und Computernetze, Hanser
LIENEMANN G., TCP-IP-Grundlagen, Heise
EBERSPÄCHER J., VÖGEL H.J., GSM, Global System for Mobile Communication, Teubner
ETSCHBERGER K., Controller-Area-Network, Hanser
PERLMAN R. Bridges, Router, Switches und Internetworking-Protokolle, Addison Wesley
SIKORA A., Wireless LAN, Addison Wesley
[*updated 13.03.2007*]

Module offered in:
WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, ...

Software Engineering 1

Module name (EN): Software Engineering 1
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI300
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 5
Semester: 3
Mandatory course: yes
Language of instruction: German
Assessment: 180-minute written exam
Curricular relevance: KI300 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 3, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI210 Informatics 2 [*updated 20.06.2013*]

Recommended as prerequisite for:
KI400 Software Engineering 2
KI598 Game Design and Development
KI600 Laboratory Course in Information and Communication
KI603 GUI Programming with Qt
KI681 Design Patterns
KI682
[*updated 18.04.2016*]

Module coordinator:
Prof. Dr. Helmut Folz

Lecturer:
Prof. Dr. Helmut Folz
[*updated 20.06.2013*]

Learning outcomes:
This module aims to provide students with an overview of some important software engineering topics. Students will become acquainted with both classical techniques and object-oriented approaches to software development. The main focus of the course is on object-oriented analysis and design. Students will be able to use the most important UML diagrams (Unified Modelling Language). The practical exercises serve to consolidate student understanding of UML by using an OOA/D tool to model problems of practical relevance.
[*updated 13.03.2007*]

Module content:
1. Introduction to and overview of software engineering
2. Classical approaches
2.1. The waterfall model
2.2. The spiral model
3. Object-oriented approaches
4. Unified Modelling Language
5. Concepts and notation used in object-oriented analysis
5.1. Fundamental concepts
5.2. Static concepts
5.3. Dynamic concepts
6. Object-oriented analysis
6.1. Analysis process
6.2. Analysis patterns
6.3. Static model
6.4. Dynamic model
7. Object-oriented design
7.1. Design notation
7.2. Design patterns (introduction)
7.3. Database interfacing
7.4. Three-layer architecture
[*updated 13.03.2007*]

Recommended or required reading:
BALZERT Hei., Lehrbuch der Objektmodellierung: Analyse und Entwurf, Spektrum Akademischer Verlag, 1999
BALZERT Hel., Lehrbuch der Softwaretechnik, Spektrum Akademischer Verlag Band 1 Software-Entwicklung 2. Aufl, 2000
OESTEREICH B., Objektorientierte Softwareentwicklung: Analyse und Design mit der UML, Oldenbourg, 1998
KAHLBRAND B., Software-Engineering: Objektorientierte Software-Entwicklung mit der UML, Springer, 1998
OESTERREICH, HRUSCHKA, et al., Erfolgreich mit Objektorientierung Vorgehensmodelle, Oldenbourg, 1999
BOOCH, RUMBAUGH, JACOBSON, Das UML-Benutzerhandbuch, Addison-Wesley, 1999
BOOCH G., Objektorientierte Analyse und Design, Addison-Wesley, 1994
RUMBAUGH J., Objektorientiertes Modellieren und Entwerfen, Hanser, 1993
[*updated 13.03.2007*]

Module offered in:
WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, ...

Software Engineering 2

Module name (EN): Software Engineering 2

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI400

Hours per semester week / Teaching method: 2V+2P (4 hours per week)

ECTS credits: 4

Semester: 4

Mandatory course: yes

Language of instruction:
German

Assessment:
Ninety-minute written exam

Curricular relevance:
KI400 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 4, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI300 Software Engineering 1
[*updated 18.04.2016*]

Recommended as prerequisite for:
KI500 Internet Technologies
KI581 Internet Development with Java 1
KI593 Introduction to Parallel Programming with CUDA
KI598 Game Design and Development
KI599 Mobile Application Development (Android)
KI619 Enterprise Java Beans
KI682
[*updated 20.07.2016*]

Module coordinator:
Prof. Dr. Martina Lehser

Lecturer:
Prof. Dr. Martina Lehser
Dipl.-Ing. Michael Sauer
[*updated 09.05.2016*]

Lab:
Communication Systems Lab (5204)

Learning outcomes:
This course introduces students to object-oriented programming in Java. After introducing the basic elements of the language, the course then focuses on object-oriented programming and its applications. Another key topic covered in this module is programming interactive graphical user interfaces. The theoretical knowledge acquired will be applied in practical exercises.
[*updated 13.03.2007*]

Module content:
1. Fundamentals
2. Program structure
3. Language elements
4. References
5. Inheritance
6. Exception handling
7. Input/Output
8. Interfaces
9. Dynamic data
10. Graphical user interfaces
[*updated 13.03.2007*]

Recommended or required reading:
J. Goll et al.: Java als erste Programmiersprache, Teubner 2001
H. Mössenböck: Sprechen Sie Java, dpunkt 2005
J. Nowak: Fortgeschrittene Programmierung mit Java 5, dpunkt 2005
C. Ullenboom: Java ist auch eine Insel, Galileo 2005
C. Horstmann, G. Cornell: Das core Java 5-Paket, Grundlagen und Expertenwissen, Addison-Wesley 2006
[*updated 13.03.2007*]

Module offered in:
SS 2018, SS 2017, SS 2016, SS 2015, SS 2014, ...

System Management and Security

Module name (EN): System Management and Security

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI430

Hours per semester week / Teaching method: 2V+2P (4 hours per week)

ECTS credits: 4

Semester: 4

Mandatory course: yes

Language of instruction:
German

Assessment:
Written examination 90 min.

Curricular relevance:
KI430 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 4, mandatory course
PIB423 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 4, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI260 Mathematics 2
KI320 Computer Networks
[*updated 10.04.2013*]

Recommended as prerequisite for:
KI500 Internet Technologies
KI593 Introduction to Parallel Programming with CUDA
KI600 Laboratory Course in Information and Communication
KI614 Web Security Project
KI616
KI633
KI690 IT Forensics
[*updated 09.04.2018*]

Module coordinator:
Prof. Dr. Damian Weber

Lecturer:
Prof. Dr. Damian Weber
Dipl.-Inform. Marion Bohr (practical training)
Dipl.-Ing. Michael Sauer (practical training)
[*updated 10.04.2013*]

Lab:
IT-security lab (5103/2)

Learning outcomes:
After completing this course, students will be able to act as system administrators for networked Unix systems. They will understand how to configure and operate such systems reliably. They will be able to protect the network from random errors or from deliberate hostile attacks and be able to respond to critical system states.
[*updated 08.05.2008*]

Module content:
1. The UNIX philosophy
2. Files and inodes
3. Shells
4. Processes
5. User IDs
6. File systems
7. Bootstrapping
8. The operating system kernel
9. System messages
10. Network configuration
11. Status and statistics of the system state
12. Security aspects
13. System protection
14. Local security
15. Network security

In the problem-solving sessions, students will have the opportunity to modify the operating system, the network configuration and the user management system, as well as simulating local and network attacks. The configuration of typical security measures such as firewalls and virtual private networks will be studied both theoretically and in practice, and the capabilities and limits of currently available network tools discussed and examined.
[*updated 08.05.2008*]

Recommended or required reading:
WThe FreeBSD Project: http://www.freebsd.org/
The SANS Institute: http://www.sans.org/
McCLURE, SCAMBRAY, KURTZ: Hacking Exposed, McGraw-Hill
[*updated 08.05.2008*]

Module offered in:
SS 2018, SS 2017, SS 2016, SS 2015, SS 2014, ...

Work Experience Phase

Module name (EN): Work Experience Phase

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI590

Hours per semester week / Teaching method: -

ECTS credits: 12

Semester: 4

Mandatory course: yes

Language of instruction:
German

Assessment:
Written report

Curricular relevance:
KI590 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 4, mandatory course

Workload:
The total student study time for this course is 360 hours.

Recommended prerequisites (modules):
KI100 Programming 1
KI110 Informatics 1
KI120 Physical and Technical Foundations of IT 1
KI200 Programming 2
KI210 Informatics 2
KI220 Physical and Technical Foundations of IT 2
KI320 Computer Networks
[*updated 31.05.2015*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Damian Weber

Lecturer:
Prof. Dr. Damian Weber
[*updated 31.05.2015*]

Learning outcomes:
The work experience phase offers students an opportunity to apply their theoretical knowledge to practical situations. Students will be expected to contribute to solving real problems of clearly delineated scope. The insight and experience gained during the work experience phase constitutes an important part of the overall degree programme. The work experience phase allows students to implement the knowledge acquired in lectures and applied in lab courses to solving real-world problems.
[*updated 13.03.2007*]

Module content:
Students working in a company will be assigned tasks that correspond to the work typically carried out by a information and communications engineer. As the tasks to be performed will vary depending on the company and sector, students have an opportunity to experience a broad range of relevant activities.
[*updated 13.03.2007*]

Recommended or required reading:
Depends on the specific practical topics being addressed in the project.
[*updated 13.03.2007*]

Computer Science and Communication Systems - optional courses

"Engineering Visions" Intensive Program

Module name (EN): "Engineering Visions" Intensive Program
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI606
Hours per semester week / Teaching method: 2PA+1S (3 hours per week)
ECTS credits: 4
Semester: 4
Mandatory course: no
Language of instruction: English
Assessment: Written composition with presentation

Curricular relevance:
BMT553 Biomedical Engineering, Bachelor, ASPO 01.10.2011, optional course, non-technical
KI606 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 4, optional course, non-technical
KIB-IPRE Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 4, optional course, non-technical
MAB.4.2.1.29 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 3, optional course, general subject
MST.IPE Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 4, optional course, non-technical
MST.IPE Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 4, optional course, non-technical
PIBWN68 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 4, optional course, not informatics specific
PIB-IPRE Applied Informatics, Bachelor, ASPO 01.10.2017, semester 4, optional course, not informatics specific
Suitable for exchange students (learning agreement)

Workload:
45 class hours (= 33.75 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 86.25 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI190 English 1
KI290 English 2
[*updated 25.10.2013*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Martin Löffler-Mang

Lecturer: Prof. Dr. Martin Löffler-Mang
[*updated 25.10.2013*]

Learning outcomes:
After successfully completing this module, students will be able to analyze and evaluate global challenges. They will have acquired new working techniques that will help them develop innovative and technical visions for the future. They will be familiar with the most important basic concepts of conscious communication and discussions in interdisciplinary work. They can present and document work results in an appropriate manner. In addition, students will have expanded their intercultural and foreign language skills through work in international teams.
[*updated 19.02.2018*]

Module content: Students will discuss the challenges of today´s world and develop technical visions for what they believe life on earth will be like in 10 to 50 years. In international project groups, they will develop and discuss their own technical visions from fields such as bionics, mechatronics, nanotechnology, intelligent materials, renewable energies, optical technologies and information technologies (selection) for a sustainable life on earth. [*updated 24.02.2018*]
Teaching methods/Media: The initial phase will focus on inspiring, future-oriented lectures by our speakers on technical topics of the future. The goal of these lectures is to motivate the students and inspire their conceptual work. The lectures will be accompanied by workshops on creative techniques (brainstorming, mind mapping, World Café etc.) and team building. During the main phase, students will work autonomously in groups supported by mentors (lecturers from our partner universities). At the end of each day, together with the lecturers, he students will reflect on their own results, as well as those from the other groups. The intensive program will end with a presentation and self-assessment of each group´s results in the form of a marketplace. [*updated 24.02.2018*]
Recommended or required reading: Project-related literature [*updated 19.02.2018*]
Module offered in: SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

.NET Concepts and Tools

Module name (EN): .NET Concepts and Tools
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI665
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Project work
Curricular relevance: KI665 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-NETW Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI79 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific PIB-NETW Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI200 Programming 2
KI500 Internet Technologies
[*updated 10.02.2017*]

Recommended as prerequisite for:

Module coordinator:
Thomas Beckert, M.Sc.

Lecturer:
Thomas Beckert, M.Sc.
[*updated 10.02.2017*]

Learning outcomes:
Based on the content management system Umbraco, students will acquire the ability to conceptually assess Microsoft´s .NET framework and use it for the development of web portals.

They will be able to model web applications with the ASP. NET MVC pattern.

Students will be capable of creating interactive elements with the inline script engine Razor (C#). In doing so, they will learn to extend the CMS backend. Using the SQL Management Studio, students will be able to view and modify database-driven information.

[*updated 26.02.2018*]

Module content:
1. Installing CMS Umbraco
2. .NET framework
3. MVC approach and Umbraco basics of the backend
4. Media content
5. Partial view macros
6. Grid - flexible content creation
7. Property editor
8. Umbraco API, C# and Visual Studio
9. Extending the backend
10. Database communication with PetaPoco
11. Handlers and web services in .NET
12. Search function in Umbraco
13. Multilingualism
14. Surface controller
15. Members area
16. Web application, project work/practical exercises

[*updated 26.02.2018*]

Recommended or required reading:
Will be announced in the course
[*updated 26.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

Applied Computer Science Seminar

Module name (EN): Applied Computer Science Seminar
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI594
Hours per semester week / Teaching method: 2S (2 hours per week)
ECTS credits: 3
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Presentation/discussion (obligation to attend all presentations), term paper
Curricular relevance: KI594 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical KIB-SAI Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical PIBWI47 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific PIB-SAI Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. André Miede

Lecturer: Prof. Dr.-Ing. André Miede
[*updated 05.09.2012*]

Learning outcomes:
After successfully completing this course, students will be able to describe and explain the basic forms of scientific work (literature research, argumentation). They will apply this knowledge to prepare both a scientific presentation and a seminar paper.
[*updated 19.02.2018*]

Module content:
During the course, the necessary methodical and
technical basics will first be taught and then intensified through practical exercises.
At the same time, students will be assigned their topic for the research project and then
work independently on these topics.

1. Methodological basics
 o Scientific work
 o Structuring arguments
 o Seminar lectures and presentations
2. Technical basics
 o Introduction to LaTeX
 o Reference management
 o Using templates (IEEE)
3. Seminar
 o Processing current topics according to the chosen
topic
 o Presentation of the results to the group
 o Group discussion and exchange
 o Written composition (term paper)
 o Group discussion and exchange
 o Written composition (term paper)

[*updated 19.02.2018*]

Teaching methods/Media:
Transparencies/beamer, board, coaching, homework, group discussions, student presentations, written exercises
[*updated 19.02.2018*]

Recommended or required reading:
Martin Kornmeier: Wissenschaftlich Schreiben leicht gemacht, utb, 2013.
Marcus Deininger, Horst Lichter, Jochen Ludewig, Kurt Schneider:
Student research projects: Ein Leitfaden zur Vorbereitung, Durchführung und Betreuung von Studien-, Diplom- und Doktorarbeiten am Beispiel Informatik. Teubner, 3. Auflage 1996.
Justin Zobel: Writing for Computer Science. Springer, 2. Auflage 2009.
Barbara Minto: Das Prinzip der Pyramide. Pearson Studium, 2005.
Gene Zelazny: Say it with Presentations. McGraw-Hill, 2006.
Tobias Oetiker: The Not So Short Introduction to LaTeX

[*updated 19.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

Automotive Engineering

Module name (EN): Automotive Engineering
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI620
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 3
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment:
Curricular relevance: E1614 Electrical Engineering, Bachelor, ASPO 01.10.2012, semester 6, mandatory course KI620 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-ATEC Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI33 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific PIB-ATEC Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Horst Wieker

Lecturer:
Golanov, M.Sc.
Metzner, M.Sc.
[*updated 27.03.2019*]

Learning outcomes:
After successfully completing this module, students will have developed an understanding of how information is generated and distributed within a vehicle.
Students will be able to name the advantages and disadvantages of bus systems, as well as the various fields of application
where bus systems are normally used.
In addition, students will be able to list the data typically generated in modern vehicles and the connections between this data and assistance systems. Students will be aware of the fundamental problems of automated driving and its connection with telematics systems.

Students will be capable of demonstrating the basic motivation behind Cooperative Intelligent Transports Systems (C-ITS). They will be able to
reconstruct the basic standardization use cases and explain how messages are structured using given scenarios. Students will be capable of solving routing problems by calculating the best propagation path. Lastly, they will be able to explain how information from vehicle bus systems is used in the context of automated driving.

[*updated 26.02.2018*]

Module content:
This course will give students an insight into automotive engineering and explain how data is generated and communicated in this field.

1. Overview of different bus systems, in particular CAN
2. Introduction to driver assistance systems
3. Introduction to automated driving
4. Introduction to V2X communication
5. V2X communication use cases
6. Protocols and algorithms in V2X communication

[*updated 26.02.2018*]

Teaching methods/Media:
Beamer, board
[*updated 19.02.2018*]

Recommended or required reading:
[*still undocumented*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016

Basic Principles Governing the Qualification of Trainers and Instructors in Germany’s Dual Education and Vocational Training System

Module name (EN): Basic Principles Governing the Qualification of Trainers and Instructors in Germany´s Dual Education and Vocational Training System
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI611
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Written exam

Curricular relevance:
E1582 Electrical Engineering, Bachelor, ASPO 01.10.2012, optional course
EE-K2-546 Energy system technology / Renewable energies, Bachelor, ASPO 01.04.2015, optional course, engineering
FT63 Automotive Engineering, Bachelor, ASPO 01.04.2016, semester 5, optional course, technical
FT63 Automotive Engineering, Bachelor, ASPO 01.10.2019, semester 5, optional course, technical
KI611 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical
KIB-AUSB Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical
MAB.4.2.1.20 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 4, optional course
MST.GAU Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, optional course, non-technical
MST.GAU Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, optional course, non-technical
PIBWN66 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific
PIB-AUSB Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific
MST.GAU Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, optional course, non-technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Dietmar Brück

Lecturer:
Michael Meter
[*updated 09.02.2013*]

Learning outcomes:
After successfully completing this module, students will be familiar with the legal regulations that apply to vocational training and can implement them responsibly. They will have all of the knowledge necessary for the successful completion of the instructor qualification test at the Chamber of Industry and Commerce (IHK). Students will be capable of training young people in a company in accordance with legal, technical and organizational guidelines and helping their trainees successfully complete their training.
[*updated 26.02.2018*]

Module content:
- Planning and testing vocational training requirements
- Preparing vocational training and participating in the recruitment of trainees
- Carrying out vocational training
- Completing vocational training

[*updated 19.02.2018*]

Teaching methods/Media:
Transparencies
[*updated 19.02.2018*]

Recommended or required reading:
Ausbilder-Eignungsverordnung, Rahmenplan mit Lernzielen, Publisher: DIHK - Deutscher Industrie- und Handelskammertag e. V., Berlin 2009
[*updated 19.02.2018*]

Module offered in:
WS 2019/20, SS 2019, WS 2018/19, SS 2018, WS 2017/18, ...

Broadband Technology and its Applications

Module name (EN): Broadband Technology and its Applications
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI612
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 3
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Written exam
Curricular relevance: KI612 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-BBTA Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIB-BBTA Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI320 Computer Networks KI450 Communications Technology and Systems 1 KI550 Communications Technology and Systems 2 [*updated 24.01.2013*]

Recommended as prerequisite for:
Module coordinator: Prof. Dr. Horst Wieker
Lecturer: Dipl.-Ing. Reiner Kroha [*updated 24.01.2013*]
Learning outcomes: After successfully completing this module, students will be able to apply basic knowledge of the technologies used (e. g.: GPON, IP multicast, RF Overlay, VDSL2+) in a structured manner. This will enable them to design broadband areas and create and evaluate business cases. [*updated 26.02.2018*]
Module content: TC Broadband Expansion of FTTX Areas -Services: Telephony (TDM vs. VoIP) Broadband Internet Home office workstations Broadcast TV (RF Overlay vs. IPTV) Video on demand Online gaming - Situation and current and future requirements - Technologies FTTH (GPON, Active Ethernet) FTTB (LWL, VDSL2+) FTTC (VDSL2+, bonding, vectoring) - Business case examples [*updated 26.02.2018*]
Recommended or required reading: Most of the relevant literature for this topic is available online: http://en.wikipedia.org/wiki/Fiber_to_the_x http://de.wikipedia.org/wiki/Glasfasernetz http://de.wikipedia.org/wiki/Gigabit_Passive_Optical_Network http://en.wikipedia.org/wiki/Very-high-bit-rate_digital_subscriber_line_2 [*updated 26.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

Chinese for Beginners I

Module name (EN): Chinese for Beginners I
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI572
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: no
Language of instruction: English
Assessment: Written composition with presentation
Curricular relevance: EE-K2-543 Energy system technology / Renewable energies, Bachelor, ASPO 01.04.2015, optional course, general subject, course inactive since 14.03.2018 KI572 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, non-technical KIB-CHI1 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, non-technical MAB.4.2.1.23 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 4, optional course, non-technical MST.CA1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, optional course, non-technical MST.CA1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, optional course, non-technical PIBWN61 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific PIB-CHI1 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, not informatics specific MST.CA1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, optional course, non-technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Thomas Tinnefeld

Lecturer: Prof. Dr. Thomas Tinnefeld
[*updated 21.06.2012*]

Learning outcomes:
- Introduction to Pinyin, the phonetic Chinese alphabet
- Training of basic listening comprehension skills in relation to lexemes and idiomatic expressions discussed in the course
- Ability to communicate in narrowly defined situational contexts such as greeting someone, providing personal information or introducing one´s own family
- Ability to recognize contextually validated Chinese lexemes and expressions in Pinyin
- Development of a basic understanding of Chinese script with regard to radicals and the direction of writing
- Ability to write one´s own Chinese name in the correct writing direction
- Raise awareness for the Chinese culture in comparison to one´s own culture
[*updated 24.02.2018*]

Module content:
- Introduction to Chinese
- Basic greeting phrases
- Introduction to the pronunciation system of Mandarin Chinese (Hanyu-Pinyin)
- Introduction to the Chinese script system (radicals and writing direction)
- Questions about one´s own Chinese name in oral and written form
- Chinese numbers from 1 to 999
- Asking about the date (day, month, year)
- Asking what time it is
- Introducing oneself in Chinese
- Awareness for the Chinese culture (e.g. Chinese festivities)
[*updated 24.02.2018*]

Teaching methods/Media:
- Presentations by the lecturer
- Partner work
- Group work phases where work assignments will be completed by the students
- Multimedia language lab
- Short presentations by the students
- Internet research
[*updated 19.02.2018*]

Recommended or required reading:
- Use of free materials developed by the teacher (not textbooks)
- Listening comprehension texts (audio and/or video)
- Internet resources
- Subject-related multimedia programs
- Additional materials on vocabulary and grammar
[*updated 19.02.2018*]

Cloud Computing

Module name (EN): Cloud Computing

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI699

Hours per semester week / Teaching method: 2V+2PA (4 hours per week)

ECTS credits: 5

Semester: 6

Mandatory course: no

Language of instruction:
German

Assessment:

Curricular relevance:
KI699 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical
KIB-CCOM Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical
PIBWI18 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific
PIB-CCOM Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI410 Distributed Systems 1
KI420 Operating Systems
KI510 Distributed Systems 2
[*updated 15.09.2017*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Markus Esch

Lecturer: Prof. Dr. Markus Esch
[*updated 29.03.2017*]

Learning outcomes:
After successfully completing this module, students will be able to name the basic concepts and service models of cloud computing. They will be able to explain the technological foundations of cloud computing and describe modern architectures.

