Fakultät Technik und Informatik
Department Informations- und Elektrotechnik

Module Handbook

Degree Program
Information Engineering (B.Sc.)

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Assesment types

According to § 14 APSO-INGI, as currently applicable, the assesment types for the following module handbook are defined as follows:

1. Case study (Fallstudie/ FS)
A case study is a piece of written work presenting a reasoned solution to a set problem. Students work either individually or in a group to establish, analyse and solve specific problems in practice by applying scientific and academic methods and findings. Case studies are set for specific classes, and must be completed in the same semester as the class and by the time the class ends. The programme-specific examination and study regulations may contain more detailed provisions on the time available for case studies.

2. Home project (Hausarbeit/ H)
A home project is a piece of written work, to be produced by the student on his or her own and outside class hours, in which the student is to prove that he or she is able to investigate and analyse a set question or subject independently. A maximum of three months is allowed for completion. If the home project constitutes an examination, the programme-specific examination and study regulations may specify whether or not a colloquium is to be held once the written project has been submitted. Colloquia should last between 15 and 45 minutes, and are generally to be held within one month of submission of the written work.

3. Written examination (Klausur/ K)
A written examination is completed under supervision. Students must complete the set questions on their own, either without the use of study aids or with the use ofspecified study aids only. Written examinations last at least 60 and no longer than 240 minutes.

4. Colloquium (Kolloquium/ KO)
A colloquium may be required as part of certain types of examination, or in combination with the Bachelor or Master thesis. A colloquium is an oral examination in which students must prove their knowledge of the material examined, speaking and responding freely in an open discussion. A colloquium lasts at least 15 and no more than 45 minutes, and is also aimed at establishing that the written work submitted was all the student's own work. Colloquia can be organised as individual or group examinations. The size of the group for group examinations should be considered accordingly when setting the length of the examination.

5. Construction task (Konstruktionsarbeit/ KN)
A construction task is a piece of written work in which the student must prove his or her design skills by solving practical tasks. A maximum of three months is allowed for completion.

6. Lab work completion (Laborabschluss/ LA)
Lab work is successfully completed when students have successfully conducted the experiments set by the examiner during the semester and have demonstrated their knowledge by taking part in corresponding colloquia and/or by submitting written records of their work and/or by completing set written tasks. Colloquia last for a minimum of 15 and a maximum of 45 minutes. The written work must be submitted by a deadline set by the examiner; the latest deadline is the end of the semester in which the class in question was taken.

7. Lab work examination (Laborprüfung/ LR)
Lab work examination consists of the completion of lab work and a final examination at the end of the class. In the examination, the student is required to conduct and solve an experiment on his or her own and independently. Examinations last at least 60 and no more than 240 minutes.

8. Oral examination (Mündliche Prüfung/ M)
In an oral examination, a student must demonstrate in discussion with the examiner that he or she fully understands the material on which he or she is being examined. Oral examinations generally last at least 15 and no more than 45 minutes. Oral examinations may be conducted as individual or group examinations, and are to be conducted by one examiner and one assessor in accordance with Section
An oral examination may alternatively be conducted by two or more examiners instead of one, i.e. by a panel of examiners; in such a case, the student is to be examined by one examiner only in each of the various examination subjects. Oral examinations are always assessed and graded by one examiner only, no matter whether they are conducted by several examiners or by an examiner and an assessor. The examiner responsible for grading in each case must consider the views of the other examiners/the assessor before deciding on the grade to be awarded. The main aspects covered in and results of each oral examination are to be recorded. The record is signed by the examiners and assessor and is filed with the examination documents.

9. Project (Projekt/ Pj)
A project is an interdisciplinary task relating to the area of industry or business for which the course is designed. The results of projects must be documented. At least 6 and no more than 26 weeks are allowed for projects. Project work is generally completed with a colloquium. The applicable programme-specific examination and study regulations may specify additional requirements in terms of the form, content and goal of the project, and may specify another form of final assessment instead of a colloquium.

10. Paper (Referat/ R)
A paper is a presentation lasting between 15 and 45 minutes on the basis of written preparation by the student. A paper is followed by a discussion led by the student or tutor. Papers should not be read out from detailed notes; students should be able to speak spontaneously. Digital or hard copies of any presentations and graphics used are to be submitted to the examiner. The detailed written paper to be submitted to the examiner should summarise the key findings and conclusions.