Students will be able to describe advantages and disadvantages, as well as differences to traditional server-based applications, especially in terms of scalability and availability, and will be able to recognize the relationship between architecture and scalability.

Within the framework of a project, students will learn how to work together in small groups and will be able to design and implement scalable cloud-based applications.
[*updated 24.02.2018*]

Module content:
1. Cloud computing architectures, concepts and technologies
   - IaaS, PaaS, SaaS
   - distributed key-value stores
   - distributed file systems
   - distributed hash tables
   - gossiping
   - load balancing
   - consistency
   - error tolerance
   - microservices
2. Cloud computing from a developer´s perspective
   - developing cloud-based applications
   - tools and procedures

[*updated 24.02.2018*]

Teaching methods/Media:
Lecture slides, annotated lecture slides as a script, program examples, project work
[*updated 24.02.2018*]

Recommended or required reading:
Christoph Fehling, Frank Leymann, Ralph Retter, Walter Schupeck, Peter Arbitter: Cloud Computing Patterns: Fundamentals to Design, Build, and Manage Cloud Applications, Springer, 2014

Kenneth P Birman: Guide to Reliable Distributed Systems: Building High-Assurance Applications and Cloud-Hosted Services, Springer, 2012

Thomas Erl: Cloud Computing: Concepts, Technology & Architecture, Prentice Hall, 2013

Thomas Erl and Robert Cope: Cloud Computing Design Patterns, Prentice Hall, 2015

Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen: Microservice Architecture: Aligning Principles, Practices, and Culture, O_Reilly, 2016
[*updated 24.02.2018*]

Module offered in:
SS 2018

Compiler Design

Module name (EN): Compiler Design
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI675
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 5
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Oral examination, graded project work + presentation
Curricular relevance: KI675 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical KIB-CBAU Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical PIBWI55 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific PIB-CBAU Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI100 Programming 1
KI200 Programming 2
KI210 Informatics 2
KI586
[*updated 22.01.2018*]

Recommended as prerequisite for:

Module coordinator:
Thorsten Jakobs, M.Sc.

Lecturer:
Thorsten Jakobs, M.Sc.
[*updated 26.09.2007*]

Learning outcomes:
After completing this module, students will:
- understand the structure of a compiler and its phases;
- understand basic compiler terminology;
- be acquainted with a compiler development strategy (front-end code, back-end code, intermediate code, bootstrapping);
- have a detailed appreciation of all phases of a compiler front-end and parts of the back-end including the corresponding theoretical principles.
- The development tools lex and yacc will be used by students during their project work , which will involve developing a compiler front-end for a small high-level programming language.

[*updated 08.05.2008*]

Module content:
1. Introduction to compiling
2. Phases of a compiler (with simple illustrative examples), basic terminology
3. Bootstrapping
4. Lexical analysis
5. Syntactic analysis
6. Semantic analysis and semantically-driven compilation
7. Development tools (generators)
8. Code generation
9. Project work: Developing a compiler front-end for a high-level programming language (subset of C)

[*updated 08.05.2008*]

Teaching methods/Media:
AHO, SETHI, ULLMANN: Compilerbau, Addison Wesley 1989, ISBN 3-89319-151-8
WILHELM, MAURER: Übersetzerbau, Theorie, Konstruktion, Generierung, Springer-Verlag, 1992, ISBN 3-540-55704-0
Online documentation of development tools, e.g. SUN Solaris documentation for lex and yacc
[*updated 08.05.2008*]

Recommended or required reading:
[?]
[*still undocumented*]

Module offered in:
SS 2020 (probably), SS 2019, WS 2018/19, SS 2018, WS 2015/16, ...

Computer Graphics

Module name (EN): Computer Graphics
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI676
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 3
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Oral examination
Curricular relevance: KI676 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical PIBWI80 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI160 Mathematics 1 KI260 Mathematics 2 [*updated 19.11.2007*]

Recommended as prerequisite for:
KI635
KI648 Visualization with C++ / OpenGL
[*updated 04.02.2014*]

Module coordinator:
Prof. Dr. Ralf Denzer

Lecturer:
Prof. Dr. Ralf Denzer
[*updated 19.11.2007*]

Learning outcomes:
Students will be taught the theoretical framework required in computer graphics.
[*updated 08.05.2008*]

Module content:
1. Introduction
2. Graphics systems
3. Raster graphics
4. 2D transformations
5. 2D graphics
6. 3D transformations
7. Projections
8. Modelling objects and scenes
9. Rendering
10. Texture mapping

[*updated 08.05.2008*]

Recommended or required reading:
Bender M., Brill M.: Computergraphik, Hanser
Foley J., van Dam A., Feiner S., Hughes J.: Computer Graphics, Principles and Practice, Addison-Wesley, 1997
Watt A.: 3D-Computergrafik, Addison-Wesley, Übersetzung der dritten Auflage, 2002
Watt A., Watt M.: Advanced Animation and Rendering Techniques, Addison-Wesley, 1992
Wolfe R.: 3D Graphics A Visual Approach, Oxford University Press, 2000
ACM: http://www.siggraph.org
IEEE Technical Committee on Visualization and Graphics: http://www.computer.org/tab/tclist/tcvg.htm
EG European Association for Computer Graphics: http://www.eg.org
Gesellschaft für Informatik, Fachausschuss 4.1 Graphische Datenverarbeitung: http://www.informatik.uni-leipzig.de/gifa41/
[*updated 08.05.2008*]

Module offered in:
WS 2015/16, WS 2014/15, WS 2013/14, WS 2012/13, SS 2009, ...

Computer Science and Society Seminar

Module name (EN): Computer Science and Society Seminar
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI602
Hours per semester week / Teaching method: 2S (2 hours per week)
ECTS credits: 3
Semester: 6
Mandatory course: no
Language of instruction: English
Assessment: Presentation/discussion (obligation to attend all presentations), research project
Curricular relevance: KI602 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical KIB-SCSS Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical PIBWI64 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific PIB-SCSS Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. André Miede

Lecturer: Prof. Dr.-Ing. André Miede
[*updated 11.02.2015*]

Learning outcomes:
After successfully completing this course, students will be able to describe and explain the foundations of scientific work (literature review, logical arguments). They will be able to apply these skills by preparing a scientific presentation and a written seminar paper.
[*updated 19.02.2018*]

Module content:
The course teaches the necessary methodological and technical foundations for developing a presentation and seminar paper. This is supported by practical exercises. Together with the professor, the students will select a suitable topic to work on independently during the semester.

1. Methodological foundations
 o Working with scientific methods
 o Structuring ideas and arguments
 o Presenting ideas and arguments
2. Technical foundations
 o Introduction to LaTeX
 o Bibliography management
 o Using an official template (IEEE)
3. Seminar
 o Independent work on individual topic (own idea/suggestions from professor)
 o Presentation of initial results to the group
 o Discussion and exchange with the group
 o Submission of written seminar paper
[*updated 19.02.2018*]

Teaching methods/Media:
Transparencies, projector, board, presentations by the students and discussion
[*updated 19.02.2018*]

Recommended or required reading:
Martin Kornmeier: Wissenschaftlich Schreiben leicht gemacht, utb, 2013.
William Strunk, Jr.; Elywyn B. White: The Elements of Style, Longman, 1999.
Justin Zobel: Writing for Computer Science. Springer, 2. Auflage 2009.
Barbara Minto: Das Prinzip der Pyramide. Pearson Studium, 2005.
Gene Zelazny: Say it with Presentations. McGraw-Hill, 2006.
Marcus Deininger, Horst Lichter, Jochen Ludewig, Kurt Schneider: Studien-Arbeiten: Ein Leitfaden zur Vorbereitung, Durchführung und Betreuung von Studien-, Diplom- und Doktorarbeiten am Beispiel Informatik. Teubner, 3. Auflage 1996.
Tobias Oetiker: The Not So Short Introduction to LaTeX
[*updated 26.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

Computer Science in the Media

Module name (EN): Computer Science in the Media
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI697
Hours per semester week / Teaching method: 2S (2 hours per week)
ECTS credits: 3
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Seminar presentation, discussion (obligation to attend all presentations), term paper
Curricular relevance: KI697 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-SIDM Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI27 Applied Informatics, Bachelor, ASPO 01.10.2011, optional course, informatics specific PIB-SIDM Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Klaus Berberich

Lecturer: Prof. Dr. Klaus Berberich
[*updated 10.02.2016*]

Learning outcomes:
After successfully completing this module, students will be able to independently access, process and reproduce the content of a scientific publication, both orally and in writing. In addition, they will be able to actively participate in a technical discussion.

[*updated 26.02.2018*]

Module content:
Computer science is increasingly influencing our everyday life. Therefore, it is not surprising that current results from computer science research are also presented to a broader public in the media. This seminar will look at current publications from the field of computer science research (in English) together with the corresponding media coverage (in English or German).

In a lecture, (approx. 30 minutes), each participant will present a selected scientific publication, with special emphasis on how technical details in media reporting are simplified and technical terminology is avoided. In order to facilitate a lively discussion, all participants should be familiar with media coverage, but not with the scientific publication itself. The collected findings will be summarized in a seminar paper (approx. 6 pages).
[*updated 26.02.2018*]

Recommended or required reading:
William Strunk, Jr. and Elywyn B. White: The Elements of Style, Longman, 1999.
Justin Zobel: Writing for Computer Science, Springer, 3. Auflage, 2015
[*updated 26.02.2018*]

Module offered in:
SS 2018, SS 2017, SS 2016

Computer Vision

Module name (EN): Computer Vision

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI692

Hours per semester week / Teaching method: 4V (4 hours per week)

ECTS credits: 5

Semester: 6

Mandatory course: no

Language of instruction:
German

Assessment:
Project work

Curricular relevance:
KI692 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical
KIB-CVIS Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical
MST.CVI Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 6, optional course, technical
MST.CVI Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 6, optional course, technical
PIBWI83 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific
PIB-CVIS Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
MST.CVI Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, semester 6, optional course, technical

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI160 Mathematics 1
KI260 Mathematics 2
KI360 Mathematics 3
[*updated 27.03.2013*]

Recommended as prerequisite for:

Module coordinator:
N.N.

Lecturer:
Dipl.-Math. Dimitri Ovrutskiy
Prof. Dr. Barbara Grabowski
[*updated 27.03.2013*]

Lab:
Applied Mathematics, Statistics, and eLearning (5306)

Learning outcomes:
After successfully completing this module, students will be able to explain and apply image processing algorithms such as noise reduction and deblurring. They will be familiar with the design of digital filters. They will be able to manipulate images without using image editing software.

In addition, they will also be able to apply methods that can detect moving objects in a film, reconstruct 3D information based on images and improve the quality of 2D images. Students will learn how robots _see_.
[*updated 19.02.2018*]

Module content:
* Digitization of analog images
* Image transformations (e.g. linear filters, math. Morphology, diffusion filters, wavelet shrinkage, deblurring)
* Color perception and color spaces
* Image editing
* Feature extraction (edges, corners, lines and circles)
* Segmentation
* Extraction of 3D information
* Object detection
[*updated 19.02.2018*]

Teaching methods/Media:
100% of the lecture will take place in the PC lab AMSEL "Angewandte Mathematik, Statistik und eLearning". Computer-supported practical case studies will be worked through using the algorithms taught in this module.

In addition, the eLearning system MathCoach (AMSEL PC laboratory 5306) will be used.
[*updated 24.02.2018*]

Recommended or required reading:
R.C. Gonzalez, R.e. Woods: Digital Image Processing, Addison-Wesley, SE 2002
K.R. Castelman: Digital Image Procesing, Prentice Hall, 1996
R.Jain, R.Kasturi, B.G. Schunck: Machine Vision, McGraw, 1995
E.Trucco, A. Verri: Introductory Techniques for 3-D Computer Vision, Prentice Hall,1995
R.Klette, K.Schlüns, A.Koschan: Computer Vision:Three-Dimensional Data from Images, Springer, 1998
[*updated 19.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

Decision Support Systems

Module name (EN): Decision Support Systems
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI650
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: English
Assessment: Written exam (50 %) / Student assignment (50 %)
Curricular relevance: KI650 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dave Swayne

Lecturer:
Prof. Dave Swayne
[*updated 01.04.2003*]

Learning outcomes:
After completing this course students will understand agent architectures in artificial intelligence and the relationship between artificial intelligence and operations research (planning and decision making).

Students will be able to distinguish between three different classes of decision-making systems (logic-based, probabilistic and machine-learning-based) and will gain experience with a sample of each of the following system classes: first-order logic / prolog, Bayesian network, inductive learning / decision tree.
[*updated 13.03.2007*]

Module content:
Artificial intelligence (introduction, intelligent agents)
Problem-solving (solving problems by searching)
Knowledge and reasoning (agents, logic, Prolog)
Acting logically (planning)
Uncertain knowledge and reasoning (uncertainty, probabilistic reasoning, decisions)

Expert systems based on machine learning
[*updated 13.03.2007*]

Recommended or required reading:
Artificial Intelligence A Modern Approach, Second Edition, Stewart Russell and Peter Norvig

[*updated 13.03.2007*]

Module offered in:
WS 2005/06, SS 2005

Design Patterns

Module name (EN): Design Patterns

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI681

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 3

Semester: 6

Mandatory course: no

Language of instruction:
German

Assessment:
Oral examination

Curricular relevance:
KI681 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical
KIB-EWM Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical
PIBWI73 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific
PIB-EWM Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI300 Software Engineering 1
[*updated 06.04.2010*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Helmut Folz

Lecturer:
Prof. Dr. Helmut Folz
[*updated 06.04.2010*]

Learning outcomes:
After successfully completing this course, students will:
_ know the differences between architectural patterns, software design patterns, and programming idioms and be able to explain them.
_ be familiar with the most important architectural patterns and can explain their application context and structure
_ be familiar with the most important software design patterns, their application contexts, structure and dynamics and can illustrate this with examples.
_ understand the structure and use of JUnit.
_ have an overview of refactoring methods and can explain them using code examples.

[*updated 19.02.2018*]

Module content:

1. Introduction to software design patterns
   1.1 General information
   1.2 Pattern categories
   1.2 Patterns and software architectures

2. Architectural patterns
   2.1 Multi-tier patterns
   2.2 Broker pattern
   2.3 Model-view-controller
   2.4 Other architectural patterns

3. Software design patterns and applications
   3.1 Creational patterns
   3.2 Structural patterns
   3.3 Behavioral design patterns

4. Introduction to JUnit
   4.1 Unit tests with JUnit
   4.2 The design of JUnit 3.8.x
   4.3 Annotations
   4.4 JUnit 4.x

5. Refactoring and patterns
   5.1 Introduction to software metrics
   5.2 Introduction to refactoring
   5.3 Refactoring and patterns

6. Introduction to aspect-oriented software development (optional)
   6.1 Aspect-oriented software development overview
   6.2 Application examples for aspect-oriented software development
   6.3 Aspect-oriented software development and patterns

[*updated 19.02.2018*]

Teaching methods/Media:

Transparencies, projector, board
Course-specific website
[*updated 19.02.2018*]

Recommended or required reading:
Geirhos, Matthias:
Entwurfsmuster _ Das umfassende Handbuch
Rheinwerk Verlag GmbH, Bonn

Goll, Joachim:
Architektur- und Entwurfsmuster der Softwaretechnik
Springer Vieweg

Gamma, E.; Helm, R.; Johnson, R.; Vlissides, J.:
Entwurfsmuster: Elemente wiederverwendbarer objektorientierter Software
Addison-Wesley

Fowler, Martin: Refactoring
Oder wie Sie das Design vorhandener Software verbessern.
Addison-Wesley
[*updated 19.02.2018*]

Module offered in:
SS 2019, SS 2018, SS 2017, SS 2016, SS 2015, ...

Digital Television Technology

Module name (EN): Digital Television Technology
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI643
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 3
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Oral examination
Curricular relevance: KI643 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-DIGF Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIB-DIGF Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Martin Buchholz

Lecturer:
Prof. Dr. Martin Buchholz
[*updated 01.04.2003*]

Learning outcomes:
After successful completion of this module, students will be able to classify and describe the basics of studio technology, source coding (audio and video coding) and channel coding (error protection), as well as the necessary transmission technology and its technical implementation. This will enable them to apply the most important methods of video coding (MPEG-4, H. 264) and transmission standards in their fields of application and assess them with regard to efficiency, complexity and their interactions in the subsystems.
[*updated 26.02.2018*]

Module content:
1. Overview and introduction
   History of television, basics of analog television technology,
   Transition to digital television

2. Recording technology and digitalization of audio and video signals

3. Redundancy and irrelevance reduction (source coding)
   Data reduction, Huffman code, DCT,
   Video and audio encoding, MPEG-2, MPEG-4, DivX

4. Error protection methods (channel coding)

5. Digital television signal transmission
   Transmission via different transmission media:
   Cable, satellite, terrestrial

6. Mobile TV broadcasting and technological convergence
   Doppler shift, multipath propagation, diversity reception
   New digital video services, technological convergence, IP datacasting

[*updated 26.02.2018*]

Recommended or required reading:
Reimers, U., Digitale Fernsehtechnik
Strutz/Mildenberger, Bilddatenkompression
Bossert, Kanalcodierung
[*updated 26.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

Electromobility

Module name (EN): Electromobility

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI617

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 3

Semester: 6

Mandatory course: no

Language of instruction:
German

Assessment:

Curricular relevance:
FT62 Automotive Engineering, Bachelor, ASPO 01.04.2016, semester 6, optional course, specialisation
FT62 Automotive Engineering, Bachelor, ASPO 01.10.2019, semester 6, optional course, specialisation
KI617 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical
KIB-EMOB Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical
PIBWI59 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific
PIB-EMOB Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Horst Wieker

Lecturer:
Dipl.-Ing. Peter Saeger
[*updated 09.09.2011*]

Learning outcomes:
After successfully completing this module, students will understand new and adapted vehicle systems and be able to describe different market requirements against the background of market trends. They will be able to characterize the functional structure of the systems and their interfaces and identify solutions to typical problems.
[*updated 26.02.2018*]

Module content:
This course will focus on trends, technology and system networking in and outside of vehicles.

The electrification of the automobile occupies a strong position in the global market. The transition from the combustion engine to pure electric driving have led to a wide range of new systems and information networks in vehicles.

This course will deal with the following questions:
* What are the main differences between a vehicle with an internal combustion engine and a hybrid or electric car and what effects do these differences have on the function development?
* How do electronic systems and networks work in an electric car?
* Are there special functional requirements for assistance systems in electric vehicles?
* What do the data networks look like in the future vehicles and what requirements do they have to meet?

1. General information on market trends and their technical requirements
   * User behavior
   * Political influences
2. General technical principles
   * Gasoline engines
   * Diesel engines
   * Hybrid vehicles
   * Electric vehicles
3. The architecture of electric vehicles
   * Drive systems
   * Chassis & safety systems
   * Vehicle cabin systems
   * High-voltage architectures
4. Driver assistance systems
   * Overview of functionalities and networks
   * Limits of driver assistance systems
5. Communication systems inside and outside vehicles
   * ITS and electric vehicles
   * Data networks
6. Functional safety
   * General requirements for security and privacy
   * Redundancies
   * Requirements for assistance and security systems
   * Road vehicles - Functional safety ISO 26262

[*updated 26.02.2018*]

Recommended or required reading:
[*still undocumented*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

Electronic Business

Module name (EN): Electronic Business
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI631
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 4
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Written examination, written assignment on a selected topic
Curricular relevance: KI631 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course PIBWI40 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, course inactive since 19.07.2011
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Klaus Huckert

Lecturer:
Prof. Dr. Klaus Huckert
[*updated 01.04.2003*]

Learning outcomes:
After completing this course students will:
- understand the business and commercial relevance of the internet
- understand web-interfacing of databases
- be aware of new technologies (e.g. XML, linking mobile phones to the internet, pervasive computing)
- be acquainted with modelling internet-based business processes

[*updated 08.05.2008*]

Module content:
1. Basic terminology
2. Internet, intranet, extranet
3. Marketing, advertising and sales promotion
4. Public relations work
5. Selling products (internet shops)
6. Web-interfacing of databases (with practical exercises)
7. Web payment systems, financial transactions
8. Customer Relationship Management / Customer services
9. Teleservices
10. Project management
11. Personnel management
12. Logistics
13. Electronic commerce and EDI/XML
14. Practical exercises on XML
15. B2B portals, e-procurement
16. E-learning
17. E-government
18. Mobile commerce
19. Management, financial planning and control of internet applications
20. Content management
21. The future of e-business
22. Pervasive computing
23. Case studies

[*updated 08.05.2008*]

Recommended or required reading:
To be announced at the beginning of the course.

[*updated 13.03.2007*]

Module offered in:
SS 2007

Embedded Linux

Module name (EN): Embedded Linux

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI689

Hours per semester week / Teaching method: 2V+2P (4 hours per week)

ECTS credits: 4

Semester: 6

Mandatory course: no

Language of instruction:
German

Assessment:
Project

Curricular relevance:
KI689 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical
KIB-EMBL Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical
PIBWI31 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, technical
PIB-EMBL Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI678 Embedded Computing
[*updated 02.03.2017*]

Recommended as prerequisite for:

Module coordinator:
Dipl.-Inf. Ulrich Bruch

Lecturer:
Dipl.-Inf. Ulrich Bruch
[*updated 02.03.2017*]

Learning outcomes:
After successfully completing this module, students will be familiar with system design and programming techniques for embedded applications.
They will be able to use and customize bootloaders.
They will have acquired experience in working with real-time operating systems such as FreeRTOS.
Students will be capable of working with embedded Linux e. g. on a single board computer (Raspberry etc.).
They will be able to design simple, embedded systems.
They will have the know-how to use basic IoT technologies (e.g. 6LoWPan, COAP, MQTT,...).

[*updated 26.02.2018*]

Module content:
1. Introduction to the terms used in embedded Linux
2. Review course "Embedded Computing", build process, toolchain, cross compiler
3. Special mechanisms and techniques for the realization of bootloaders
4. Micro operating systems, structure, function, implementation, application - problem discussions
5. Embedded Linux using the example of a single-board computer - implementation of simple tasks in
user space, meaning and limits of embedded Linux, insight into kernel driver development using the example of a
Push button.
6. Use of embedded systems for the Internet of Things using a small weather station as an example,
presentation of common protocols and methods

Topics 2 to 5 will be accompanied by exercises.
[*updated 26.02.2018*]

Recommended or required reading:
Wolfgang Matthes "Embedded Electronics 1", Elektor-Verlag
Wolfgang Matthes "Embedded Electronics 2", Elektor-Verlag
Jürgen Wolf ?Cvon A bis Z?, Galileo Computing
Hans Werner Lang "Algorithmen", Oldenbourg
Jörg Wiegelmann "Softwareentwicklung in C für Mikroprozessoren und Mikrocontroller", Hüthig Verlag
Using the FreeRTOS Real time kernel (e-book at www.freertos.org [www.freertos.org])
FreeRTOR Reference Manual (e-book at www.freertos.org [www.freertos.org])
Jürgen Quade "Embedded Linux"
Jürgen Quade "Linux Treiber entwickeln"
Ralf Jesse "Embedded Linux mit Raspberry Pi und Co."
[*updated 26.02.2018*]

Module offered in:
SS 2017, SS 2016, SS 2015, SS 2014

Enterprise Java Beans

Module name (EN): Enterprise Java Beans
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI619
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Project work
Curricular relevance: KI619 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-EJB Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI49 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific PIB-EJB Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI200 Programming 2
KI400 Software Engineering 2
[*updated 18.07.2011*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Helmut Folz

Lecturer:
Alexander Kiefer, M.Sc.
[*updated 18.07.2011*]

Lab:
Technical Systems Lab (8207)

Learning outcomes:
- Students will be able to implement enterprise applications using the JavaEE 6 framework and run them on the JBoss application server.

- They will have basic knowledge of the JBoss configuration, understand how the application server works, and will be familiar with the main programming features of Java EE using the JBoss 6 AS (EJB 3.0 / 3.1).

- They will be familiar with the integrated development environment Eclipse and the resulting advantages in the field of Java EE / JBoss development.

- They will be capable of developing, testing, debugging and commissioning complex client-server applications.

- They will be familiar with the most important design patterns of software development and their use in Java EE6, the tool _Ant_ for automated building and the _Log4j_ library for logging information into the log files of the application server.
[*updated 26.02.2018*]

Module content:
1. Introduction The Bean concept, _Hello World_ with EJB and JBoss application server
2. History: Comparison of J2EE 1.1, Java EE 5 and Java EE 6, JBoss development stages
3. JBoss application server: Structure, functionality and basic configuration, reading log files, elementary terms
4. Eclipse IDE: Setting up an environment for the efficient development of Java Enterprise applications, configuring, creating user libraries, debugging a running JBoss application (remote debugging), using ANT as a build tool
5. Enterprise Java Beans (EJB): bean types, interaction of beans, transaction principles (bean-managed, container-managed), lifecycle of beans
6. Java Persistence API (JPA): Data access layer: EntityManager, object-relational mapping, queries with JPQL, performance enhancement, transactions
7. Java Message Services: Message-Driven Beans
8. Testing: Test-driven development with JUnit
9. Further topics: Web services, EJB Interceptors, EJB Security
[*updated 26.02.2018*]

Recommended or required reading:
Jamae, Javid: JBoss im Einsatz , Carl Hanser Verlag
Werner Eberling: Enterprise Java Beans 3.1, Carl Hanser Verlag
[*updated 26.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2016/17, WS 2015/16, WS 2014/15, ...

Enviromatics

Module name (EN): Enviromatics
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI677
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Written assignment
Curricular relevance: KI677 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course PIBWI85 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Ralf Denzer

Lecturer: Prof. Dr. Ralf Denzer
[*updated 23.11.2007*]

Learning outcomes:
Students will acquire an overview of how the methods of informatics are applied in the fields of environmental protection and risk, crisis and disaster management.
[*updated 08.05.2008*]

Module content:
1. History of enviromatics
2. Areas of application

3. Enviromatics: the basic methodology
   - Environmental data preparation and acquisition
   - Monitoring
   - Environmental information systems
   - Geomatics

4. Diagnosis and interpretation
   - Risk and impact assessment
   - Environmental models
   - Indicators

5. Decision support systems

6. Enviromatics integration methods
   - Integration problems
   - Interoperability in EIS
   - Meta information systems
   - Open EIS architectures
   - Large-scale infrastructures

[*updated 08.05.2008*]

Recommended or required reading:
Each year, a list of relevant reference materials will be compiled based on current research projects, particularly those within the EUs 6th and 7th Framework Programmes.
[*updated 08.05.2008*]

Error-Identification and Error-Correcting Codes

Module name (EN): Error-Identification and Error-Correcting Codes

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI656

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 3

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:

Curricular relevance:
DFBI-346 Computer Science and Web Engineering, Bachelor, ASPO 01.10.2018, semester 6, optional course, informatics specific
KI656 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical
KIB-FFKC Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical
MST.FKC Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, optional course, technical
MST.FKC Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, optional course, technical
PIBWI56 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific
PIB-FFKC Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific
MST.FKC Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, optional course, technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Dipl.-Math. Wolfgang Braun

Lecturer: Dipl.-Math. Wolfgang Braun
[*updated 01.10.2006*]

Learning outcomes:
After successfully completing this module, students will have a basic understanding of the importance and problems of error identification and correction. In addition, they will:
- be able to explain basic terms (redundancy, code rate, generator matrix, check matrix, Hamming distance,
  Hamming limit, _)
- have mastered arithmetics in finite fields of the type GF (p)
- Coding and decoding of linear binary block codes: have an understanding of the theoretical interrelationships
  and have mastered execution by means of matrix calculation
- be able to construct Hamming codes
- be able to classify binary block codes according to their performance capability
- Coding and decoding of cyclic codes via GF (2): have an understanding of the theoretical interrelationships
  and have mastered execution by means of polynomial operations
- have knowledge of coding theory applications in various fields
- be able to implement basic algorithms from the lecture in a common programming language
- have gained insights into how the coding theory can be developed further
- have learned how mathematical theories can be translated into practice-relevant algorithms in computer science

[*updated 06.09.2018*]

Module content:
- Principle of coding a message for error identification and error correction
- Simple error identification and correction procedures (ISBN No., EAN code, repeat code, 2-dimensional
  parity, _.)
- The ring of integers, residue classes
- Computations in finite fields GF (p)
- n-dimensional vector spaces over GF (p)
- Linear block codes over GF (2)
- Hamming codes
- Cyclic codes over GF (2)
- Applications and perspectives (ECC-RAM, CRC-32, CIRC, digital TV,
  matrix codes, extension of coding theory by GF (2^n), convolutional codes, _.)

The lecture will concentrate on the algebraic methods. A statistical treatment of the transmission channel (e.g. _Entropy_, _Markov sources_), as well as an implementation of the algorithms by means of hardware are not part of this lecture.
[*updated 19.02.2018*]

Teaching methods/Media:
Lecture with integrated exercises using a script, demonstration of basic algorithms using Maple.
[*updated 19.02.2018*]

Recommended or required reading:
Lecture script with exercises
Werner, M.: Information und Codierung, vieweg, Braunschweig/Wiesbaden 2002
Klimant, H. u.a. : Informations- und Kodierungstheorie, Teubner, Wiesbaden 2006
Schulz, R.-H. : Codierungstheorie, vieweg, Wiesbaden 2003
[*updated 19.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, WS 2016/17, WS 2015/16, ...

Field Bus Systems

Module name (EN): Field Bus Systems
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI654
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment:
Curricular relevance: KI654 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical PIBWI88 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific, course inactive since 19.07.2011
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr.-Ing. Jürgen Schäfer

Lecturer:
Prof. Dr.-Ing. Jürgen Schäfer
Dipl.-Ing. Hans-Joachim Bohr
[*updated 01.10.2006*]

Learning outcomes:
After completing this course, students will understand the different realizations of the physical layer and the data-link layer in the LIN and CAN field bus systems. They will also be acquainted with the basic functionality of the CANOpen protocol and with the fundamentals of the FlexRay system architecture. Students will be able to program a microcontroller in a CAN network so that data can be exchanged in accordance with a specified communications protocol. Students will have the opportunity to apply their knowledge in automation engineering projects.

[*updated 13.03.2007*]

Module content:
1. Fundamentals of data transmission
2. Data bus systems in automation and process control technology
3. CAN physical layer
4. CAN data link layer
5. CAN data transmission security
6. CAN bus time response
7. Design of CAN systems
8. The 82C150 CAN chip
9. The CANOpen application layer
10. LIN physical layer
11.LIN data link layer
12. FlexRay A data bus system for safety-critical applications

[*updated 13.03.2007*]

Recommended or required reading:
K. Etschberger: CAN Grundlagen, Protokolle, Bausteine, Anwendungen, Carl Hanser Verlag, München 1994
W. Lawrenz: CAN Controller Area Network Grundlagen und Praxis, Hüthig-Verlag, 1999
N.N: CAN Specification 2.0 Part B, CAN in Automation, Erlangen, 2002
N.N: CiA 102 DS V2.0 CAN physical layer for industrial applications, CAN in Automation, Erlangen, 2005
N.N: CiA 301 DS V4.1: CANopen application layer and communication profile, CAN in Automation, Erlangen, 2006
A. Grzemba, H.-C. von der Wense: LIN-Bus Systeme Protokolle, Franzis Verlag, 2005
N.N.: FlexRay Communications System Protocol Specification Version 2.1, FlexRay Konsortium, 2005
[*updated 13.03.2007*]

Module offered in:
WS 2006/07

French I

Module name (EN): French I
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI657
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: no
Language of instruction: French
Assessment: Written examination (final exam)
Curricular relevance: KI657 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, non-technical KIB-FRA1 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, non-technical MAB.4.2.1.16 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 5, optional course MST.FR1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 5, optional course MST.FR1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 5, optional course PIBWN35 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific PIB-FRA1 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, not informatics specific MST.FR1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, semester 5, optional course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
KI658 French II
[*updated 16.01.2007*]

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Margret Wilhelm, Diplomdolmetscherin
[*updated 16.01.2007*]

Learning outcomes:
The courses French I and II are based on each other. In the course of the two modules, students will improve their professional French so that they advance from the desired entry level B1 to level B2 of the Common European Framework of Reference for Languages.

Based on a common level of knowledge and motivation amongst the students, the main objective of the language course is to refresh and develop existing French skills, as well as to reduce barriers to learning and negative attitudes towards language learning while strengthening confidence in one´s own foreign language competence. Subjects and situations that are relevant for the later professional career will be used to impart skills and knowledge that will enable students to communicate orally and in writing with colleagues and business partners in francophone countries.

To do so, all four skills (speaking, listening comprehension, reading and writing) will be trained equally using, in part, multimedia learning tools. Content development will be supported by the repetition of a basic vocabulary and the relevant grammatical structures, also in self-study.

The course takes a communicative and pragmatic approach that particularly promotes communicative competence in job-relevant situations through the use of role playing and situational dialogues. This also includes intercultural aspects that raise the students´ awareness of cultural differences and enable them to assert themselves in specific situations.
[*updated 24.02.2018*]

Module content:
Establishing contact
- Greetings
- Introducing oneself and others
- Receiving someone
- Presenting a company

Job profiles and the workplace
- Company-internal communication:
- Describing professional activities and priorities
- Company structure and workflow
- Raising one´s own concerns
- Negotiating proposals

Written communication
- Formal aspects (correcte form of a letter, layout etc.)
- Formulating a letter of inquiry
- Formulas for greetings and closings, taking into account different stylistic levels

In addition, we will concentrate on basic grammatical structures. Students are expected to work on and expand their basic vocabulary independently in self-learning phases in the multimedia computer language laboratory.
[*updated 24.02.2018*]

Teaching methods/Media:
Teaching and learning materials (print media, slides, audio-visual teaching materials), multimedia learning software specially compiled for the learning group.
[*updated 19.02.2018*]

Recommended or required reading:
- PONS Kompaktwörterbuch für alle Fälle - Französisch-Deutsch/Deutsch-Französisch. Vollständige Neubearbeitung 2002, Klett-Verlag, Stuttgart, ISBN 3-12-517209-8

- M. Grégoire, O. Thiévenaz: Grammaire Progressive du Français - Niveau intermédiaire. (Deutsche Ausgabe); Klett-Verlag, Stuttgart, ISBN 3-12-529873-3

Students will receive a list of recommended teaching and learning materials.

We recommend the following multimedia learning program for independent learning:
Oberstufe Französisch. 6000 Vokabeln zu allen Themen. Vokabellernprogramm auf CD-ROM mit Sprachausgabe. Klett-Verlag, Stuttgart
[*updated 19.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

French II

Module name (EN): French II
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI658
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 6
Mandatory course: no
Language of instruction: French
Assessment: Written examination (final exam)

Curricular relevance:
EE-K2-523 Energy system technology / Renewable energies, Bachelor, ASPO 01.10.2012, semester 6, optional course
EE-K2-523 Energy system technology / Renewable energies, Bachelor, ASPO 01.04.2015, semester 6, optional course, course inactive since 14.03.2018
KI658 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical
KIB-FRA2 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical
MAB.4.2.1.17 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 6, optional course
MST.FR2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 6, optional course
MST.FR2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 6, optional course
PIBWN36 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific
PIB-FRA2 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific
MST.FR2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, semester 6, optional course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI657 French I
[*updated 16.01.2007*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Margret Wilhelm, Diplomdolmetscherin
[*updated 16.01.2007*]

Learning outcomes:
The courses French 1 and 2 are based on each other. In the course of the two modules, students will improve their professional French so that they advance from the desired entry level B1 to level B2 of the Common European Framework of Reference for Languages.
Based on a common level of knowledge and motivation amongst the students, the main objective of the language course is to refresh and develop existing French skills, as well as to reduce barriers to learning and negative attitudes towards language learning while strengthening confidence in one´s own foreign language competence. Subjects and situations that are relevant for the later professional career will be used to impart skills and knowledge that will enable students to communicate orally and in writing with colleagues and business partners in francophone countries.
To do so, all four skills (speaking, listening comprehension, reading and writing) will be trained equally using, in part, multimedia learning tools. Content development will be supported by the repetition of a basic vocabulary and the relevant grammatical structures, also in self-study.
The course takes a communicative and pragmatic approach that particularly promotes communicative competence in job-relevant situations through the use of role playing and situational dialogues. This also includes intercultural aspects that raise the students´ awareness of cultural differences and enable them to assert themselves in specific situations.

[*updated 26.02.2018*]

Module content:
Talking on the telephone
- Common verbal expressions
- Giving information
- Asking for information
- Arranging and postponing appointments

Job market and job search
- Job advertisements
- Applicant´s profile
- Hiring personnel

Application process
- Resume
- Application cover letter
- Job interview
- Working conditions

In addition, we will concentrate on basic grammatical structures. Students are expected to work on and expand their basic vocabulary independently in self-learning phases in the multimedia computer language laboratory.
[*updated 24.02.2018*]

Teaching methods/Media:
Teaching and learning materials (print media, slides, audio-visual teaching materials), multimedia learning software compiled specifically for the learning group.
[*updated 19.02.2018*]

Recommended or required reading:
- PONS Kompaktwörterbuch für alle Fälle - Französisch-Deutsch/Deutsch-Französisch. Vollständige Neubearbeitung 2002, Klett-Verlag, Stuttgart, 3-12-517209-8
- M. Grégoire, O. Thiévenaz: Grammaire Progressive du Français - Niveau intermédiaire. (Deutsche Ausgabe); Klett-Verlag, Stuttgart, ISBN 3-12-529873-3

Students will receive a list of recommended teaching and learning materials.

We recommend the following multimedia learning program for independent learning:
Oberstufe Französisch. 6000 Vokabeln zu allen Themen. Vokabellernprogramm auf CD-ROM mit Sprachausgabe. Klett-Verlag, Stuttgart
[*updated 19.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

French for Beginners I

Module name (EN): French for Beginners I

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI659

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 2

Semester: 5

Mandatory course: no

Language of instruction:
French

Assessment:
Written examination (final exam)

Curricular relevance:
KI659 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, non-technical
KIB-FFA1 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, non-technical
MAB.4.2.1.6 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 5, optional course
MST.FA1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 5, optional course, non-technical
MST.FA1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 5, optional course, non-technical
PIBWN40 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific
PIB-FFA1 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, not informatics specific
MST.FA1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, semester 5, optional course, non-technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
KI660 French for Beginners II
[*updated 16.01.2007*]

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Margret Wilhelm, Diplomdolmetscherin
[*updated 16.01.2007*]

Learning outcomes:
The course French for Beginners I is aimed towards learners with little or no previous knowledge of the French language. The courses French for Beginners I and II are based on each other. In the course of the two modules, students will first reach proficiency level A1 and then advance to level A2 of the European Framework of Reference for Languages.

The goal of the course is to provide students with basic knowledge of the French language, which will enable them to communicate in general and professional situations as quickly as possible, both orally and in writing. To do so, all four skills (speaking, listening comprehension, reading and writing) will be trained equally. Content development will be supported by the repetition of the relevant grammatical structures.

The course takes a communicative and pragmatic approach that particularly promotes communicative competence in job-relevant situations through the use of role playing and situational dialogues. This also includes intercultural aspects that raise the students´ awareness of cultural differences and enable them to assert themselves in specific situations.
[*updated 26.02.2018*]

Module content:
Establishing contact
- Greetings
- Introducing oneself and others
- Asking how someone is feeling
- Giving information about yourself and requesting information about others
- Saying thank you, apologizing and saying goodbye

Job profiles and the workplace
- Company structure and workflow
- Describing jobs and activities
- Showing and describing products

Telephone communication
- Common verbal expressions
- Asking for and giving information

In addition, we will concentrate on basic grammatical structures. Students should work on and expand their basic vocabulary independently.
[*updated 26.02.2018*]

Recommended or required reading:
The course is based on the following textbook and will be supplemented by suitable material from other textbooks:

Jambon, Krystelle: Voyages 1 - Französisch für Erwachsene, Klett, Stuttgart: 2006.

We also recommend purchasing the following grammar exercise book: Eurocentres Paris (group of authors): Exercices de grammaire en contexte - niveau débutant, Hachette Livre, Paris: 2000, 144 p.

Students will receive a list of recommended teaching and learning materials. We recommend the following multimedia learning program for independent learning: Oberstufe Französisch. 6000 Vokabeln zu allen Themen. Vokabellernprogramm auf CD-ROM mit Sprachausgabe.
Klett-Verlag, Stuttgart
[*updated 26.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

French for Beginners II

Module name (EN): French for Beginners II
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI660
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 6
Mandatory course: no
Language of instruction: French
Assessment: Written examination (final exam)
Curricular relevance: KI660 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical KIB-FFA2 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical MAB.4.2.1.7 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 6, optional course MST.FA2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 6, optional course, non-technical MST.FA2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 6, optional course, non-technical PIBWN41 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific PIB-FFA2 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific MST.FA2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, semester 6, optional course, non-technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI659 French for Beginners I
[*updated 16.01.2007*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Margret Wilhelm, Diplomdolmetscherin
[*updated 16.01.2007*]

Learning outcomes:
The courses French for Beginners I and II are based on each other. In the course of the two modules, students will first reach proficiency level A1 and then advance to level A2 of the European Framework of Reference for Languages. The goal of the course is to provide students with basic knowledge of the French language, which will enable them to communicate in general and professional situations as quickly as possible, both orally and in writing.

To do so, all four skills (speaking, listening comprehension, reading and writing) will be trained equally. Content development will be supported by the repetition of the relevant grammatical structures. The course takes a communicative and pragmatic approach that particularly promotes communicative competence in job-relevant situations through the use of role playing and situational dialogues.

This also includes intercultural aspects that raise the students´ awareness of cultural differences and enable them to assert themselves in specific situations.
[*updated 26.02.2018*]

Module content:
Job profiles and the workplace
- Addresses and telephone numbers
- Work routine: working hours, breaks
- Internal communication: giving information
- Accepting and rejecting suggestions
- Invitations and business lunches
- Business trips

Telephone communication
- Asking for and giving information
- Spelling things
- Making reservations
- Making appointments with date and time

Directions
- Asking for directions
- Giving directions
- Location details

In addition, we will concentrate on basic grammatical structures. Students should work on and expand their basic vocabulary independently.
[*updated 26.02.2018*]

Recommended or required reading:
The course is based on the following textbook and will be supplemented by suitable material from other textbooks:

Jambon, Krystelle: Voyages 1 - Französisch für Erwachsene, Klett, Stuttgart: 2006.