11. Test (T)
Tests are pieces of written work in which students demonstrate their ability to solve set tasks in a clearly defined subject area under examination conditions. Tests last at least 15 and no more than 90 minutes. The programme-specific examination and study regulations may specify that test results are to be included in the overall grade for written examinations.

12. Exercise slip (Übungstestat/ ÜT)
An exercise slip is awarded once a student has successfully solved the written theory tasks set by the examiner and has demonstrated his or her knowledge of the subject in a colloquium or paper. Colloquia last at least 15 and no more than 45 minutes. The written work must be submitted by a deadline set by the examiner; the latest deadline is the end of the semester in which the class type in question (exercise) was taken.

Module Descriptions

Bachelor Information Engineering	
Mathematics 1	
Abbreviation	MA1 / MAE1
Module responsibility	Prof. Dr. Heß (Hess)
Duration / Semester/ Regular cycle	One semester / 1. semester / summer and winter semester
Credits (CP) / Semester hours per week (SHW)	8 LP 5 + 1 SHW
Workload	Attendance: 108 h Self-study: 132 h
Type of module	Mandatory module
Prerequisites	Recommended: Mathematics on secondary school level
Language	English
Learning outcomes	The students can solve mathematical problems for further subjects of the course by using profound knowledge in the fields of • Logic, sets, single argument functions, mathematical induction • Natural, integer, rational, real and complex numbers • Sequences, series and power series • Differential calculus, polynomials, rational functions and curve sketching • System of linear equations, matrices, determinants, eigen-values and -vectors
Learning content	This unit presents an introduction to the fundamentals of Differential Calculus for single argument functions and to linear algebra. Many applications and solution techniques are presented
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (ÜT)(PVL)
Courses	MA1 (Lecture) MAE1 (Exercises)
Type of Media	MA1: Tuition in seminars, blackboard, slides, computer simulation MAE1: Practical course
Literature	In the current edition: • Lecture notes • Courant, R.; John, F.: Introduction to Calculus and Analysis, Springer • Murray, H.; Protter.: Basic Elements of Real Analysis, Springer

Bachelor Information Engineering	
Software Construction 1	
Abbreviation	SO1 / SOL1
Module responsibility	Prof. Dr.-Ing. Marc Hensel
Duration / Semester/ Regular cycle	One semester / 1. semester / summer and winter semester
Credits (CP) / Semester hours per week (SHW)	7 LP 4 + 1,5 SHW
Workload	Attendance: 99 h Self-study: 111 h
Type of module	Mandatory module
Prerequisites	Recommended: - school mathematics - basic operation of personal computers (including text editors)
Language	English
Learning outcomes	The students can develop small console applications in the C programming language (e.g., to process scientific data or program microcontrollers) by • analyzing given source code, • implementing given functional requirements, and • implementing, debugging, and testing code in an integrated development environment.
Learning content	• Data types (including integer and floating-point, operators, and type conversions) • Flow control (including selections, jumps, and loops) • Functions (including recursive functions) • Arrays (including 2-dimensional arrays) and strings • Pointers • Memory management (including dynamic memory allocation) • Structures, enumerations, and type definitions • Input / output (including keyboard, console, and files) • Bit operations • Preprocessor directives • Selected applications (like, e.g., sorting, linked lists, and microcontrollers) • Development principles and introduction to an integrated development environment (including coding style and debugging)
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in Lab work examination (LR)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	SO1 (Lecture) SOL1 (Laboratory)
Type of Media	SO1: Tuition in seminars, blackboard, slides, demonstration and elaboration of computer programs SOL1: Laboratory exercises
Literature	In the current edition: • Prata, Stephen: C Primer Plus, Addison Wesley