We also recommend purchasing the following grammar exercise book: Eurocentres Paris (group of authors): Exercices de grammaire en contexte - niveau débutant, Hachette Livre, Paris: 2000, 144 p.

Students will receive a list of recommended teaching and learning materials.

We recommend the following multimedia learning program for independent learning: Oberstufe Französisch. 6000 Vokabeln zu allen Themen. Vokabellernprogramm auf CD-ROM mit Sprachausgabe. Klett-Verlag, Stuttgart
[*updated 26.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

Functional Programming

Module name (EN): Functional Programming
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI571
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment:
Curricular relevance: KI571 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-FPRG Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI14 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific PIB-FPRG Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Thomas Kretschmer

Lecturer: Prof. Dr. Thomas Kretschmer
[*updated 31.01.2018*]

Learning outcomes:
[*still undocumented*]

Module content:
[*still undocumented*]

Recommended or required reading:
[*still undocumented*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018

Future Internet: Software Defined Networking

Module name (EN): Future Internet: Software Defined Networking
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI596
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 4
Semester: 5
Mandatory course: no
Language of instruction: English
Assessment: Written exam/paper
Curricular relevance: KI596 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical KIB-FSDN Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical PIBWI44 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific PIB-FSDN Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:
Module coordinator: Prof. Dr. Damian Weber
Lecturer: Prof. Joberto Martins [*updated 04.09.2012*]
Lab: Communication Systems Lab (5204)
Learning outcomes: After successfully completing this course, students will be able to classify all of the consequences of adopting Software Defined Networking (SDN) to the applications development process. Students will be able to assess the impact of SDN for the TCP/IP architecture. They will also be capable of explaining and implementing openflow-based applications. In addition, students will be capable of designing control and monitoring frameworks and writing a concept for a deploying mechanism of such tools using advanced concepts such as federation. [*updated 26.02.2018*]

Module content:
1. Networking Architectural Approaches and Issues:
- Actual IP architecture scenario and new requirements
- Software Defined Networking (SDN)
- Architectural issues: naming, addressing, mobility, scalability, autonomy and virtualization

2. OpenFlow Protocol:
- OpenFlow (OF) architecture
- OF protocol
- OF and virtualization
- OF use cases: virtual router, level 2 virtualization, other
- OF experimentation with MiniNet (hands-on exercises)

3. Experimental Networks (EN):
- Experimental Networks principles - user-defined, large and innovative experiments, users, reproducibility, scaling and monitoring:
  . Experiment (project) requirements
  . Experiment (project) planning
  . Experiment (project) execution
  . Experiment (project) monitoring
- CMF - Control and Monitoring Framework - model and components
- Experimental network OFELIA (OpenFlow in Europe: Linking Infrastructure and Applications) _ Architecture:
 components, tools, experimentation facilities, monitoring
- Experimental Network OMF (Orbit Management Framework) _ Architecture:
components, tools, experimentation facilities, monitoring
- Experimental Network FIBRE EU-BR (Future Internet Testbed Experimentation between Brazil and Europe) _ Architecture:
components, tools, experimentation facilities, monitoring
- Experimental networks monitoring:
- Architecture, components and issues on monitoring an experiment using an "Experimental Network" (EN)

- Study case: FIBRE EU-BR I&M Architecture
- Experimental Networks Federation:
  . Federation principles
  . SFA (Slice-based Federation Architecture) approach
- Experimental Networks "hands-on" exercise:
  Exercise: create a project/experiment on one of the above experimental networks (OFELIA, OMF or FIBRE)

4. Future Internet - Trends and Scenarios:
- QoS (Quality of Service) and QoE (Quality of Experience) in FI
- FI use cases
- FI research

[*updated 26.02.2018*]

Recommended or required reading:
[*still undocumented*]

Module offered in:
WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, ...

GUI Programming with Qt

Module name (EN): GUI Programming with Qt

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI603

Hours per semester week / Teaching method: 4V (4 hours per week)

ECTS credits: 5

Semester: according to optional course list

Mandatory course: no

Language of instruction:
German

Assessment:
Project work

Curricular relevance:
KI603 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, optional course, informatics specific
KIB-PRQT Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, optional course, technical
PIBWI63 Applied Informatics, Bachelor, ASPO 01.10.2011, optional course, informatics specific
PIB-PRQT Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI100 Programming 1
KI200 Programming 2
KI300 Software Engineering 1
[*updated 13.02.2015*]

Recommended as prerequisite for:

Module coordinator:
Hong-Phuc Bui, M.Sc.

Lecturer:
Hong-Phuc Bui, M.Sc.
[*updated 13.02.2015*]

Lab:
Applied Mathematics, Statistics, and eLearning (5306)

Learning outcomes:
After successfully completing this module, students will have mastered the three components of the Qt framework: Qt widget, QML/QtQuick and the input/output framework. They will be able to use these components to develop desktop applications with a graphical user interface and access to
common data sources (file system, database, http web service).
In addition, they will demonstrate and deepen the knowledge they have acquired in this subject area in a project.
[*updated 26.02.2018*]

Module content:
1. Qt Widget and QML/QtQuick
   * Common C++-based GUI widgets
   * Designing graphical user interfaces with the declarative language QML
2. The signal and slot concept, the elementary concept in Qt
   to connect Qt objects
3. In and output utilities in Qt libraries
   * Access to the file system, database and http website
   * Graphical representation of data
4. Working with the IDE Qt Creator and
   the build program qmake, syntax of a qmake file.
[*updated 26.02.2018*]

Recommended or required reading:
* qt.io: Qt Documentation (http://doc.qt.io/)
* Qt Project Documentation (http://qt-project.org/doc/)
* Guillaume Lazar, Robin Penea: Mastering Qt 5, 2016
[*updated 26.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

Game Design and Development

Module name (EN): Game Design and Development
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI598
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 5
Semester: 5
Mandatory course: no
Language of instruction: English
Assessment: Project work
Curricular relevance: KI598 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical KIB-GDEV Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, optional course, technical PIBWI43 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific PIB-GDEV Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific Suitable for exchange students (learning agreement)
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI100 Programming 1
KI190 English 1
KI200 Programming 2
KI290 English 2
KI300 Software Engineering 1
KI400 Software Engineering 2
[*updated 06.08.2014*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. André Miede

Lecturer: Prof. Dr.-Ing. André Miede
[*updated 24.07.2012*]

Lab:
Technical Systems Lab (8207)

Learning outcomes:
After successfully completing this course, students will be able to apply their programming, algorithmic/mathematical, and project management skills
for solving basic problems during the design and development of computer games.

[*updated 26.02.2018*]

Module content:
The course introduces the basic concepts and challenges of designing and developing computer games. The focus is mainly on technical aspects such as understanding typical algorithms (and their underlying mathematical concepts) and implementing them using typical programming languages. In addition, state-of-the-art game technologies, i.e., game engines, can be used for the project(s).
1. Introduction and Overview
2. Game Production/Processes and Teams
3. Game Design
4. Game Architecture
5. Collision Detection
6. Computer Graphics
7. Artificial Intelligence
8. Selected Special Topics from the Field of Game Development
[*updated 26.02.2018*]

Recommended or required reading:
Main references:
Game Design and Development
Clinton Keith: Agile Game Development with SCRUM, 2010
Steve Rabin: Introduction to Game Development, 2010
Jeannie Novak: Game Development Essentials: An Introduction, 2011
Game Design
Scott Rogers: Level Up! The Guide to Great Video Game Design, 2014
Jesse Schell: Die Kunst des Game Designs, 2012
Ernest Adams: Fundamentals of Game Design, 2009

Suggested further reading:
Will Goldstone: Unity 3.x Game Development Essentials, 2011, ISBN-13: 978-1849691444
Penny Baillie-De Byl: Holistic Game Development with Unity: An All-In-One Guide to Implementing Game Mechanics, Art, Design, and Programming, 2011, ISBN-13: 978-0240819334
Chris Crawford: The Art of Computer Game Design
Ulrich Schmidt: Game Design und Produktion: Grundlagen, Anwendungen und Beispiele
Katie Salen, Eric Zimmermann: Rules of Play: Game Design Fundamentals, 2003, ISBN-13: 978-0262240451

[*updated 26.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

Human Computer Interaction

Module name (EN): Human Computer Interaction
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI636
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 5
Semester: 5
Mandatory course: no
Language of instruction: English
Assessment: Project work
Curricular relevance: KI636 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical KIB-HCI Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical KI855 Computer Science and Communication Systems, Master, ASPO 01.04.2016, semester 2, optional course, course inactive since 30.09.2009 MAM.2.1.2.20 Engineering and Management, Master, ASPO 01.10.2013, semester 1, optional course, specialisation PIBWI90 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific PIB-HCI Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Steven Frysinger

Lecturer: Prof. Steven Frysinger
[*updated 26.07.2009*]

Learning outcomes:
After successfully completing this module, students will be able to:
- Discuss the cognitive characteristics of humans involved in computing and information systems;
- Analyze information systems to assess their ability to meet user needs;
- Identify and characterize the users of a particular information system to be designed;
- Gather and analyze needs assessment data from representative users of an information system;
- Develop a hierarchical task analysis of the users;
- Develop both a conceptual design and a physical design for an information system;
- Write a user requirements specification for the system;
- Develop a test plan by which their system design could be submitted to summative evaluation upon implementation.

Computer systems are embedded in virtually every aspect of our modern life, from the database systems that help us run our businesses to the cellular telephones we have come to depend on for daily personal communication. However, developers of these tools frequently forget that the human being is part of the computer system, because essentially all of these systems depend on human interaction of some sort to produce the desired end result. In order to overcome this, we must educate computer system developers about the nature of the human/computer interface (HCI) and give them tools with which to design and test effective interfaces in the systems they develop.

This course will:

(A) make the system developer aware of the human aspects of the system, including the cognitive and perceptual attributes of the human being;

(B) provide the developer with design criteria and guidelines that will help produce effective interactive computer systems; and

(C) teach the developer how to quantitatively test the human/computer interface in a rigorous way
[*updated 26.02.2018*]

Module content:

1. Interactive Computer Systems, Human Factors Engineering, and the Software Engineering Lifecycle
2. Process of Interaction Design: User-centered Design
3. Needs Assessment and Requirements Specification
4. Conceptual Design
5. Physical Design: Graphical User Interfaces
6. Widget Design: When to use what
7. Test Phase: Evaluation
8. Understanding Users: Cognition, Sensation & Perception, Mental Models, and the "Differently-Abled"
9. Decision Support
10. Data Representation
11. Help and Documentation; Multimedia and the World Wide Web

[*updated 26.02.2018*]

Recommended or required reading:

Interaction Design (second edition). Jennifer Preece, Yvonne Rogers, Helen Sharp, John Wiley and Sons, 2007.

[*updated 26.02.2018*]

Module offered in:

WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

IT Contract Law

Module name (EN): IT Contract Law
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI670
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Written examination
Curricular relevance: KI670 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course PIBWN55 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: RA Cordula Hildebrandt

Lecturer:
RA Cordula Hildebrandt
[*updated 02.02.2007*]

Learning outcomes:
This course aims to teach students those legal issues that are of significance when drawing up a contract. In addition to covering general principles, the course will also examine aspects of special interest for contracts in the software industry.
By analysing discussions of court judgments, students will become acquainted with legal thought processes and legal arguments and will be able to understand the formulations used in individual contract clauses.
[*updated 08.05.2008*]

Module content:
- General information on contracts and declarations of intent
- Forms of contract as provided for by the German Civil Code (BGB)
- Software contracts, project contracts
- Important provisions, General Terms and Conditions
- Patent and proprietary rights
- Data protection and privacyConcluding contracts via the internet

[*updated 08.05.2008*]

Recommended or required reading:
WESTPHALEN, Friedrich Graf von: Vertragsrecht und AGB-Klauselwerke. CH Beck Verlag. 19. Auflage 2007
ZAHRNT, Christoph: Richtiges Vorgehen bei Verträgen über ITLeistungen. - Ein Ratgeber für Auftragnehmer und Auftraggeber-. dpunkt Verlag. 2. Auflage 2005.
Gesetzestexte, BGB (Bürgerliches Gesetzbuch): http://bundesrecht.juris.de/aktuell.html
http://www.jurawelt.de/
http://de.wikipedia.org/wiki/Vertrag
[*updated 08.05.2008*]

Module offered in:
WS 2007/08, WS 2006/07, SS 2005

IT Forensics

Module name (EN): IT Forensics
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI690
Hours per semester week / Teaching method: 1V+1P (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Successful participation in the tutorial, oral examination
Curricular relevance: DFBI-344 Computer Science and Web Engineering, Bachelor, ASPO 01.10.2018, semester 6, optional course, informatics specific KI690 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical KIB-ITF Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical PIBWI54 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific PIB-ITF Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI420 Operating Systems KI430 System Management and Security [*updated 21.07.2010*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Damian Weber

Lecturer:
Thorsten Wacker, M.Sc.
[*updated 21.07.2010*]

Learning outcomes:
After successfully completing this course, students will be able to use the system properties of an IT system to secure evidence that can be used in court after an IT security incident. To this end, they will apply best practices, compare the advantages and disadvantages, isolate problems that arise and investigate the usability of the secured data. They will be capable of interpreting the collected data and presenting the results convincingly to an independent authority.
[*updated 26.02.2018*]

Module content:

1. General information about the field
   Tools
   Literature

2. Introduction
   Definition of terms
   Motivation for authorities
   Motivation for companies

3. Principles of IT forensics
   Procedure model
   Digital traces
   Volatile data
   Interpreting data
   Interpreting time stamps

4. File system basics
   Hard disks, partitioning, file systems
   Unix file management

5. File system analysis
   Creating a file system image
   Analyzing a file system image
   Deleted files
   File carving

6. Analyzing a compromised system
   Process handling
   RAM
   Rootkits

[*updated 26.02.2018*]

Recommended or required reading:

Forensic Discovery. (Addison-Wesley Professional Computing) (hard cover)
by Daniel Farmer (author), Wietse Venema (author)
http://www.amazon.de/Forensic-Discovery-Addison-Wesley-Professional-Computing/dp/020163497X

File System Forensic Analysis. (soft cover) by Brian Carrier (author)
http://www.amazon.de/System-Forensic-Analysis-Brian-Carrier/dp/0321268172

[*updated 26.02.2018*]

Module offered in:

WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, ...

IT Forensics Practical Course

Module name (EN): IT Forensics Practical Course
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI601
Hours per semester week / Teaching method: 2P (2 hours per week)
ECTS credits: 3
Semester: according to optional course list
Mandatory course: no
Language of instruction: German
Assessment: Project work
Curricular relevance: KI601 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, optional course, technical KIB-ITFP Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI66 Applied Informatics, Bachelor, ASPO 01.10.2011, optional course, informatics specific PIB-ITFP Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Damian Weber

Lecturer: Prof. Dr. Damian Weber
[*updated 11.02.2015*]

Learning outcomes:
After successfully completing this course, students will be able to secure justiciable evidence in the event of an IT security incident. In particular, they will be capable of tracing manipulative operations at the operating system level. This will enable them to uncover digital traces of electronic transactions or data transfers, even if they were rendered unusable for purposes of deception.
[*updated 26.02.2018*]

Module content:
1. General information about the field
   Tools
   Literature

2. Introduction
   Definition of terms
   Motivation for authorities
   Motivation for companies

3. Principles of IT forensics
   Procedure model
   Digital traces
   Volatile data
   Interpreting data
   Interpreting time stamps

4. File system basics
   Hard disks, partitioning, file systems
   Unix file management

5. File system analysis
   Creating a file system image
   Analyzing a file system image
   Deleted files
   File carving

6. Analyzing a compromised system
   Process handling
   Rootkits

[*updated 26.02.2018*]

Recommended or required reading:
Forensic Discovery. (Addison-Wesley Professional Computing) (hard cover)
by Daniel Farmer (author), Wietse Venema (author)
http://www.amazon.de/Forensic-Discovery-Addison-Wesley-Professional-Computing/dp/020163497X

File System Forensic Analysis. (soft cover) by Brian Carrier (author)
http://www.amazon.de/System-Forensic-Analysis-Brian-Carrier/dp/0321268172

[*updated 26.02.2018*]

Module offered in:
SS 2016, SS 2015

Industrial Ecology

Module name (EN): Industrial Ecology
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI671
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: English
Assessment: Project work
Curricular relevance: KI671 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical KIB-INEC Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical MAB.4.2.6.4 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 6, optional course, non-technical PIBWN11 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific PIB-INEC Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific Suitable for exchange students (learning agreement)
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Steven Frysinger

Lecturer:
Prof. Steven Frysinger
[*updated 28.01.2012*]

Learning outcomes:
After successfully completing this module, students will be able to:
- Define environmental science and describe the key environmental challenges presented by industrial society;
- Define industrial ecology and explain the metaphorical relationship between industrial systems and biological ecosystems;
- Interpret the _master equation_ of industrial ecology and explain the role of technology in the pursuit of a more sustainable industrial society;
- Define and give examples of the concepts of Design for Environment and Environmentally Conscious Manufacturing;
- Provide a detailed explanation of the Life Cycle Assessment methodology and carry out such an assessment on a product/system;
- Discuss allocation of environmental loads to system components;
- Interpret the role of Life Cycle Assessment in environmental management decision-making.
[*updated 26.02.2018*]

Module content:
We will study the theoretical underpinnings of IE, briefly examining the biological metaphor for industrial ecosystems. We will also address various elements of practice which are associated with IE, especially Life Cycle Assessment and Design for Environment. Our goal is to better understand how industrial ecology can help us to evolve into a sustainable industrial society.
[*updated 26.02.2018*]

Recommended or required reading:
GRAEDEL, T. E./ B. R. ALLENBY, B.R.: Industrial Ecology. Prentice Hall, 2003.
[*updated 26.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

Information Retrieval

Module name (EN): Information Retrieval

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI584

Hours per semester week / Teaching method: 2V+2PA (4 hours per week)

ECTS credits: 5

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam/Project

Curricular relevance:
KI584 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, informatics specific
KIB-IRET Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical
PIBWI29 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific
PIB-IRET Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific
Suitable for exchange students (learning agreement)

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI100 Programming 1
KI110 Informatics 1
KI160 Mathematics 1
KI190 English 1
KI200 Programming 2
KI260 Mathematics 2
KI290 English 2
KI360 Mathematics 3
[*updated 18.03.2015*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Klaus Berberich

Lecturer: Prof. Dr. Klaus Berberich
[*updated 18.03.2015*]

Learning outcomes:
After successfully completing this course, students will have learned basic information retrieval methods. This
includes retrieval models (e.g., Vector Space Model), link analysis
(e.g., PageRank), and effectiveness measures (e.g., Precision/Recall
and MAP). They will be able to apply/implement the above methods in practice. In
addition, students will be aware of easily accessible information
retrieval systems (e.g., Apache Lucene/Solr).
[*updated 26.02.2018*]

Module content:
Information Retrieval is pervasive and its applications range from finding contacts or e-mails on your smartphone to web-search engines that index billions of web pages. This course covers the most important information retrieval methods. We will look into how these methods are defined formally, including the mathematics behind them, but also see how they can be implemented efficiently in practice. As part of the project work, we will implement a small search engine from scratch.

1. Introduction
- History
- Applications
- Course overview

2. Natural language
- Documents and terms
- Stopwords and stemming/lemmatization
- Synonyms, polysemes, compounds

3. Retrieval models
- Boolean retrieval
- Vector space model with TF.IDF term weighting
- Language models

4. Indexing methods
- Inverted index
- Compression (d-Gaps, variable-byte encoding)
- Index pruning

5. Query processing
- Holistic methods (DAAT, TAAT)
- Top-k methods (NRA, WAND)

6. Evaluation
- Cranfield Paradigm
- Benchmark initiatives (TREC, CLEF, NTCIR)
- Traditional effectiveness measures (precision, recall, MAP)
- Non-traditional effectiveness measures (nDCG, ERR)

7. Web retrieval
- Crawling
- Near-duplicate detection
- Link analysis (PageRank, HITS)
- Web spam

8. Information retrieval systems
- Indri
- Apache Lucene/Solr
- ElasticSearch

[*updated 26.02.2018*]

Recommended or required reading:
Christopher D. Manning, Prabhakar Ragahavan, and Hinrich SchÃ¼tze: Introduction to Information Retrieval, Cambridge University Press, 2008.
(available online at: http://nlp.stanford.edu/IR-book/)

Reginald Ferber: Information Retrieval: Suchmodelle und Data-Mining Verfahren fÃ¼r Textsammlungen und das Web, dpunkt, 2003.
(available online at: http://information-retrieval.de/irb/ir.html)

Stefan Büttcher, Charles L. A. Clarke, Gordon V. Cormack: Information Retrieval: Implementing and Evaluating Search Engines, MIT Press, 2010.
[*updated 26.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, SS 2018, SS 2017, SS 2016

Integration Compatible Circuitry

Module name (EN): Integration Compatible Circuitry
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI667
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment:
Curricular relevance: KI667 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI220 Physical and Technical Foundations of IT 2 [*updated 31.01.2007*]
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Albrecht Kunz

Lecturer:
Prof. Dr. Albrecht Kunz
[*updated 31.01.2007*]

Learning outcomes:
[*still undocumented*]

Module content:
[*still undocumented*]

Recommended or required reading:
[*still undocumented*]

Module offered in:
WS 2012/13, WS 2011/12, WS 2010/11, WS 2009/10, WS 2007/08, ...

Intercultural Communication

Module name (EN): Intercultural Communication

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI589

Hours per semester week / Teaching method: 2SU (2 hours per week)

ECTS credits: 2

Semester: 6

Mandatory course: no

Language of instruction:
German

Assessment:
Composition

Curricular relevance:
BMT1584 Biomedical Engineering, Bachelor, ASPO 01.10.2013, optional course, non-medical/technical
E1584 Electrical Engineering, Bachelor, ASPO 01.10.2012, optional course, non-technical
KI589 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical
KIB-INTK Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course
MAB.4.2.1.27 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 4, optional course, non-technical
PIBWN67 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific
PIB-INTK Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Andrea Roth, M.A.
[*updated 11.10.2013*]

Learning outcomes:
The main objective of this course is the development of consciousness and reflection on one´s own cultural imprint in thought, action and communication patterns. This awareness is decisive for any successful intercultural cooperation in both professional and private spheres.
We approach other cultures through an idea of culture that influences our perception, thinking and actions. The characteristics and comparable dimensions of cultures on the macro level are in the foreground here. These, in turn, are complemented by a look at the intercultural micro-level that arises in the contact between individuals.
An introduction to the theories and approaches from different disciplines to these questions will enable a better understanding of people from other cultures and is intended to facilitate a change of perspective. This change of perspective is a central starting point for acquiring the following key competences:
- The ability to assess your own personal cultural influence,
- The ability to know, understand and accept backgrounds of foreign/culturally specific behavior,
- The ability to deal with contradiction and ambiguity,
- The ability to behave adequately in an intercultural context and thus, enable effective action.

[*updated 19.02.2018*]

Module content:
1. What is culture? How do cultural differences arise? Stereotypes?
2. Communication and culture _ How does communication work and what role can cultural factors play in it?
3. Verbal and non-verbal communication
4. Acculturation/Culture shock
5. Intercultural communication strategies
6. Diversity management
7. Globalization and its influences on culture and intercultural communication

Case studies and examples will be adapted to the needs of the students.
[*updated 19.02.2018*]

Teaching methods/Media:
Lectures by lecturers and discussion, group work on small case studies, simulation games, films.
[*updated 19.02.2018*]

Recommended or required reading:
R. Gibson: Intercultural Business Communication. Cornelsen & Oxford
F.E. Jandt: An Introduction to Intercultural Communication _ Identities in a Global Community. Sage
M. Mooij: Global Marketing and Advertising. Sage
J.W. Neuliep: Intercultural Communication _ A Contextual Approach. Sage
M. Schugk: Interkulturelle Kommunikation. Verlag Franz Vahlen
[*updated 19.02.2018*]

Module offered in:
SS 2018, SS 2017, SS 2016, SS 2015, SS 2014

Internet Development with Java 1

Module name (EN): Internet Development with Java 1
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI581
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 5
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Project work
Curricular relevance: KI581 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical KIB-IJA1 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical PIBWI24 Applied Informatics, Bachelor, ASPO 01.10.2011, optional course, informatics specific PIB-IJA1 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI100 Programming 1
KI200 Programming 2
KI400 Software Engineering 2
[*updated 20.07.2016*]

Recommended as prerequisite for:

Module coordinator:
Dipl.-Inf. Christopher Olbertz

Lecturer: Dipl.-Inf. Christopher Olbertz
[*updated 18.07.2016*]

Lab:
Technical Systems Lab (8207)

Learning outcomes:
After successfully completing this course, students will:
- be able to manage, modularize and document a project with Maven.
- understand the Java configuration of Spring.
- be able to use SpringBoot for their own web applications.
- be able to write a Java application with JSPs.
- understand the life cycle of JSF and can apply it to their own programs.
- be capable of developing and running a JSF-based application.
[*updated 19.02.2018*]

Module content:
The lecture offers an introduction to modern Java technologies for the development of dynamic websites. Stand-alone programs are developed on a SpringBoot basis with an integrated web server. However, all technologies also work on a common server such as GlassFish. The main focus of the lecture is on JavaServer Faces.

1. Basic terms from the field of web development

2. Maven
2.1. Principles of Maven
2.2. Modularization with Maven
2.3. Profiles
2.4. Documentation with Maven

3. Spring and SpringBoot
3.1. Introduction to Spring and SpringBoot
3.2. Java configuration of Spring
3.3. Advanced Springboot configuration

4. JavaServer Pages (JSP)
4.1. Short introduction to servlets
4.2. JSP

5. JavaServer Faces
5.1. The concept of JavaServer Faces and the lifecycle of JSF pages
5.2. Portlets with JavaServer Faces
5.3. ManagedBeans as an interface between Java and websites
5.4. Event handling in JSF
5.5. Validation with JSF
5.6. JSF Ajax library
5.7. Introduction to PrimeFaces
5.8. The JSF template mechanism
5.9. Developing your own components
5.10. Running JSF applications with SpringBoot
5.11. Running JSF applications with a GlassFish server
[*updated 19.02.2018*]

Teaching methods/Media:
Transparencies with notes, exercises, Kahoot quiz
[*updated 19.02.2018*]

Recommended or required reading:
Martin Spiller: Maven 3 - Konfigurationsmanagement mit Java
Andy Bosch: Portlets und JavaServer Faces
Burns Schalk: JavaServer Faces 2.0
Bernd Müller: JavaServer Faces 2.0
[*updated 19.02.2018*]

Module offered in:
WS 2018/19, WS 2017/18, WS 2016/17

Internet Development with Java 2

Module name (EN): Internet Development with Java 2
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI577
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Project, presentation, documentation
Curricular relevance: KI577 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-IJA2 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI21 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific PIB-IJA2 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:

Module coordinator:
Dipl.-Inf. Christopher Olbertz

Lecturer: Dipl.-Inf. Christopher Olbertz
[*updated 10.02.2017*]

Learning outcomes:
After successfully completing this course, students will:
- be able to set up, configure and operate a Liferay portal server.
- be able to develop their own portlets that correspond to the standard.
- be able to develop their own portlets with the Liferay API.
- be able to use Apache Tiles as a templating mechanism.
- be able to use other Spring projects in their web application.
- be able to develop their own applications in Vaadin.
[*updated 24.02.2018*]

Module content:
This lecture is based on "Internet Development with Java 1" and teaches further concepts in web page development with the programming language Java. One of the topics is for example, the construction and operation of a Java portal based on the OpenSource container Liferay using the SystemTechnikPortal that runs in the SystemTechnikLab. First, the concepts of the portlet standard (JSR 286) and the development of portlets with the standard will be discussed. Then, we will learn about Liferay´s proprietary API that makes development much easier. In addition, Vaadin will be introduced as an alternative View technology to JSP/JSF.

1. Portlet concepts and basics
1.1. Introduction: basics and concepts of portlet technology
1.2. Liferay as a portlet container
1.3. Portlet 2.0 (JSR 286)
1.4. JavaServer Pages (JSP) as a standard presentation technology
1.5. Basic administration of a portal server

2. Liferay API
2.1. Developing with the Plugins SDK
2.2. Service Builder
2.3. Liferay portlet MVC
2.4. Managing users and permissions
2.5. Hooks

3. Apache Tiles as a templating mechanism

4. Spring in web applications
4.1. Spring MVC
4.2. Spring Webflow
4.3. Spring Data JPA
4.4. Spring Security

5. Vaadin GUI framework
5.1. How Vaadin works
5.2. Vaadin and JSF: a comparison
5.3. Portlets with Vaadin
[*updated 24.02.2018*]

Teaching methods/Media:
Transparencies with notes, exercises, Kahoot quiz, GlassFish as an application server
[*updated 24.02.2018*]

Recommended or required reading:
Richard Sezov: Liferay in Action
Xinsheng Chang: Liferay 6.2 - User Interface Development
Baumann, Arndt, Engelen, Hardy, Mjartan: Vaadin - Der kompakte Einstieg für Java-Entwickler
Craig Walls: Spring im Einsatz
[*updated 24.02.2018*]

Module offered in:
WS 2019/20, SS 2019, SS 2018, SS 2017

Internet and the Law

Module name (EN): Internet and the Law

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI651

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 2

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
KI651 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, non-technical
KIB-REII Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, non-technical
MAB.4.2.7.4 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 5, optional course, non-technical
PIBWN60 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific
PIB-REII Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, not informatics specific

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
RA Cordula Hildebrandt

Lecturer:
RA Cordula Hildebrandt
[*updated 01.04.2003*]

Learning outcomes:
After successfully completing this module, students will be familiar with the legal issues that are of significance when creating, maintaining and hosting a website.
They will be able to answer questions pertaining to general topics such as the application of law to the internet, copyright infringement and intellectual property rights, as well as to more advanced topics such as e-commerce, distance selling, concluding contracts via the internet, internet security and data protection and privacy. They will be capable of demonstrating what they have learned using examples and relevant legal judgments.
Students will be able to assess the applicability of the relevant regulations and laws in this area and use this knowledge to clarify new issues.
[*updated 26.02.2018*]

Module content:
1. The website
1.1 Domain name law
 a) Address allocation
 b) Requirements relating to potential infringements of trademark law
1.2 Impressum (site information required under German law)
 a) Mandatory information
 b) Requirements under German employment law
2. Concluding contracts via the Internet
2.1 Formal requirements
2.2 Offer and acceptance
2.3 General terms and conditions
2.4 Appeals
3. Patent and proprietary rights
3.1 Application of law
3.2 Copyright laws
3.3 Trademark law
4. Security
4.1 Electronic signatures
4.2 Watermarks
5. Data protection and privacy
[*updated 26.02.2018*]

Recommended or required reading:
http://www.rechtslexikon-online.de   Gesetzestexte

http://www.jurawelt.de/
Navigation bar: Studentenwelt -> Skripten -> A. Zivilrecht

http://www.uni-muenster.de/Jura.itm/hoeren/
Navigation bar: Lehre -> Materialien -> Skriptum Internet-Recht
[*updated 26.02.2018*]

Module offered in:
SS 2020 (probably), WS 2019/20, SS 2019, WS 2018/19, SS 2018, ...

Introduction to Astronomy

Module name (EN): Introduction to Astronomy

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI674

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 2

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:

Curricular relevance:
KI674 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, non-technical
KIB-ASTR Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, non-technical
MAB.4.2.1.3 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 5, optional course
MST.EAS Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 5, optional course, non-technical
MST.EAS Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 5, optional course, non-technical
PIBWN25 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific
PIB-ASTR Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, not informatics specific
MST.EAS Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, semester 5, optional course, non-technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Martin Löffler-Mang

Lecturer: Prof. Dr. Martin Löffler-Mang
[*updated 08.05.2007*]

Learning outcomes:
After successfully completing this module, students will be able to orient themselves on the night sky, recognize structures and find the most important constellations in the northern sky. In addition, they will be capable of using the most important basic tools for astronomical observations. Students will also be familiar with elementary celestial mechanics and will be able to make simple predictions for the rising and setting of selected celestial bodies. Finally, students will know about the various astronomical objects in the sky and will be familiar with the standard models for both the formation of the universe (Big Bang theory) and its further development (accelerated expansion of the universe).
[*updated 19.02.2018*]

Module content:
Part I: Introduction
1. Where Are We?
2. The Night Sky
3. Observation Tools

Part II: The Solar System
1. The Sun
2. The Moon
3. The Planets
4. Celestial Mechanics

Part III: Astronomical Instruments
1. Large Telescopes
2. Space Telescopes

Part IV: Astrophysics
1. Cosmology
2. The Principles and Terms of Nuclear Physics (Folkerts)
3. Stars, Star Formation, The Origin of Elements (Folkerts)
4. Are We Alone?

[*updated 19.02.2018*]

Teaching methods/Media:
Lecture, observations
[*updated 26.02.2018*]

Recommended or required reading:
Kosmos-Himmelsjahr (almanac)
Sterne und Weltraum (monthly journal)
[*updated 19.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

Introduction to Parallel Programming with CUDA

Module name (EN): Introduction to Parallel Programming with CUDA
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI593
Hours per semester week / Teaching method: 1V+1P (2 hours per week)
ECTS credits: 3
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Project work, presentation and composition
Curricular relevance: DFBI-342 Computer Science and Web Engineering, Bachelor, ASPO 01.10.2018, semester 6, optional course, informatics specific KI593 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical KIB-CUDA Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical PIBWI39 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific PIB-CUDA Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI100 Programming 1
KI110 Informatics 1
KI400 Software Engineering 2
KI420 Operating Systems
KI430 System Management and Security
[*updated 18.10.2013*]

Recommended as prerequisite for:

Module coordinator:
Dipl.-Inform. Marion Bohr

Lecturer: Dipl.-Inform. Marion Bohr
[*updated 13.09.2012*]

Lab:
IT-security lab (5103/2)

Learning outcomes:
CUDA (Compute Unified Device Architecture) is a technology developed by NVIDIA that allows software developers and software engineers to use a CUDA-enabled graphics processing unit for general purpose processing.

After successfully completing this module, students will have received insight into problem solving by means of parallel programming. They will understand the algorithmic basics of parallel programming. Students will be capable of using hardware and software components based on CUDA and demonstrate their use by carrying out clearly defined practical exercises. They will be able to leverage the strengths of a GPU architecture in practice-oriented project work, optimize its performance and analyze the resource requirements of a parallel implementation.
[*updated 26.02.2018*]

Module content:
* Basics: processes, threads, blocks, warps, memory types, etc.
* Algorithmic basics
* Examples of algorithms and implementations for programs that can and cannot be parallelized
* Runtime measurement, runtime comparison, possibilities for increasing performance
* GPU applications from different subject areas using the example of CUDA
[*updated 26.02.2018*]

Teaching methods/Media:
Presentation slides, board, exercises
[*updated 26.02.2018*]

Recommended or required reading:
* The CUDA Handbook: A Comprehensive Guide to GPU Programming, Nicholas Wilt, Addison-Wesley 2013
* CUDA by Example _ An Introduction to General-Purpose GPU Programming, Jason Sanders/ Edward Kandrot, Addison-Wesley 2011
* Programming Massively Parallel Processors _ A Hands-on Approach, David B. Kirk/ Wen-mei W. Hwu, Elsevier-Morgan Kaufmann Publishers 2010
[*updated 26.02.2018*]

Module offered in:
WS 2017/18, WS 2016/17, WS 2015/16, WS 2014/15, WS 2013/14, ...

Introduction to Project Management

Module name (EN): Introduction to Project Management
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI639
Hours per semester week / Teaching method: 2V+2PA (4 hours per week)
ECTS credits: 4
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment:
Curricular relevance: KI639 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, non-technical PIBWN30 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Dipl.-Ing. Michael Sauer

Lecturer: Dipl.-Ing. Michael Sauer [*updated 26.07.2009*]
Learning outcomes: [?] [*still undocumented*]
Module content: [?] [*still undocumented*]
Recommended or required reading: [?] [*still undocumented*]
Module offered in: WS 2011/12, WS 2010/11, WS 2009/10, WS 2008/09, WS 2007/08, ...

Introduction to Wireless LANs

Module name (EN): Introduction to Wireless LANs

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI632

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 3

Semester: 6

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam (90 min.)

Curricular relevance:
KI632 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical
KIB-WLAN Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical
PIBWI20 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific
PIB-WLAN Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI320 Computer Networks
[*updated 01.04.2003*]

Recommended as prerequisite for:

Module coordinator:
Dipl.-Math. Wolfgang Braun

Lecturer:
Dipl.-Math. Wolfgang Braun
[*updated 01.04.2003*]

Learning outcomes:
After successfully completing this module, students will have a basic understanding of the terms and relationships required for the use of WLAN in communications technology.
- They will be able to explain the basic concepts of WLAN technologies according to the standard 802.11
- They will be able to use the formulas from telecommunications engineering discussed in the lecture to solve problems in the field of WLAN.
- Students will know how to set up secure WLAN environments
- They will be able to explain basic procedures for planning, installing, configuring (functionality, security) and monitoring WLAN systems
- And they will be able to design simple WLAN applications

[*updated 19.02.2018*]

Module content:
- Basic functionality according to the IEEE 802.11 standard
- Typical areas of application and reasons for use
- Basic knowledge about electromagnetic waves (modulation, attenuation, antenna gain, free space path loss,...)
- Practical exercises on the propagation of electromagnetic waves
- Problems with use and negative aspects
- The technologies of the WLAN standard 802.11
- Presentation of a current system with practical experiments
- Security in WLANs
- Planning and monitoring WLANs with a presentation of the software used for this purpose
- Examples of use
- Evaluation criteria for WLAN systems

[*updated 19.02.2018*]

Teaching methods/Media:
Lecture using PowerPoint slides and worksheets. Practical experiments with standard WLAN hardware and home-made antennas.
[*updated 19.02.2018*]

Recommended or required reading:
PowerPoint slides will be available to the students.
Rech, J. : Wireless LANs Heise-Verlag, 4. Auflage, Hannover 2012, ISBN 978-3-936931-75-4
Kauffels, F.-J. : Moderne Wireless-Technologien, Technologiereport der Firma ComConsult, 2012
[*updated 19.02.2018*]

Module offered in:
SS 2020 (probably), WS 2019/20, SS 2019, WS 2018/19, SS 2018, ...

Italian for Beginners 1

Module name (EN): Italian for Beginners 1
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI661
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: no
Language of instruction: Italian
Assessment: Written exam at end of course
Curricular relevance: KI661 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course PIBWN45 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for: KI662 Italian for Beginners 2 [*updated 27.11.2012*]

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Paola Netti
[*updated 16.01.2007*]

Learning outcomes:
The course Italian for Beginners 1 is designed for learners with no or only very limited proficiency in Italian. The modules Italian for Beginners 1 and 2 have been designed so that module 2 builds on the skills and knowledge acquired in module 1. During the course of these two modules, student language proficiency should be raised first to level A1 and then to level A2 of the Common European Framework.
The aim is to teach students the fundamentals of Italian so that they can, within a relatively short space of time, use the spoken and written language to express themselves in general everyday and professional situations. Students will receive training in all four language skills: oral expression, listening comprehension, reading comprehension and written expression. Language acquisition will be supported and supplemented by teaching students the relevant grammar structures.
The lessons are based on a communicative-pragmatic approach that aims to promote communicative proficiency in career-relevant situations by using role-playing and situational dialogues. Intercultural aspects are also incorporated to raise student awareness of cultural differences and to make them better able to use language appropriate to specific business or social situations.
[*updated 08.05.2008*]

Module content:
Functional expressions:

- Greeting and welcoming someone
- Introducing someone
- Introducing yourself
- Talking about yourself
- Asking people about themselves
- Offering something
- Explaining a problem
- Talking about another person
- Placing an order
- Enquiring about something
- Describing a person
- Describing an object or process
- Describing family and social relationships
- Talking about regular activities, habits and hobbies

Grammar practice (particularly Linea Diretta 1a, Lezioni 1-4):

- Present tense
- Subject pronouns
- Definite and indefinite articles
- Nouns and adjectives (singular and plural forms)
- Possessive pronouns
- Direct object pronouns
- Prepositions of time and place
- Forming adverbs

Vocabulary:

- Basic vocabulary
- Countries and nationalities
- The alphabet and pronunciation
- Numbers
- Clock times

[*updated 08.05.2008*]

Teaching methods/Media:
A selection of language teaching and learning materials appropriate to the target group (print media, audio-visual aids), multimedia language learning software
[*updated 08.05.2008*]

Recommended or required reading:
C. Conforti, L. Cusimano: Linea Diretta neu 1a, Hueber
S. Bertoni, S. Nocchi : Le parole italiane. Esercizi e giochi per imparare il lessico, Hueber
D. Alessandroni, Cara Italia...Eserciziario, Hueber
[*updated 13.03.2007*]

Module offered in:
WS 2007/08, WS 2006/07, WS 2005/06

Italian for Beginners 2

Module name (EN): Italian for Beginners 2
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI662
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 6
Mandatory course: no
Language of instruction: Italian
Assessment: Written exam at end of course
Curricular relevance: KI662 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical PIBWN46 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI661 Italian for Beginners 1 [*updated 27.11.2012*]
Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Paola Netti
[*updated 27.11.2012*]

Learning outcomes:
The modules Italian for Beginners 1 and 2 have been designed so that module 2 builds on the skills and knowledge acquired in module 1. During the course of these two modules, student language proficiency should be raised first to level A1 and then to level A2 of the Common European Framework.

The aim is to teach students the fundamentals of Italian so that they can, within a relatively short space of time, use the spoken and written language to express themselves in general everyday and professional situations. Students will receive training in all four language skills: oral expression, listening comprehension, reading comprehension and written expression. Language acquisition will be supported and supplemented by teaching students the relevant grammar structures.

The lessons are based on a communicative-pragmatic approach that aims to promote communicative proficiency in career-relevant situations by using role-playing and situational dialogues. Intercultural aspects are also incorporated to raise student awareness of cultural differences and to make them better able to use language appropriate to specific business or social situations.
[*updated 08.05.2008*]

Module content:
Functional expressions:
- Routine activities and habits in contrast to occasional or one-off activities
- Making, accepting and rejecting proposals
- Speaking about your past
- Speaking about your education
- Writing job applications and compiling a CV
- Explaining something and discussing problems
- Exchanging information
- Telephoning (e.g. requesting quotes, reaching an agreement, registering a complaint, making an appointment)
- Looking after customers and visitors
- Correspondence (writing business letters, faxes, e-mails, quotations, orders, letters of complaint)
- Interpreting numbers and tables
- Active participation in meetings
- Presentations

Grammar practice (particularly Linea Diretta 1a Lezioni 5-8):
- Passato prossimo
- The imperfect
- The auxiliary verbs avere and essere
- Reflexive verbs
- Double negation
- Superlativo assoluto
- The si construction
- The partitive article
- The continuous aspect (stare + gerund)
- The comparative
- Formulating questions with interrogatives

Vocabulary:
Consolidating basic vocabulary, introduction to career and work-related vocabulary
[*updated 08.05.2008*]

Teaching methods/Media:
A selection of language teaching and learning materials appropriate to the target group (print media, audio-visual aids), multimedia language learning software
[*updated 08.05.2008*]

Recommended or required reading:
C. Conforti, L. Cusimano: Linea Diretta neu 1a, Hueber
S. Bertoni, S. Nocchi: Le parole italiane. Esercizi e giochi per imparare il lessico, Hueber
D. Alessandroni: Cara Italia...Eserciziario, Hueber
[*updated 13.03.2007*]

Module offered in:
SS 2008, SS 2007

Law for Business Founders

Module name (EN): Law for Business Founders
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI673
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Written exam
Curricular relevance: KI673 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical KIB-REXG Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical MAB.4.2.7.3 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 6, optional course, non-technical PIBWN56 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific PIB-REXG Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:

Module coordinator:
RA Cordula Hildebrandt

Lecturer:
RA Cordula Hildebrandt
[*updated 06.02.2007*]

Learning outcomes:
The course provides students with the important legal knowledge necessary for founding and operating a company.