Bachelor Information Engineering	
Electrical Engineering 1	
Abbreviation	EE1 / EEL1
Module responsibility	Prof. Dr. Rasmus Rettig
Duration / Semester/ Regular cycle	One semester / first semester / summer and winter semester
Credits (CP) / Semester hours per week (SHW)	6 CP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Knowledge of basic calculus (incl. curve sketching, quadratic equations, differential and integral calculus) is recommended
Language	English
Learning outcomes	*By* applying the fundamental concepts and methods (see learning content), the students *can* • calculate, measure and evaluate voltages and currents in basic DC networks with linear and non-linear components, • calculate, measure and evaluate voltages and currents in basic AC networks with capacitors/inductors and sinusoidal excitation to setup electric circuits with defined characteristics.
Learning content	• **Fundamental concepts and methods**: Physical basis of voltage, current, power, energy, Ohm's law, Kirchhoff's laws, superposition principle, mesh and nodal analysis, Thevenin's and Norton's theorems, equivalent voltage and current sources • **DC**: Instruments for DC measurements, error calculation and propagation, DC bridge circuits • **AC**: Characterization of AC-signals, Phasors, impedance, reactance, admittance, AC bridge circuits, AC power, power factor correction, frequency- and amplitude-response, filters, resonant circuits • **Components**: Resistors, non-linear resistors, linear sources, controlled sources, inductors, capacitors • **Tools**: DC-measurement of voltage, current and resistance, instrumentation, errors and tolerances in instruments, SPICE simulations
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	EE1 (Lecture) EEL1 (Practical Course / Laboratory / Exercises)
Type of Media	EE1: Tuition in seminars, blackboard, slides, computer simulation EEL1: Practical course
Literature	In the current edition: • Bongart, T.: Electric Circuits, McGraw-Hill • Edminister, J.: Schaum's Outline of Electric Circuits, McGraw-Hill • Boylestad, R.: Introductory Circuit Analysis, Prentice Hall • Alexander, C.K.: Fundamentals of Electric Circuits, McGraw-Hill

Bachelor Information Engineering	
German	
Abbreviation	GE
Module responsibility	Prof. Dr.-Ing. Lutz Leutelt
Duration / Semester/ Regular cycle	One semester / 1. semester / summer and winter semester
Credits (CP) / Semester hours per week (SHW)	4 LP 2 SHW
Workload	Attendance: 36 h Self-study: 84 h
Type of module	Mandatory module
Prerequisites	All levels accepted – different courses available
Language	German
Learning outcomes	The students • have improved the ability to communicate in German to assist in their daily interaction with their surroundings, but also to express themselves efficiently and competently in their course studies, • are better prepared to participate in technical discussions for the purpose of an internship or a career in a German company, • have used authentic teaching material which improved their speaking, writing, reading and understanding abilities, • have acquired grammatical proficiency and broadened their understanding of the German culture, • have trained their optimization of presentations.
Learning content	• German language classes are offered on different levels, for example elementary (A1), pre-intermediate (A2-B1), intermediate (B2), or upper intermediate (C1-C2) according to CEFR (Common European Framework of Reference for Languages) • Grammar, syntax, vocabulary and practical speech training for daily professional and technical situations • Analysis, presentation and documentation (description) of technical and daily situations in German • an excursion to one of the major companies like AIRBUS, which is a linguistic as well as technical challenge, upon which we will later reflect and comment on
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Seminar: Successful paper presentation on the basis of written preparation (R)(SL)
Courses	GE (Seminar)
Type of Media	GE: Tuition in seminars, blackboard, slides, computer simulation
Literature	• List of work- and reference books will be provided, Internet Links, Bilingual Dictionary, Hand outs

Bachelor Information Engineering	
Learning and study methods (1)	
Abbreviation	LSE1 / LSL1
Module responsibility	Prof. Dr.-Ing. Lutz Leutelt
Duration / Semester/ Regular cycle	one semester / 1. semester / summer and winter semester
Credits (CP) / Semester hours per week (SHW)	4 CP 2 + 1.5 SHW
Workload	Attendance: 63 h Self-study: 57 h
Type of module	Mandatory module
Prerequisites	None: Introductory course
Language	English
Learning outcomes	The students • can use methodical and organizational tools and are able to complete the course assignments and examinations punctually, effectively and independently using the English language. In order to do this, skills outside of the technical subject area have been presented and subsequently acquired by the students, • are aware of their personal work and learning techniques with regard to life-long learning strategies and goals, • are able to solve problems and complete tasks systematically as well as analyse complex daily situations and set personal goals, • are able to self-reflect their individual learning progress by the collateral coaching project that is continued in semester 2.
Learning content	• Time management • Learning and studying techniques (independent study) • Group work/ Teamwork/ Group projects • Reading skills • Scientific/ academic methods • Presentation skills • Dealing with stress • Motivation • Responsibility
Usability of the module	Degree program Information Engineering Degree program Elektro- und Informationstechnik Degree program Regenerative Energiesysteme und Energiemanament
Requirements for the recognition of credits (Study and exam requirements)	Seminar + Lab: Successful paper presentation on the basis of written preparation (R)(SL)
Courses	LSE1 (Seminar) LSL1 (Lab)
Type of Media	LSE1: Tuition in seminars, blackboard, slides, computer simulation LSL1: Practical course
Literature	In the current issue: • Jewler, A.; Gardner, J. (1993): Your College Experience: Strategies for Success, Wadsworth