After successfully completing this module, they will be able to select the right form of company for setting up a business and examine the corresponding possibilities for funding.

Students will be able to answer typical questions about setting up a company:
Which contracts does a young entrepreneur have to conclude to cover his own needs?
What is important when concluding a contract with a customer?
Which liability issues and protection options are relevant?

Students will be able to model the path from the initial idea to operation and use practical examples to assess the legal possibilities and dangers.
[*updated 26.02.2018*]

Module content:
1. Introduction Idea, business plan

2. Paths to starting your own company:
   forming a new company, participation, takeover

3. Funding, grants

4. Contract law, drafting a contract

5. Advertising, unfair competition

6. Liability, insurance
[*updated 26.02.2018*]

Recommended or required reading:
Starting a business:
http://www.existenzgruender.de/
http://www.ihk-nordwestfalen.de/existenzgruendung/index.php
http://www.franchiseportal.de/franchise-franchising/Article/ID/19/Session/1-ai7bwP5t-0-IP/Start.htm

Legislative texts:
http://bundesrecht.juris.de/aktuell.html (BGB)
http://www.jurawelt.de/ (contract law)
[*updated 26.02.2018*]

Module offered in:
WS 2017/18, SS 2017, WS 2016/17, SS 2016, WS 2015/16, ...

Machine Learning

Module name (EN): Machine Learning
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI575
Hours per semester week / Teaching method: 2V+2U (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: English
Assessment: Written exam
Curricular relevance: KI575 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-MLRN Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI19 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific PIB-MLRN Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific Suitable for exchange students (learning agreement)
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI110 Informatics 1
KI160 Mathematics 1
KI260 Mathematics 2
KI360 Mathematics 3
[*updated 02.03.2017*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Klaus Berberich

Lecturer: Prof. Dr. Klaus Berberich
[*updated 10.02.2017*]

Learning outcomes:
After successfully completing this module, students will know about fundamental supervised and unsupervised methods from machine learning. This includes methods for regression, classification, and clustering. Students will understand how these methods work and know how to use existing implementations (e.g., in libraries such as scikit-learn). Given a practical problem setting, they will be able to choose a suitable method, apply it to the dataset at hand, and assess the quality of the determined model. In addition, students will be aware of typical data-quality issues and know how to resolve them.
[*updated 26.02.2018*]

Module content:
Machine learning plays an increasingly important role with applications ranging from recognizing handwritten digits, via filtering out unwanted span e-mails, to the ranking of results in modern search engines. After successfully completing this module, students will know about fundamental supervised and unsupervised methods of machine learning. We will look into how these methods are defined formally, including the mathematics behind them. Moreover, we will apply all methods on concrete datasets to solve practical problems. To do so, we will rely on existing libraries (e.g., scikit-learn) that provide efficient implementations of the methods. This course will be accompanied by theoretical exercises and project assignments. The exercises will help students to deepen their understanding of the methods, while the project assignments will encourage students to solve practical problems by applying their knowledge to real-world datasets.

1. Introduction
- What is Machine Learning?
- Applications
- Libraries
- Literature

2. Working with data
- Typical data formats (e.g., CSV, spreadsheets, databases)
- Data quality issues (e.g., outliers, duplicates)
- Scales of measures (i.e., nominal, ordinal, numerical)
- Data pre-processing (in Python and using UNIX command line tools)

3. Regression
- Ordinary least squares
- Multiple linear regression
- Non-linear regression
- Evaluation

4. Classification
- Logistic regression
- k-nearest neighbors
- Naive Bayes
- Decision trees
- Neural networks
- Evaluation

5. Clustering
- k-means and k-medoids
- Hierarchical agglomerative/divisive clustering
- Evaluation

6. Outlook
- Ongoing research
- Competitions (e.g., Kaggle and KDD Cup)
- Other resources (e.g., KDnuggets)
[*updated 26.02.2018*]

Recommended or required reading:
P. Harrington: Machine Learning in Action, Manning, 2012

G. James, D. Witten, T. Hastie, R. Tibshirani: An Introduction to Statistical Learning - with Applications in R, Springer, 2015

A. C. Müller and S. Guido: Introduction to Machine Learning with Python, O´Reilly, 2017

M. J. Zaki und W. Meira Jr.: Data Mining and Analysis: Fundamental Concepts and Algorithms, Cambridge University Press, 2014
[*updated 26.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017

Management and Communication

Module name (EN): Management and Communication
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI644
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Student assignment, exercises and a written exam
Curricular relevance: KI644 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, non-technical PIBWN15 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Klaus-Jürgen Schmidt

Lecturer:
Prof. Dr. Klaus-Jürgen Schmidt
[*updated 01.04.2003*]

Learning outcomes:
Students will learn about important elements of interpersonal communication and management and how to apply them. They will gain insight into day-to-day management processes and will examine case studies of team management within companies. After completing this course, students will be able to work more efficiently in groups and influence team interaction in a positive manner.
[*updated 13.03.2007*]

Module content:
1. The basic terminology of interpersonal communication
2. The relationship between interpersonal communication and management
3. Techniques of verbal communication and feedback
4. Facilitation and moderation skills
5. Presentations and communication
6. Creativity techniques
7. Problem-solving techniques
8. Team development
[*updated 08.05.2008*]

Recommended or required reading:
Gehm, Theo: Kommunikation im Beruf, Weinheim und Basel 1994
Mehrmann, Elisabeth: Präsentation und Moderation
Schulz von Thun, Friedmann: Miteinander reden I-IV. Reinbeck 2002
Weinert, A.B.: Organisationspsychologie, Weinheim 1998
Additional print and web-based references will be provided.
[*updated 08.05.2008*]

Module offered in:
WS 2015/16, WS 2014/15, WS 2013/14, WS 2012/13, SS 2012, ...

Mathematical Software Systems and Algorithmic Applications

Module name (EN): Mathematical Software Systems and Algorithmic Applications
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI637
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 5
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Case studies/Project collection
Curricular relevance: KI637 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical KIB-MSAA Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical PIBWI91 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific PIB-MSAA Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI160 Mathematics 1
KI260 Mathematics 2
[*updated 28.09.2009*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Barbara Grabowski

Lecturer:
Prof. Dr. Barbara Grabowski
[*updated 28.09.2009*]

Lab:
Applied Mathematics, Statistics, and eLearning (5306)

Learning outcomes:
After successfully completing this module, students will be familiar with typical mathematical software, know its advantages and disadvantages, can classify it according to type and application areas and can develop solution algorithms for simpler problems and implement them in a suitable language. They will be able to differentiate between computer algebra systems, numerical systems, statistical software, graphical systems and logical programming languages. They will be familiar with the problems of rounding errors and error propagation and know how to control such errors.
Furthermore, they will be able to manipulate and analyze mathematical terms with the typical data and control structures of computer algebraic systems (CAS) and implement algorithms for symbolic term transformations.
[*updated 19.02.2018*]

Module content:
1. Problems of rounding errors, error propagation

2. Classification of common math software systems
2.1. Numerical packages
(classification, computation accuracy, rounding problems,
error propagation, typical examples)
2.2. Computer algebraic systems
(classification, exact computations, symbolic computation, runtime problems, typical examples)
2.3. Other software
(graphical CAS, statistics packages, software for TR, typical examples)
2.4. Declarative languages
(description of the problem and not the solution algorithm, typical examples)

3. CAS
3.1. General elementary concepts of computer algebra
3.2. Recursive structure of mathematical expressions
3.3. Elementary mathematical algorithms, case study
3.4. Recursive mathematical algorithms, case study
3.5. Polynomials, exponential and trigonometric transformations, case study

4. Solving problems with mathematics software
4.1 SPSS
4.1.1 Introduction to SPSS
4.1.2 Case studies: Data mining methods Cluster analysis and exploratory data analysis with SPSS
4.2 MAPLE
4.2.1. Introduction, data structures, control structures, MAPLE programming environment
4.2.2 Case studies: Sorting and search methods,
solving equation systems,
route planning, graph theory and coding
4.3 MatLab
4.3.1. Introduction, data structures, control structures, MatLab development environment
4.3.2 Case studies: Numerical methods for interpolation and approximation

5. Introduction to PROLOG
5.1. Structure: clauses, facts and rules
5.2. The backtracking algorithm
5.3. Lists and recursion in PROLOG
5.4. Creating your own CAS in PROLOG
[*updated 19.02.2018*]

Teaching methods/Media:
100% of the lecture will take place in the PC lab "Angewandte Mathematik, Statistik und eLearning". All of the practical exercises for the lecture, as well as solving exercises, homework and case studies will be done with the e-learning system MathCoach, CAS systems, statistics and mathematics software (AMSEL lab: PC lab: "Angewandte Mathematik, Statistik und eLearning").

[*updated 24.02.2018*]

Recommended or required reading:
Joel S. Cohen, Computer Algebra and Symbolic Computation, Bd1: elemtary algorithms, A.K.Peters Ldt., 2002

BRANDSTÄDT A., Graphen und Algorithmen, B.G.Teubner Stuttgart, 1994
[*updated 19.02.2018*]

Module offered in:
WS 2016/17, WS 2015/16, WS 2014/15, WS 2012/13, WS 2011/12, ...

Measurements and Simulations in Communications Engineering

Module name (EN): Measurements and Simulations in Communications Engineering
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI698
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment:
Curricular relevance: KI698 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-MSNT Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIB-MSNT Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI330 Communications Engineering KI370 Digital Electronics [*updated 28.03.2016*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Albrecht Kunz

Lecturer: Prof. Dr. Albrecht Kunz
[*updated 10.02.2016*]

Learning outcomes:
After successfully completing this course, students will be able to carry out measurements in the laboratory using equipment (e. g. oscilloscope, function generators, transmitter, spectrum analyzer, etc.), evaluate, interpret and then present their measurement results.

Students will be familiar with the relevant simulation tools used in communications engineering and digital technology. They will be able to simulate a given circuit and subject the simulation results to a critical comparison with real measured values. They will also be able to explain the measured and simulated phenomena with regard to the circuit technology used.

Students will be capable of working independently on more complex simulation and measurement tasks. In addition, they will acquire basic knowledge in semiconductor technology in order to be able to use the right circuitry techniques for various applications.
[*updated 19.02.2018*]

Module content:
1. Basics
1.1 Basics of telecommunications electronics and semiconductor technology
1.2 Introduction to and practice in working with the simulation tools ORCAD PSPICE and Matlab/Simulink

2. Simulation and measurement of analog modulation methods
2.1 Measurements on test setups in the telecommunication electronics lab
2.1 Simulation of analog modulation methods with ORCAD PSPICE and Matlab/Simulink

3. Simulation of digital modulation methods
3.1 Simulation of a digital transmission chain with Matlab
3.2 Analysis of bit error rates subject to SNR (via simulation in comparison with theory)

4. Aspects of communications engineering in audio transmission
4.1 Basics A/D and D/A conversion
4.2 Simulation of the different A/D and D/A converter concepts using ORCAD PSPICE

5. RFID technology and demonstration
5.1 Programming of the Arduino Uno board / RFID RC522 module

6. Simulation of circuits from digital technology
6.1 Structure of different counters (e. g. Gray code)
6.2 Pseudorandom number generators
6.3 Analysis of the properties of M-sequences (autocorrelation, cross correlation)
6.4 Use of pseudorandom number generators in mobile communication
[*updated 19.02.2018*]

Teaching methods/Media:
Measurements and simulations in the telecommunication electronics lab
Equipment used: Oscilloscope, function generators, measuring transmitters, AM/FM modulators, spectrum analyzers, CMOS/TTL gates, transmission gate, PLL
Simulators used: ORCAD PSPICE, Matlab/Simulink, digital technology simulators
The following should be used for presentations during the final demonstration: MS PowerPoint, white board, flipchart

[*updated 19.02.2018*]

Recommended or required reading:
Werner, M.: Nachrichtentechnik, Vieweg Teubner Verlag
Proakis, Salehi: Contemporary Communication Systems using MATLAB, Brooks/Cole
Rutledge, D.: The Electronics of Radio, Cambridge University Press
Fliege, Gaida: Signale und Systeme: Grundlagen und Anwendungen mit MATLAB, Schlembach Fachbuchverlag
Kammeyer: MATLAB in der Nachrichtentechnik, Schlembach Fachbuchverlag
Heinemann, PSPICE: Einführung in die Elektroniksimulation, Hanser Verlag
Werner, M.: Digitale Signalverarbeitung mit MATLAB: Grundkurs mit 16 ausführlichen Versuchen, Vieweg Teubner Verlag
Baker, R. Jacob: CMOS Circuit Design, Layout, and Simulation, IEEE Press Series on Microelectronic Systems
DeMassa, Thomas A.: Digital Integrated Circuits, John Wiley & Sons
Hilleringmann, U.: Silizium Halbleitertechnologie, Vieweg TeubnerVerlag
Globisch, Lehrbuch Mikrotechnologie, Hanser Verlag
[*updated 19.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016

Mentoring

Module name (EN): Mentoring
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI591
Hours per semester week / Teaching method: 2S (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Seminar paper
Curricular relevance: KI591 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, non-technical KIB-MENT Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, non-technical MAB.4.2.1.15 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 3, optional course PIBWN39 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific PIB-MENT Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, not informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Simone Odierna

Lecturer: Prof. Dr. Simone Odierna
[*updated 13.07.2011*]

Learning outcomes:
After successfully completing this module, the students will have acquired the following competences:

- They will know, understand and be able to explain the structure of mentoring programs
- They will know and understand theories of conversation techniques and be able to apply them during consultations
- They will be able to plan and conduct consultations and group discussions
- They will be able to reflect upon and optimize their consulting competences
- They will be able to build new networks

(Text form: In addition to teaching the history, structure and background of mentoring programs in general, this course is intended help students become familiar with the university´s internal mentoring program.
Students will get to know different theories of conversation and practice using them. By means of different methods, students will learn to reflect upon and optimize their own consulting skills. For the duration of one semester, students will support a group of 6-10 other students via group work and individual counselling.
Through regular inter-faculty meetings, students will establish new networks.
[*updated 19.02.2018*]

Module content:

- Definition, history and background of mentoring programs in the USA and Europe
- Structure and course of the HTW mentoring program
- Theories in conversation management
- Theories about group dynamics
- Non-verbal communication
- Schulz von Thun communication model
- Constructive criticism
- Giving feedback
- Active listening
- Assuming roles
- Planning, structuring and recording consultations and group discussions

[*updated 19.02.2018*]

Teaching methods/Media:
Worksheets and guidelines for the course and presentations, slide handouts, work in small groups, role playing
[*updated 26.02.2018*]

Recommended or required reading:
Deutsches Jugendinstitut e.V. (Hrsg.) (1999): Mentoring für Frauen. Eine Evaluation verschiedener Mentoring Programme. München.

Haasen, Nele (2001): Mentoring. Persönliche Karriereförderung als Erfolgskonzept. München.

Heinze Christine (2002): Frauen auf Erfolgskurs. So kommen Sie weiter mit Mentoring. Freiburg.

Krell, Gertraude (Hrsg.) (1997): Chancengleichheit durch Personalpolitik,Wiesbaden
[*updated 19.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

Methods and Applications from the Field of Artificial Intelligence for Signal and Image Processing

Module name (EN): Methods and Applications from the Field of Artificial Intelligence for Signal and Image Processing
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI578
Hours per semester week / Teaching method: 4PA (4 hours per week)
ECTS credits: 5
Semester: according to optional course list
Mandatory course: no
Language of instruction: German
Assessment: Short paper and presentation
Curricular relevance: KI578 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, optional course, technical KIB-KISB Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, optional course, technical PIBWI22 Applied Informatics, Bachelor, ASPO 01.10.2011, optional course, informatics specific PIB-KISB Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI560 Digital Signal Processing
[*updated 03.02.2017*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Ahmad Osman

Lecturer: Prof. Dr.-Ing. Ahmad Osman
[*updated 20.01.2017*]

Learning outcomes:
Students will learn the practical and scientific methods of project work by writing a paper based on examples, problems and applications from the field of signal and image processing with AI, e. g. research on the state of knowledge and technology in image processing, classification methods, regression procedures, data compression, data reconstruction, human-machine interaction, literature research (also in English), presentation of project results.

After successfully completing this module, students will be able to document and explain their approach. They will be able to defend and explain their results achieved using the engineering knowledge they have acquired. This will enable them to illustrate the use of the above methods within project work.
[*updated 24.02.2018*]

Module content:
Image processing: filtering techniques

Image segmentation: region-based or contour-based methods

Classification methods: neural networks, support vector machine etc.

Data fusion: Evidence Theory

Data reconstruction

Data visualization

Data compression

Human-machine interaction

Research to deepen technical or scientific aspects in the form of a supervised short paper.
Literature research (incl. English specialist literature).

Scientific presentations.
[*updated 24.02.2018*]

Teaching methods/Media:
Short paper with academic supervision on a clearly defined research topic using scientific project work methods. Participants will be familiar with the state of research/technology in selected areas of artificial intelligence and will be capable of dealing with research and development projects.
[*updated 24.02.2018*]

Recommended or required reading:
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

Independent research is also part of the term paper.
[*updated 24.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017

Mobile Application Development (Android)

Module name (EN): Mobile Application Development (Android)

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI599

Hours per semester week / Teaching method: 2V+2P (4 hours per week)

ECTS credits: 5

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:
Exercises, project and presentation

Curricular relevance:
KI599 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical
KIB-MADA Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical
PIBWI42 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific
PIB-MADA Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI400 Software Engineering 2
[*updated 25.01.2013*]

Recommended as prerequisite for:

Module coordinator:
Christoph Karls, M.Sc.

Lecturer:
Christoph Karls, M.Sc.
Nils Steinbiß, M.Sc.
[*updated 25.01.2013*]

Lab:
Embedded Robotics Lab (5307)
Communication Systems Lab (5204)

Learning outcomes:
After successfully completing this module, students will be able to explain the basics of application development in the context of mobile applications and work with a corresponding development environment (e. g. Android Studio).
They will be familiar with the basic concepts of the Android operating system (e. g. activities, intents, services and threads) and can plan and implement applications independently.
Students will put the above mentioned topics to the test in exercises. This will enable them to develop an integrated solution for a given task in a final project independently and in a problem-oriented manner.
[*updated 19.02.2018*]

Module content:
- Basics
- Programming environment & special toolchain
- Activities and life cycle
- User interfaces
- Intents and broadcast receiver (communication between application components)
- Services and threads
- Persistence
- Content provider
- Sensors and actuators
- Miscellaneous

[*updated 19.02.2018*]

Teaching methods/Media:
Android smartphones and tablets, transparencies, projector, board, project and group work, lecture-relevant exercises, oral presentations by students
[*updated 19.02.2018*]

Recommended or required reading:
http://www.android.com
http://developer.android.com
MarkL.Murphy,Commonsware,TheBusyCoder_sGuide to Android Development - https://commonsware.com/Android/
[*updated 19.02.2018*]

Module offered in:
WS 2017/18, WS 2015/16, WS 2014/15, WS 2013/14, SS 2013, ...

Music and Computers

Module name (EN): Music and Computers

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI646

Hours per semester week / Teaching method: 4V (4 hours per week)

ECTS credits: 4

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:
Students assignment and presentation

Curricular relevance:
KI646 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, non-technical
PIBWN10 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Klaus Huckert

Lecturer:
Prof. Dr. Klaus Huckert
[*updated 01.04.2003*]

Learning outcomes:
After completing this module, students will be acquainted with the basic terminology of music and music formats.
They will understand the relationship between music and computers, will have met relevant examples for web applications and will understand the relationships between the data formats MIDI, MP3, WAV and XML.
[*updated 13.03.2007*]

Module content:
1. The notation used in the graphical representation of music
2. Midi: basics, messages, applications
3. MP3 and WAV formats, rendering
4. Sequencer software (Cubasis)
5. Notation software (Finale, Sibelius), interfacing to Midi and sequencers, XML representation
6. Software for musical arrangements (automatic accompaniments, creating new melodies and solos) with the software package Band in the Box
7. Production of a CD (recording, mixing and burning)
8. Use in web applications

[*updated 08.05.2008*]

Recommended or required reading:
To be announced during the course.
[*updated 13.03.2007*]

Module offered in:
SS 2014, SS 2013, SS 2012, SS 2011, SS 2010, ...

Numerical Software

Module name (EN): Numerical Software
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI672
Hours per semester week / Teaching method: 2V+2PA (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Case studies and micro-projects with the applications discussed
Curricular relevance: KI672 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-NUMS Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical MST.NSW Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, optional course, technical MST.NSW Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, optional course, technical PIBWI92 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific PIB-NUMS Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific MST.NSW Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, optional course, technical

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI160 Mathematics 1
KI260 Mathematics 2
[*updated 20.07.2016*]

Recommended as prerequisite for:

Module coordinator:
N.N.

Lecturer:
Dipl.-Math. Dimitri Ovrutskiy
Prof. Dr. Barbara Grabowski
[*updated 20.07.2016*]

Lab:
Applied Mathematics, Statistics, and eLearning (5306)

Learning outcomes:
After successfully completing this module, students will be able to independently implement algorithms using Matlab to solve mathematical problems, process experimental data and display this data graphically.
[*updated 19.02.2018*]

Module content:
- Programming in Matlab
- Types of Matlab programs
- Graphical output in 2D and 3D
- Diagrams of statistical data and measurement data
- Symbolic calculations

Applications:
- Numerical integration
- Regression, interpolation and approximation
- Zero and fixed-point search
- Gradient method

[*updated 19.02.2018*]

Teaching methods/Media:
100% of the lecture will take place in the PC lab "Angewandte Mathematik, Statistik und eLearning". All of the practical exercises for the lecture, as well as solving exercises, homework and case studies will be done with the e-learning system MathCoach and with mathematical numerical software (AMSEL lab: PC lab: "Angewandte Mathematik, Statistik und eLearning").
[*updated 24.02.2018*]

Recommended or required reading:
F. und F. Grupp: MATLAB 7 für Ingenieure: Grundlagen und Programmierbeispiele
O. Beucher: MATLAB und Simulink: Grundlegende Einführung für Studenten und Ingenieure in der Praxis (z.B. Pearson Studium, 2008)
W. Schweizer: MATLAB kompakt (z.B. Oldenbourg, 2009)
Lecture notes
[*updated 19.02.2018*]

Module offered in:
SS 2020 (probably), WS 2019/20, SS 2019, WS 2018/19, SS 2018, ...

Practical Circuit Design

Module name (EN): Practical Circuit Design
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI653
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 4
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Written exam and student assignment
Curricular relevance: KI653 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical PIBWI65 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI370 Digital Electronics [*updated 01.11.2006*]
Recommended as prerequisite for:

Module coordinator:
Dipl.-Ing. Hans-Joachim Bohr

Lecturer:
Dipl.-Ing. Hans-Joachim Bohr
[*updated 01.11.2006*]

Learning outcomes:
This module aims to show students how an electronic circuit is developed from the initial idea through to the fully functioning circuit board. The accompanying lab course provides students with the opportunity to design, manufacture and test an electronic circuit and to document the development process.
[*updated 08.05.2008*]

Module content:
Lectures
1. Introduction
2. Electronic components: characteristic data, design types, properties, standards
3. Circuit design and circuit diagram generation
4. Designing and creating the circuit layout
5. The production of electronic circuits
6. The documentation of electronic circuits

Lab course
1. Circuit design
2. Creating a circuit diagram
3. Creating the circuit layout
4. Making and assembling a printed circuit board
5. Commissioning and testing the circuit
6. Documentation
[*updated 08.05.2008*]

Recommended or required reading:
Lindner, Brauer, Lehmann: Taschenbuch der Elektrotechnik und Elektronik, 7. Aufl., Fachbuchverlag Leipzig, 1999
Nührmann: Das komplette Werkbuch Elektronik, 7. Aufl., Franzis-Verlag, München, 2002
Tietze, Schenk: Halbleiter-Schaltungstechnik, 12. Aufl., Springer-Verlag, Berlin-Heidelberg, 2002
Schramm: Entwurf und Herstellung gedruckter Schaltungen, 8. Aufl., Elektor-Verlag, Aachen, 1999
[*updated 08.05.2008*]

Module offered in:
WS 2012/13, WS 2011/12, WS 2010/11, WS 2009/10, WS 2008/09, ...

Presenting a Project

Module name (EN): Presenting a Project
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI574
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Oral presentation with grade
Curricular relevance: KI574 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical KIB-SSP Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical PIBWN33 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific PIB-SSP Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Dipl.-Übers. Betina Lang
[*updated 13.03.2017*]

Learning outcomes:
This compulsory elective course is based on the mandatory Bachelor module "Professional Presentations". The focus of this module will be the oral presentation of a project carried out at university, student conference or the workplace.

To this end, students will deepen their strategic knowledge in order to be able to give professional, subject-specific presentations, define quality criteria and further develop their language skills. They will test and hone these strategies, their knowledge and their skills in short presentations at different presentation phases and receive feedback from their fellow students. Students will learn how to combine the phases of their presentation to form a whole, how to enhance their presentations with the help of visual aids, how to prepare themselves for their presentation in a targeted manner and finally, how to give their presentation.
[*updated 24.02.2018*]

Module content:
- Repetition and application of the strategies taught in the _Professional Presentations_ module
- Visual aids
- Establishing contact with the audience
- Voice and body language
- Short presentations
- Peer review

In addition, we will work on:
Repeating relevant linguistic resp. grammatical structures (where necessary)
Intercultural competence
Raising awareness for functional language use
[*updated 24.02.2018*]

Teaching methods/Media:
Teaching and learning materials for specific target groups (print, audio, video)
[*updated 24.02.2018*]

Recommended or required reading:
Students will receive a list of recommended teaching and learning materials.
The following materials are free of charge for students of the htw saar. We recommend their use for independent learning:

- Christine Sick, unter Mitarbeit von Miriam Lange (2011): TechnoPlus Englisch 2.0 (Multimediales Sprachlernprogramm für Technisches und Business Englisch, Niveau B1-B2+), EUROKEY.

- Christine Sick (2015): TechnoPlus Englisch VocabApp (Mobile-Learning-Angebot insbesondere zum Grundwortschatz, alle Niveaustufen), EUROKEY.
[*updated 24.02.2018*]

Module offered in:
SS 2017

Programming Tools

Module name (EN): Programming Tools

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI569

Hours per semester week / Teaching method: 2V+2P (4 hours per week)

ECTS credits: 5

Semester: 6

Mandatory course: no

Language of instruction:
German

Assessment:
Project

Curricular relevance:
DFBI-443 Computer Science and Web Engineering, Bachelor, ASPO 01.10.2018, optional course, informatics specific
KI569 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, informatics specific
KIB-PRGW Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical
PIBWI13 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific
PIB-PRGW Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Reinhard Brocks

Lecturer: Prof. Dr. Reinhard Brocks
[*updated 01.02.2018*]

Learning outcomes:
After successfully completing this module, students will be able to choose the suitable tools for each phase of the implementation process. They will be able to define the toolchain for a software project, configure its development environment, and implement an automatic build process. They will be able to explain the basic functions of different programming tools and use them for a specific programming language Students will be capable of describing the structure of program libraries and frameworks and will be able to create them themselves or integrate them into their own projects. They will be able to use integrated development environments for software development.
[*updated 24.02.2018*]

Module content:
- Functions within source code editors
- Command line and scripts
- Software documentation tools
- Build tools
- Integrated development environments and their configuration
- Debuggers
- Version management
- Test frameworks
- Static source code analysis tools
- Profilers
- Issue tracking systems
- Cross-compiling
- Bug tracking systems
- Package managers
- Virtual machines

[*updated 24.02.2018*]

Teaching methods/Media:
Examples, project work, practical course with exercises, group work
[*updated 24.02.2018*]

Recommended or required reading:
Original documentation for the various software development tools

Zeller, A., Krinke, J.: Open-Source-Programmierwerkzeuge, dpunkt, 2003
Preißel, René; Stachmann, Bjørn: Git : dezentrale Versionsverwaltung im Team; Grundlagen und Workflows, dpunkt, 2012
Jürgen Wolf; Stefan Kania : Shell-Programmierung : das umfassende Handbuch; Einführung, Praxis, Übungsaufgaben, Kommandoreferenz; Bonn : Galileo Press, 2013
Helmut Herold : UNIX und seine Werkzeuge, Make und nmake : Software-Management unter UNIX und MS-DOS, Addison-Wesley, 1994
Bernd Matzke: Ant : eine praktische Einführung in das Java Build-Tool, Heidelberg : dpunkt-Verl., 2005
Martin Spille: Maven 3 : Konfigurationsmanagement mit Java, mitp, 2011
Michael Tamm : JUnit-Profiwissen : effizientes Arbeiten mit der Standardbibliothek für automatisierte Tests in Java; Heidelberg : dpunkt-Verl., 2013
Durelli, Vinicius H. S. ; Araujo, Rodrigo Fraxino ; Rafael Medeiros Teixeira: Getting Started with Eclipse Juno; Birmingham : Packt Publishing, 2013
[*updated 24.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018

Project Management

Module name (EN): Project Management
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI567
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 3
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Written exam
Curricular relevance: KI567 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-PM Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 2, mandatory course PIB-PM Applied Informatics, Bachelor, ASPO 01.10.2017, semester 3, mandatory course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:

Module coordinator:
Dipl.-Ing. Michael Sauer

Lecturer: Dipl.-Ing. Michael Sauer
[*updated 01.04.2018*]

Learning outcomes:
After successfully completing this course, students will be able to reconstruct the project planning for typical and manageable student IT projects in functional project management.

They will be capable of independently implementing an adequate form of project organization and exercising project governance during the continuous project development cycle. They will be able to recognize deviations from the plan and adjust project planning accordingly.

Students will learn to use basic project management tools, i. e. they can create work-breakdown structures, map workflows with the precedence diagram method and understand the consequences of plan changes.

They will learn to prepare and conduct meetings and to communicate their information and the results for efficient project control.

Students will become familiar with estimation processes for IT projects and know how to use them in such projects in order to stabilize project planning.

They will develop an understanding of how to work in project teams and assume project management functions.
[*updated 19.02.2018*]

Module content:
Definitions of project and project management
Projects and project management in companies
Project management tools
Special features of software projects
- Information and communication
- Cost estimation
- Collaborative software
[*updated 19.02.2018*]

Teaching methods/Media:
Lecture, simulations and workshop
Lecture script available as a PDF download
[*updated 19.02.2018*]

Recommended or required reading:
BURGHARDT M.: Projektmanagement, Publics MCD Verlag, 2000
WESTERMANN R.: Projektmanagement mit System, Gabler Verlag, 2001
MOTZEL E.+PANNENBÄCKER O.:Projektmanagement-Kanon, Roderer Verlag, 2002
TURNER M.: Microsoft Solutions Framework Essentials; Building Successful Technology Solutions, Microsoft Press ISBN-10:0-7356-2353-8
WIECZORREK W., MERTENS P.: Management von IT-Projekten, SpringerLink Verlag ISBN-978-3-642-16126-1
BOHINC T.: Führung im Projekt, SpringerLink Verlag ISBN-978-3-642-22625-0 BERGMANN R, BARRECHT M.: Organisation und Projektmanagement, SpringerLink Verlag ISBN-978-3-7908-2017-1
KÖNIGS H.-P.: IT-Risikomanagement mit System, SpringerLink Verlag ISBN-ISBN 978-3-8348-1687-0
[*updated 19.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, WS 2018/19, SS 2018

Real-Time Operating Systems

Module name (EN): Real-Time Operating Systems

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI669

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 2

Semester: 6

Mandatory course: no

Language of instruction:
German

Assessment:

Curricular relevance:
KI669 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI420 Operating Systems
KI460 Microprocessor Systems
[*updated 01.02.2007*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Jürgen Schäfer

Lecturer:
Prof. Dr.-Ing. Jürgen Schäfer
[*updated 01.02.2007*]

Learning outcomes:
[*still undocumented*]

Module content:
[*still undocumented*]

Recommended or required reading:
[*still undocumented*]

Module offered in:
SS 2007

Requirements Engineering

Module name (EN): Requirements Engineering
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI641
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: no
Language of instruction: German
Assessment: Written exam
Curricular relevance: KI641 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 60 hours (equivalent to 2 ECTS credits). There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Helmut Folz

Lecturer:
Prof. Dr. Helmut Folz
[*updated 01.04.2003*]

Learning outcomes:
This course aims to provide students with an overview of the most important core areas in modern requirements engineering. Planning games are used to teach both theoretical and practical aspects.

[*updated 13.03.2007*]

Module content:
1. Basic factors
2. Elicitation techniques
3. Requirement types
4. Types of documentation
5. Quality issues
6. Requirements management
7. Requirements and process models
8. Maturity models
9. Planning games
10. RE and RM support tools

[*updated 13.03.2007*]

Recommended or required reading:
RUPP C. et al., Requirements-Engineering und -Management, Hanser, 2004
HULL Elisabeth et al., Requirements Engineering, Springer, 2004
[*updated 13.03.2007*]

Module offered in:
WS 2005/06

Risk-Based Decision Making and Statistical Data Analysis

Module name (EN): Risk-Based Decision Making and Statistical Data Analysis

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI626

Hours per semester week / Teaching method: 2V+2P (4 hours per week)

ECTS credits: 4

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
KI626 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical
KIB-ERSD Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical
PIBWI94 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific
PIB-ERSD Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Melanie Kaspar, M.Sc.

Lecturer:
Melanie Kaspar, M.Sc.
Prof. Dr. Barbara Grabowski
[*updated 06.07.2010*]

Lab:
Applied Mathematics, Statistics, and eLearning (5306)

Learning outcomes:
After completing this course, students will be able to analyze and evaluate large amounts of data and statistically evaluate it using software.
In addition, they will be able to make statements on the reliability and statistical certainty of their evaluation results.
[*updated 26.02.2018*]

Module content:
1. Risk-Based Decision Making:
   1.1 Bayesian networks
   1.2 Decision trees
   1.3 Boolean reliability theory
   1.4 Markov chains
   1.5 Statistical decisions: hypothesis testing and estimates
   1.6 Decisions in contingency tables
   1.7 Software: SPSS, Answertree
   1.8 Case studies
2. Statistical data analysis - data mining with statistical methods
   2.1 Scale types of random features
   2.2 Statistical measures for data sets
   2.3 Correlations
   2.4 Cluster analysis technique - data aggregation
   2.5 Probit analyses
   2.6 Software: SPSS, Clementine
   2.7 Case studies
[*updated 26.02.2018*]

Teaching methods/Media:
100% of the lecture will take place in the PC lab AMSEL "Angewandte Mathematik, Statistik und eLearning". Computer-supported practical case studies will be carried out here using SPSS and R.

In addition, the eLearning system MathCoach-Statistik (AMSEL PC laboratory 5306) will be used. Students must complete homework and exercises using this system.
[*updated 24.02.2018*]

Recommended or required reading:
Lecture notes: B.Grabowski: Entscheidungen unter Risiko und statistische Datenanalyse, HTW, 2010

J.Janssen, W. Laaz: Statistische Datenanalyse mit SPSS, Springer, 2009

Handbooks: Answertree, Clementine, SPSS
[*updated 19.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2015/16, WS 2014/15, ...

Robotics Lab Course

Module name (EN): Robotics Lab Course
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI627
Hours per semester week / Teaching method: 2P (2 hours per week)
ECTS credits: 4
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Project work
Curricular relevance: KI627 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-ROBP Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI95 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific PIB-ROBP Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 120 hours (equivalent to 4 ECTS credits). There are therefore 97.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.

Recommended as prerequisite for:

Module coordinator:
Dipl.-Ing. Dirk Ammon

Lecturer:
Dipl.-Ing. Dirk Ammon
[*updated 24.06.2010*]

Learning outcomes:
After successfully completing this module, students will be familiar with the properties and effects of different sensors and actuators and how these can be modeled in software. Students will learn methods of navigation and mapping for mobile robots and how to use them. Students will be able to construct and program a mobile robot that fulfills a specific task.
[*updated 19.02.2018*]

Module content:

1. Theory
- History of robotics, overview of robotics,
- Sensors and actuators
- Evaluation of measured values and sensor fusion
- Odometry and dead reckoning
- Mapping methods

II. Practice
Creating a mobile robot Groups consisting of 2 students each receive the necessary equipment.
. Familiarization with the hardware and software by means of simple exercises and tasks
- Group-specific project
- Building and programming the robot, realization and test
- Documentation
- Lecture with presentation

[*updated 19.02.2018*]

Teaching methods/Media:
Lecture with PowerPoint slides in the theoretical part, supervised practical experiments during the practical phase, work in largely independent individual groups with accompanying project discussions during the realization.
[*updated 19.02.2018*]

Recommended or required reading:
NEHMZOW, Ulrich, Mobile Robotik, "Eine praktische Einführung", Springer Verlag Berlin-Heidelberg, 2002
GOCKEL, DILLMANN, Embedded Robotics, "Das Praxisbuch", Elektor-Verlag, Aachen, 2005
[*updated 19.02.2018*]

Module offered in:
SS 2016, SS 2015, WS 2013/14, WS 2012/13, WS 2011/12, ...

Ruby on Rails

Module name (EN): Ruby on Rails

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI680

Hours per semester week / Teaching method: 3V+1P (4 hours per week)

ECTS credits: 4

Semester: 6

Mandatory course: no

Language of instruction:
German

Assessment:
Project

Curricular relevance:
KI680 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical
KIB-RUBY Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical
PIBWI72 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific
PIB-RUBY Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI100 Programming 1
KI200 Programming 2
KI320 Computer Networks
[*updated 18.01.2008*]

Recommended as prerequisite for:

Module coordinator:
Dipl.-Inf. Julian Fischer

Lecturer:
Dipl.-Inf. Julian Fischer
[*updated 18.01.2008*]

Learning outcomes:
After successfully completing this module, students will understand the basic concepts of modern web development.

They will be able to apply Ruby and Ruby on Rails paradigms and can combine Ruby´s ecosystem building blocks to map application events.

Students will be able to identify the layers of a web application, as well as identify and correct the origin of errors. This gives them the ability to correct and develop Ruby applications.

In addition, they will also be able to estimate the challenges a cloud environment can pose for a web application and how to solve them. This will allow them to develop scalable Ruby on Rails applications.
[*updated 26.02.2018*]

Module content:
Principles of the object-oriented language Ruby
- Introduction to the metaprogramming in Ruby

Test-driven development with Ruby and RSpec
Source code versioning with Git
Architecture of the Ruby on Rails framework
- The Model View Controller Paradigm on the Web
- Exception handling, introduction to the object relationship mapper Active Record
- Action controller
- Action view

Web services with Ruby and Ruby on Rails
- REST
- OAuth2

Cloud concepts with Ruby on Rails applications
- File storage and access in the cloud

[*updated 19.02.2018*]

Teaching methods/Media:
Lecture, discussion, demonstration
[*updated 19.02.2018*]

Recommended or required reading:
D. A. BLACK, The Well Grounded Rubyist, Manning, 2009
JOSÈ VALIM, Crafting Rails Applications, The Pragmatic Programmers, 2011
RAYAN BIGG, YEHUDA KATZ, Rails3 in Action, Manning, 2011
S. RUBY, Web Development with Ruby on Rails, The Pragmatic Programmers, 2011
[*updated 19.02.2018*]

Module offered in:
SS 2018, SS 2017, SS 2016, SS 2015, SS 2014, ...

Running RoboNight Workshops

Module name (EN): Running RoboNight Workshops
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI628
Hours per semester week / Teaching method: 1PA+1S (2 hours per week)
ECTS credits: 3
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Participation in 5 classes, 3 workshops, the competition + a written composition
Curricular relevance: KI628 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical KIB-ROBO Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical MST.RNW Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, optional course, non-technical MST.RNW Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, optional course, non-technical PIBWN58 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific PIB-ROBO Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific MST.RNW Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, optional course, non-technical Suitable for exchange students (learning agreement)

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Martina Lehser

Lecturer: Prof. Dr. Martina Lehser
[*updated 18.02.2010*]

Learning outcomes:
After successfully completing this module, the students will be able to assess the special challenges involved in conducting technical workshops and take them into regard during the preparatory phase of the workshop. They will be able to adapt the contents of the training courses to the participants´ previous knowledge and provide appropriate support in dealing with technical questions. Students will also be able to collect and prepare the knowledge necessary for the course and impart it to the workshop participants in such a manner as to fit their age groups.
[*updated 26.02.2018*]

Module content:
- Create and design the tasks for workshops and the competition
- Design and implement possible solutions
- Supervise 3 workshops
- Supervise the competition
- Conduct follow-up work and document the experiences made

[*updated 26.02.2018*]

Teaching methods/Media:
Introductory workshop for robot programming with Mindstorm robots on computers and tablets, supervised practical course, largely independent development of the contents in groups, project discussions and workshop coaching.
[*updated 26.02.2018*]

Recommended or required reading:
- EV3-Programmierung Kurse, htw saar, EmRoLab 2017
- Programming LEGO NXT Robots using NXC, Daniele Benedettelli
- Workbook Bluetooth, htw saar, EmRoLab 2011
- NXT-Programmierung I und II: Einführung und Fortgeschrittene, htw saar, EmRoLab 2011
[*updated 26.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

Russian for Beginners 1

Module name (EN): Russian for Beginners 1
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI607
Hours per semester week / Teaching method: 2SU (2 hours per week)
ECTS credits: 2
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Written exam
Curricular relevance: EE-K2-524 Energy system technology / Renewable energies, Bachelor, ASPO 01.10.2012, semester 5, optional course, non-technical EE-K2-524 Energy system technology / Renewable energies, Bachelor, ASPO 01.04.2015, semester 5, optional course, non-technical, course inactive since 14.03.2018 KI607 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical KIB-RFA1 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical MAB.4.2.1.21 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 6, optional course MAM.2.1.1.20 Engineering and Management, Master, ASPO 01.10.2013, optional course, general subject PIBWN38 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific PIB-RFA1 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Ulrike Reintanz
[*updated 27.03.2013*]

Learning outcomes:
The course _Russian for Beginners 1_ is aimed at learners who have no previous knowledge of the language. The modules _Russian for Beginners 1_ and _Russian for Beginners 2_ are based on one another. In the course of the two modules, participants will first reach proficiency level A1 and then advance to level A2 of the European Framework of Reference for Languages.
The goal of the course is to provide students with basic knowledge of the Russian language, which will enable them to communicate in general and professional situations, both orally and in writing. To do so, all four skills (speaking, listening comprehension, reading and writing) will be trained equally. We will focus on oral communication in order to develop communicative competence in work-related situations, especially through role playing and the use of dialogues. Important grammatical structures will be taught in order to support and supplement the content of the course.
During the course, intercultural aspects will also be addressed so that students develop an awareness of cultural specificities and are able to act and communicate appropriately and competently in the respective situations.
[*updated 19.02.2018*]

Module content:
In the course _Russian for Beginners 1_ lessons 1 to 7 from the textbook _Otlitschno 1_ will be worked on.
Establishing contact:
_ Greetings and saying farewell
_ Introducing yourself and others
_ Giving information about yourself requesting information about others
_ Asking how someone is feeling
_ Getting to know business partners
The professional world
_ Describing jobs and activities
_ Arranging appointments
_ Planning activities
Oral and written communication
_ Requesting general information (name, nationality, telephone number, e-mail address)
_ Appointments with colleagues and business partners
_ Time, daily schedule, scheduling
_ Making telephone calls
Intercultural competence
Basic knowledge about Russian culture, history and society
In addition, both the Cyrillic alphabet and basic grammatical structures will be taught (e. g. declination of nouns, noun case usage, adjectives, personal pronouns and prepositions, verb conjugation, syntax)
Students are expected to work on and expand their basic vocabulary independently.
[*updated 26.02.2018*]