	• Gardner, J.; Upcraft, M.L. (2004): Challenging and Supporting the First-Year Student: A Handbook for Improving the First Year of College, Jossey-Bass • Powell, M. (1996): Presenting in English: How to Give Successful Presentations, Language Teaching Publications

Bachelor Information Engineering	
Learning and study methods (2)	
Abbreviation	LSL2
Module responsibility	Prof. Dr. Benno Radt
Duration / Semester/ Regular cycle	One week / 2nd semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	2 LP 1,5 SHW
Workload	Attendance: 27 h Self-study: 33 h
Type of module	Mandatory module
Prerequisites	None: Introductory course
Language	English
Learning outcomes	The Students • know the methodical and organizational tools to complete the course assignments and examinations punctually, effectively and independently using the English language • can compare skills in project management and development processes with regard to effectiveness from the students' point of view. The analysis is done based on the application example of developing a technical good like for example a robot within several days. The technical good has to fulfill several tasks described in a set of user requirements and user stories. The technical specification and the product realization is developed by the students team enabling them to reflect which theoretical basic knowledge from the courses can be applied to such a project. At the end of the project they know the industry specific glossary typically used in development projects • have become aware of their personal work preferences and learning techniques with regard to life-long learning and interdisciplinary strategies and goals • have the opportunity to contrast and criticize numerous problem solving strategies in their team and the neighboring teams • They reflect on strategies how to complete tasks systematically as well as analyze complex daily situations and set personal and realistic team goals • generate a personalized pattern how to use self-reflection of the individual learning progress and study success with the goal to be effective in a team especially knowing how to profit from multiple technical knowledge pools and multiple personalities in a team
Learning content	• Time management, conflict management and dealing with limited resources • Learning and studying techniques • Group work/ Teamwork/ Group projects/ management techniques; Project management techniques and tools; roles and responsibilities in a team • Reading and communication skills; defining a realistic project scope and S:M:A:R:T goals. • Development Process basics, design thinking process • Presentation skills

Usability of the module	Bachelor Information Engineering Bachelor-Studiengang Elektro- und Informationstechnik
Requirements for the recognition of credits (Study and exam requirements)	Successful direct team assessments by the professors during the ongoing project and successful presentation on the basis of written preparation (R)(SL)
Courses	LSL2 (Practical course)
Type of Media	Seminar: Tuition in seminars, blackboard, slides, data projector, TV/DVD/Video hands on development of a technical good
Literature	In the current issue: • Jewler, A.; Gardner, J. (1993): Your College Experience: Strategies for Success, Wadsworth • Garnder, J.; Upcraft, M. (2004): Challenging and Supporting the First-Year Student: A Handbook for Improving the First Year of College, Jossey-Bass • Powell, M. (1996): Presenting in English. How to Give Successful Presentations, Language Teaching Publications • Jose Maria Delos Santos(2013); Making Things Happen: Mastering Project Management; • Donald G. Reinertsen (2009): The principles of product development flow: second generation lean product development • Isenberg, R. (2005): Lernkonzepte – ein Teilbetrag im Rahmen des Forschungsprojekts wirtschaftliche und technische Adaption der kundenspezifischen Prozesskette im Industrieunternehmen mit Lernkonzepten (Validierung), Berichts-Nr. akp051201b Dezember, HAW Hamburg • Isenberg, R. (2006): Lernprojekt in: Bachelor Kernstudium – didaktische Konzepte (Chancen für den Bachelor), 25ter SRA Workshop HAW-MuP16.1.06 • Klocke, M. (2011): pro8 Studienziel Projektarbeit, 4ING/HRK-Workshop – Kompetenzorientiertes Prüfen in den Ingenieurwissenschaften und der Informatik, Bremen 29.3.2011