Teaching methods/Media:
Teaching and learning materials (print media, slides, audio-visual teaching materials) and recommended podcasts compiled specifically for the learning group.
[*updated 19.02.2018*]

Recommended or required reading:
The course is based on the following textbook and will be supplemented by the following:
Otlitschno 1 Lehrbuch ISBN: 978-3-19-0044771 und Arbeitsbuch ISBN: 978-3-19-014477-8
[*updated 19.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

Russian for Beginners 2

Module name (EN): Russian for Beginners 2
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI585
Hours per semester week / Teaching method: 2SU (2 hours per week)
ECTS credits: 2
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Written exam

Curricular relevance:
EE-K2-525 Energy system technology / Renewable energies, Bachelor, ASPO 01.10.2012, semester 7, optional course
EE-K2-525 Energy system technology / Renewable energies, Bachelor, ASPO 01.04.2015, semester 7, optional course, course inactive since 14.03.2018
KI585 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical
KIB-RFA2 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical
MAB.4.2.1.22 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 7, optional course
MAM.2.1.1.21 Engineering and Management, Master, ASPO 01.10.2013, optional course, general subject
MST.RA2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 7, optional course, non-technical, course inactive since 14.03.2018
MST.RA2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 7, optional course, non-technical, course inactive since 14.03.2018
PIBWN34 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific
PIB-RFA2 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer: Prof. Dr. Christine Sick
[*updated 19.02.2015*]

Learning outcomes:
The modules _Russian for Beginners 1_ and _Russian for Beginners 2_ are based on one another. In the course of the two modules, participants will first reach proficiency level A1 and then advance to level A2 of the European Framework of Reference for Languages. The course _Russian for Beginners 2_ is aimed at learners with basic knowledge of the Russian language at level A1 of the European Reference Framework or the module _Russian for Beginners 1_.
The goal of the course is to provide students with basic knowledge of the Russian language, which will enable them to communicate in general and professional situations, both orally and in writing. To do so, all four skills (speaking, listening comprehension, reading and writing) will be trained equally. We will focus on oral communication in order to develop communicative competence in work-related situations, especially through role playing and the use of dialogues. Important grammatical structures will be taught in order to support and supplement the content of the course.
During the course, intercultural aspects will also be addressed so that students develop an awareness
of cultural specificities and are able to act and communicate appropriately and competently in the respective situations.
[*updated 19.02.2018*]

Module content:
In the course _Russian for Beginners 2_ selected lessons from the textbook _Otlitschno 2_ will be worked on.
Work
_ Organizing daily and weekly schedules
_ Times, opening hours
_ Making business calls
_ Writing memos
The professional world
_ Writing and responding to invitations
_ Making hotel reservations per telephone/e-mail
_ Developing an event program for business partners
_ Describing how a company is structured
_ Naming tasks and responsibilities
Professional training and experience
_ Creating a resume
_ Reading and understanding job advertisements
Intercultural competence
Basic knowledge about Russian culture, history and society
In addition, basic grammatical structures (e. g. numbers, time and date, use and declination of nouns, adjectives and personal pronouns, prepositions, verb conjugation, sentence structure) will be taught.
Students are expected to work on and expand their basic vocabulary independently.
[*updated 19.02.2018*]

Teaching methods/Media:
Teaching and learning materials (print media, slides, audio-visual teaching materials) compiled specifically for the learning group and recommended podcasts at www.russlandjounal.de
[*updated 19.02.2018*]

Recommended or required reading:
The course is based on the following textbook and will be supplemented by the following:
Otlitschno 2 Lehrbuch ISBN: 978-3-19-0044778-8 und Arbeitsbuch ISBN: 978-3-19-014478-5
[*updated 19.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

Semiconductor Technology and Production

Module name (EN): Semiconductor Technology and Production
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI608
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Written exam
Curricular relevance: KI608 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-HLTP Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI32 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific PIB-HLTP Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI220 Physical and Technical Foundations of IT 2
KI370 Digital Electronics
[*updated 28.03.2016*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Albrecht Kunz

Lecturer: Prof. Dr. Albrecht Kunz
[*updated 31.01.2013*]

Learning outcomes:
After successfully completing this module, students will have comprehensive knowledge about current microelectronic production methods. This knowledge will enable them to classify and assess the limits and possibilities of integrated semiconductor devices and their circuit families.

Students will have detailed knowledge about common circuit families. They will understand the differences between the different circuit families and be able to analyze and evaluate them by using numerically generated simulation results with regard to possible applications.
[*updated 26.02.2018*]

Module content:
1.Technological processes:
1.1.Trends in microelectronics,
1.2.Materials,
1.3.Wafer fabrication,
1.4.Oxidation, lithography, etching and doping techniques,
1.5.Deposition methods,
1.6.MOS and bipolar technologies for circuit integration,
1.7.Integration examples

2.Semiconductor circuit families:
2.1.Diode transistor logic,
2.2.Transistor-transistor logic,
2.3.Emitter-coupled logic,
2.4.Integrated injection logic,
2.5.NMOS circuits
[*updated 26.02.2018*]

Recommended or required reading:
Baker, R. Jacob: CMOS Circuit Design, Layout, and Simulation, IEEE Press Series on Microelectronic Systems,
Uyemura, John P.: CMOS Logic Circuit Design, Kluwer Academic Publishers,
DeMassa, Thomas A.: Digital Integrated Circuits, John Wiley & Sons,
Hilleringmann, U.: Silizium Halbleitertechnologie, Teubner-Verlag,
Wupper, H.: Elektronische Schaltungen, Band 1 und 2, Springer-Verlag,
Rein, H. _ M.: Integrierte Bipolarschaltungen, Springer-Verlag,
Post, H. _ U.: Entwurf und Technologie hochintegrierter Schaltungen, Teubner-Verlag,
Paul, Reinhold: Einführung in die Mikroelektronik, Hüthig-Verlag,
Hoppe, Bernhard: Mikroelektronik, Band 1 und 2, Vogel-Verlag.
[*updated 26.02.2018*]

Module offered in:
SS 2016, SS 2015, SS 2014, SS 2013

Sino-German Student Club for Smart Sensors

Module name (EN): Sino-German Student Club for Smart Sensors
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI696
Hours per semester week / Teaching method: 1V+3PA (4 hours per week)
ECTS credits: 5
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Project work
Curricular relevance: KI696 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical KIB-SGSC Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical PIBWN70 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific PIB-SGSC Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI100 Programming 1 [*updated 06.12.2017*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Martina Lehser

Lecturer: Prof. Dr. Martina Lehser
[*updated 09.02.2016*]

Lab:
Embedded Robotics Lab (5307)
Communication Systems Lab (5204)

Learning outcomes:
After successfully completing this module, students will be able to develop a communicative system with sensors and microcontrollers in an international and globally distributed project team. They will learn to assume professional and organizational responsibility und understand and experience the importance of intercultural competence with a focus on China.
In addition, through their work in a project team with different linguistic, social and geographical environments, students will:
- understand the importance of communication in and with the other language environment
- work with team members from different learning backgrounds and nations
- recognize and use different competences
- establish contacts with foreign partners promoting internationalization
- learn to accept and adapt to other work methods
[*updated 19.02.2018*]

Module content:
Students from various fields and levels of study and with different degrees from the htw saar and CDHAW (Tongji Univ., Shanghai) will form a globally distributed team. The team will consist of 5 to 15 students. Over the period of a full semester, the team will work on a specific task within the project.
At the team´s locations, different aspects will be dealt with. At the htw saar the topics will be mechatronics and software and at the CDHAW the topics will be hardware and production.

The project results will be presented to the lecturers in the form of a presentation and a final report.

Project management:
- Specifications
- Project planning
- Version management

Software development:
- Embedded devices
- TCP/IP communication
- Data logging

Electrical Engineering/Mechatronics:
- Electronic circuits
- Test design environment
- CAD design - casing parts

Intercultural competence:
- Focus: China
- Patterns of communication
- Work methods
- The concept of time

[*updated 24.02.2018*]

Teaching methods/Media:
Lecture, workshop, training
Meeting (face to face & Skype)
[*updated 19.02.2018*]

Recommended or required reading:
- China-Strategie des BMBF 2015_2020: Strategischer Rahmen für die Zusammenarbeit mit China in Forschung, Wissenschaft und Bildung
- Umsetzungsempfehlungen für das Zukunftsprojekt Industrie 4.0: Abschlussbericht des Arbeitskreises Industrie 4.0
- Konflikte und Synergien in multikulturellen Teams, Petra Köppel
- Management von IT-Projekten, Dr. Hans W. Wieczorrek, Dipl.-Math. Peter Mertens
- Führung im Projekt, Dr. Thomas Bohinc
- Embedded Technologies, Joachim Wietzke
- Embedded Linux, Joachim Schröder · Tilo Gockel · Rüdiger Dillmann

[*updated 19.02.2018*]

Module offered in:
SS 2018, SS 2017, SS 2016

Software development for collaborative industrial robotics

Module name (EN): Software development for collaborative industrial robotics

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI566

Hours per semester week / Teaching method: 4PA (4 hours per week)

ECTS credits: 5

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:

Curricular relevance:
KI566 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, technical
KIB-IROB Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, technical
MST.SKI Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 5, optional course, technical
MST.SKI Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 5, optional course, technical
PIBWI08 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, informatics specific
PIB-IROB Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Martina Lehser

Lecturer: Prof. Dr. Martina Lehser
[*updated 29.06.2018*]

Learning outcomes:
[*still undocumented*]

Module content:
[*still undocumented*]

Recommended or required reading:
[*still undocumented*]

Spanish for Beginners I

Module name (EN): Spanish for Beginners I
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI663
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 5
Mandatory course: no
Language of instruction: Spanish
Assessment: Written examination (final exam)
Curricular relevance: KI663 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 5, optional course, non-technical KIB-SFA1 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 5, optional course, non-technical MAB.4.2.1.4 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 5, optional course MST.SA1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 5, optional course, non-technical MST.SA1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 5, optional course, non-technical PIBWN50 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific PIB-SFA1 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 5, optional course, not informatics specific MST.SA1 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, semester 5, optional course, non-technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
KI664 Spanish for Beginners II
[*updated 16.01.2007*]

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Dr. Victoriana Herrador Morillo
Mirta Vargas
[*updated 16.10.2017*]

Learning outcomes:
The course "Spanish for Beginners I" is aimed towards learners with little or no previous knowledge of the Spanish language. The courses "Spanish for Beginners I and II" are based on each other. In the course of the two modules, students will first reach proficiency level A1 and then advance to level A2 of the European Framework of Reference for Languages.

The goal of the course is to provide students with basic knowledge of the Spanish language, which will enable them to communicate in general and professional situations as quickly as possible, both orally and in writing. To do so, all four skills (speaking, listening comprehension, reading and writing) will be trained equally. Content development will be supported by the repetition of the relevant grammatical structures.

The course takes a communicative and pragmatic approach that particularly promotes communicative competence in job-relevant situations through the use of role playing and situational dialogues. This also includes intercultural aspects that raise the students´ awareness of cultural differences and enable them to assert themselves in specific situations.
[*updated 24.02.2018*]

Module content:
Content:
In the course _Spanish for Beginners I_ students will learn the lessons 1 to 5 from _Meta Profesional A1-A2_ (Spanisch für den Beruf. Klett Verlag).

Establishing contact
- Formal greetings
- Introductions
- Asking how someone is feeling
- Giving information about yourself and requesting information about others
- Saying thank you, apologizing and saying goodbye
- Describing a person
- Giving directions
- Getting to know business partners

- Job profiles and the workplace
- Describing jobs and activities
- Types of companies
- Showing and describing products
- Describing departments and responsibilities
- Planning activities
- Interaction with colleagues
- Participating in international trade fairs

Oral and written communication
- Common verbal expressions (asking for names, telephone numbers and e-mail addresses)
- Business lunches
- Making appointments with colleagues
- Requesting and giving information
- Writing e-mails
- Time
- Daily schedule, making appointments

In addition, basic grammar structures will be learned (e. g. indicative presence of regular and irregular verbs, form of progression, prepositions, personal and possessive pronouns, asking questions, syntax).

Students should work on and expand their basic vocabulary independently.
[*updated 19.02.2018*]

Teaching methods/Media:
Teaching and learning materials (print media, slides, audio-visual teaching materials), multimedia learning software compiled specifically for the learning group.
[*updated 19.02.2018*]

Recommended or required reading:
The course is based on the following textbook and will be supplemented by additional learning material:
Meta Profesional _ Spanisch für den Beruf, Lehrbuch ISBN: 978-3-12-515460-5

We also recommend these books for grammar:
Uso de la Gramática Española. Nivel Elemental. ISBN 3-12-5358116-6
Spanische Grammatik für Selbstlerner 01 Bd.1 ISBN-10: 3896577093
Tiempo para conjugar. Buch mit CD-Rom, PC, Mac. ISBN 3-12-535809-4

Students will receive a list of recommended teaching and learning materials.
[*updated 19.02.2018*]

Module offered in:
WS 2019/20, WS 2018/19, WS 2017/18, WS 2016/17, WS 2015/16, ...

Spanish for Beginners II

Module name (EN): Spanish for Beginners II

Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014

Module code: KI664

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 2

Semester: 6

Mandatory course: no

Language of instruction:
Spanish

Assessment:
Written examination (final exam)

Curricular relevance:
KI664 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical
KIB-SFA2 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical
MAB.4.2.1.5 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 6, optional course
MST.SA2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 6, optional course, non-technical
MST.SA2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 6, optional course, non-technical
PIBWN51 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, not informatics specific
PIB-SFA2 Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific
MST.SA2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, semester 6, optional course, non-technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
KI663 Spanish for Beginners I
[*updated 16.01.2007*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Prof. Dr. Christine Sick
Dr. Victoriana Herrador Morillo
[*updated 16.10.2017*]

Learning outcomes:
The courses "Spanish for Beginners I and II" are based on each other. In the course of the two modules, students will first reach proficiency level A1 and then advance to level A2 of the European Framework of Reference for Languages.

The course Spanish for Beginners II_ is aimed at learners with basic knowledge of the Spanish language at level A1 of the European Reference Framework or the module _Spanish for Beginners I_.

The goal of the course is to provide students with basic knowledge of the Spanish language, which will enable them to communicate in general and professional situations as quickly as possible, both orally and in writing. To do so, all four skills (speaking, listening comprehension, reading and writing) will be trained equally. Content development will be supported by the repetition of the relevant grammatical structures.

The course takes a communicative and pragmatic approach that particularly promotes communicative competence in job-relevant situations through the use of role playing and situational dialogues. This also includes intercultural aspects that raise the students´ awareness of cultural differences and enable them to assert themselves in specific situations.
[*updated 24.02.2018*]

Module content:
Content:
In the course _Spanish for Beginners II_ students will learn the lessons 6 to 10 from _Meta Profesional A1-A2_ (Spanisch für den Beruf, Klett Verlag).

Work
- Describing your private and professional daily routine
- A day at work: habits and time
- Talking about preferences
- Agreeing and objecting to things
- Talking about experiences
- Opening hours
- Organizing a weekly schedule
- Talking about plans

Talking on the telephone
- Making business calls

Business appointments
- Making, accepting and rejecting invitations and suggestions
- Arranging appointments
- Talking about the weather
- Making a hotel reservation
- Planning business meals
- Deciding what is most important at the first meeting with a customer

Products and projects
- Describing buildings and offices
- Assessing and describing products and prices
- Talking about quantities
- Preparing a company presentation

Professional training and experience
- Reading job advertisements
- Composing an application cover letter
- Skills, strengths and weaknesses
- Creating a resume
- Participating in a job interview

In addition, we will concentrate on basic grammatical structures (such as for example, the imperative, future and past of regular and irregular verbs). Students should work on and expand their basic vocabulary independently.
[*updated 19.02.2018*]

Teaching methods/Media:
Teaching and learning materials (print media, slides, audio-visual teaching materials), multimedia learning software compiled specifically for the learning group.
[*updated 19.02.2018*]

Recommended or required reading:
The course is based on the following textbook and will be supplemented by additional learning material:
Meta profesional A1-A2 Spanisch für den Beruf. Klett Verlag; ISBN: 978-3-12-515460-5

We also recommend these books for grammar:

Uso de la Gramática Española. Nivel Elemental. ISBN 3-12-5358116-6
Spanische Grammatik für Selbstlerner 01 Bd.1 ISBN-10: 3896577093
Tiempo para conjugar. Buch mit CD-Rom, PC, Mac. ISBN 3-12-535809-4

Students will receive a list of recommended teaching and learning materials.
[*updated 19.02.2018*]

Module offered in:
SS 2019, SS 2018, SS 2017, SS 2016, SS 2015, ...

Systems Engineering

Module name (EN): Systems Engineering
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI583
Hours per semester week / Teaching method: 2PA (2 hours per week)
ECTS credits: 3
Semester: according to optional course list
Mandatory course: no
Language of instruction: German
Assessment: Project work
Curricular relevance: E1572 Electrical Engineering, Bachelor, ASPO 01.10.2012, optional course KI583 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, optional course, technical KIB-SYSE Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, optional course, technical MAB.4.2.2.18 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, optional course, technical PIBWI34 Applied Informatics, Bachelor, ASPO 01.10.2011, optional course, informatics specific PIB-SYSE Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Martin Buchholz

Lecturer: Prof. Dr. Martin Buchholz
[*updated 12.02.2015*]

Learning outcomes:
After successfully completing this module, students will be able to transfer an interdisciplinary problem within a complex system and derive a solution using a specific methodology.
[*updated 19.02.2018*]

Module content:
Project worked based on a specific, complex task definition using the methodology learned:
- Requirements analysis and definition
- System design (calculation, simulation, evaluation)
- System integration
- System verification and validation
- Project and risk management
- Sustainable development and optimization
[*updated 19.02.2018*]

Teaching methods/Media:
Coaching during the project
[*updated 14.07.2016*]

Recommended or required reading:
Recommended reading according to project.
Trade journals and data sheets
[*updated 19.02.2018*]

Module offered in:
SS 2020 (probably), SS 2019, SS 2018, SS 2017, SS 2016, ...

Technical Documentation

Module name (EN): Technical Documentation
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI655
Hours per semester week / Teaching method: 2V (2 hours per week)
ECTS credits: 2
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment:
Curricular relevance: BMT1580 Biomedical Engineering, Bachelor, ASPO 01.10.2013, optional course, non-medical/technical E1580 Electrical Engineering, Bachelor, ASPO 01.10.2012, optional course, non-technical KI655 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, non-technical KIB-TDOK Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, non-technical MAB.4.2.1.2 Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013, semester 5, optional course, not informatics specific MST.TDO Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2012, semester 6, optional course, non-technical MST.TDO Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 6, optional course, non-technical PIBWN65 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 5, optional course, not informatics specific PIB-TDOK Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, not informatics specific MST.TDO Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2011, semester 6, optional course, non-technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Walter Calles

Lecturer: Prof. Dr. Walter Calles
[*updated 01.10.2006*]

Learning outcomes:
After successfully completing this module, students will be capable of examining and checking technical texts. They will be able to analyze different kinds of texts based on their target group intentions. The influences of text design will be illustrated and structures for easier text creation will be learned. The documentation of research and work findings, including how to handle quotations and Internet sources, their identification in texts and the creation of a bibliography will enable students to create technical/scientific texts more efficiently.
[*updated 26.02.2018*]

Module content:
1 Text design in standards, guidelines and laws
2 Rules for technical texts
3 Operating instructions
4 Abstracts/text summaries
5 Comprehensibility of texts
6 Business correspondence
7 Notes, transcripts, minutes, reports
8 Structure and numbering of texts
9 Citation rules
10 Bibliography
11 Time management for the creation of longer texts
[*updated 26.02.2018*]

Recommended or required reading:
Lecture notes
[*updated 13.03.2007*]

Module offered in:
SS 2020 (probably), SS 2019, WS 2018/19, SS 2018, WS 2017/18, ...

Web Security Project

Module name (EN): Web Security Project
Degree programme: Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014
Module code: KI614
Hours per semester week / Teaching method: 1V+1PA (2 hours per week)
ECTS credits: 3
Semester: 6
Mandatory course: no
Language of instruction: German
Assessment: Project, presentation, documentation
Curricular relevance: KI614 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014, semester 6, optional course, technical KIB-PWS Computer Science and Communication Systems, Bachelor, ASPO 01.10.2017, semester 6, optional course, technical PIBWI62 Applied Informatics, Bachelor, ASPO 01.10.2011, semester 6, optional course, informatics specific PIB-PWS Applied Informatics, Bachelor, ASPO 01.10.2017, semester 6, optional course, informatics specific
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): KI430 System Management and Security [*updated 09.04.2018*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Damian Weber

Lecturer:
Dipl.-Inform. Dominik Brettnacher
[*updated 09.04.2018*]

Lab:
IT-security lab (5103/2)

Learning outcomes:
After successfully completing this module, students will have learned about typical security holes in web applications.
They know about the effects of such mistakes and how to avoid them in practice.
- Secure development of web applications, getting to know typical target (attack) areas
[*updated 12.04.2018*]

Module content:

- Exemplary implementation of a small application that will be developed during the course of the module.
  (PHP/SQL/JavaScript)

- Technical and economic impact of exploitable vulnerabilities on the Internet.

- Incident response: My server has been hacked: what do I do if it is already too late?

[*updated 12.04.2018*]

Recommended or required reading:
2011 CWE/SANS Top 25 Most Dangerous Software Errors
Günter Schäfer: Netzsicherheit: Algorithmische Grundlagen und Protokolle, dpunkt.verlag 2003
Risk Management Guide for Information Technology Systems (NIST SP 800-30), 2012
Telekommunikationsgesetz, § 109
Kryptographische Verfahren: Empfehlungen und Schlüssellängen (BSI TR-02102-1), 2017

Module website: https://pws.blackpond.net/
[*updated 12.04.2018*]

Module offered in:
SS 2018, SS 2017, SS 2012