Bachelor Information Engineering	
Mathematics 2	
Abbreviation	MA2 / MAE2
Module responsibility	Prof. Dr. Robert Heß (Hess)
Duration / Semester/ Regular cycle	One semester / 2. semester / summer and winter semester
Credits (CP) / Semester hours per week (SHW)	8 LP 5 + 1 SHW
Workload	Attendance: 108 h Self-study: 132 h
Type of module	Mandatory module
Prerequisites	Recommended: Module Mathematics 1
Language	English
Learning outcomes	The students can solve mathematical problems for further subjects of the course by using profound knowledge in the fields of • Integral calculus with applications and integration techniques • Differential equations • Combinatorics, probability theory and stochastics
Learning content	This unit presents an introduction to the fundamentals of integral calculus, multiple argument functions, differential equations and stochastics. Many applications and solution techniques are presented.
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Exercises: Successful participation in exercises (ÜT)(PVL)
Courses	MA2 (Lecture) MAE2 (Exercises)
Type of Media	MA2: Tuition in seminars, blackboard, slides, computer simulation MAE2: Practical course
Literature	In the current issue: • Lecture notes • Courant, R.; John, F.: Introduction to Calculus and Analysis, Springer • Murray, H.; Protter.: Basic Elements of Real Analysis, Springer

Bachelor Information Engineering	
Software Construction 2	
Abbreviation	SO2 / SOL2
Module responsibility	Prof. Dr.-Ing. Sebastian Rohjans
Duration / Semester/ Regular cycle	One semester / 2. semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Software Construction 1
Language	English
Learning outcomes	The students can develop applications with graphical user interfaces (for example, to process and visualize data) by • analyzing class structures and source code, • implementing class structures and • implementing applications with given functionality according to given requirements. The students can implement object-oriented concepts, especially for increasing the code quality in the programming language Java.
Learning content	**Lecture:** • Introduction into the object-oriented programming in JAVA • The Programming environment and the fundamental programming structures in JAVA • The object-oriented programming fundamentals • The basic usage of classes, associations, inheritance, encapsulation and other object-oriented subjects • Main libraries of the API (Application Programming Interface) • The execution of JAVA programs using graphical user interfaces and threads **Laboratory:** • During the laboratories the transferring of the main parts of the object-oriented JAVA syntax into applications has to be trained. The implementation of JAVA programs, the usage of JAVA classes and the usage of the JAVA software Developers Kit (SDK) is the main focus of this module.
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in lab work examination (LR)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	SO2 (Lecture) SOL2 (Laboratory)
Type of Media	SO2: Tuition in seminars, blackboard, slides, demonstration and elaboration of computer programs SOL2: Laboratory exercises
Literature	In the current issue: • Haines, S.; Potts, S.: Java 2 Primer Plus, SAMS Publishing • Flanagan, D.: JAVA in a Nutshell, A Desktop Quick Reference, O'Reilly

	• Horstmann, C. S.; Cornell, G.: Core Java 2, Volume I-Fundamentals, Sun Microsystems Press • Eckel, B.: Thinking in Java, Prentice Hall • Arnold, K.; Gosling, J.; Holmes, D.: The Java Programming Language, Addison-Wesley

Bachelor Information Engineering	
Electrical Engineering 2	
Abbreviation	EE2 / EEL2
Module responsibility	Prof. Dr. Rasmus Rettig
Duration / Semester/ Regular cycle	One semester / second semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 CP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Electrical Engineering 1
Language	English
Learning outcomes	*By applying* the tools and methods described in the learning content, the students *can* • calculate, measure and evaluate voltages and currents in advanced AC networks with capacitors/inductors and sinusoidal or non-sinusoidal excitation, • calculate, measure and evaluate transient signals in LCR networks, • perform and evaluate AC measurements with the oscilloscope, • can calculate voltages and currents in transformers with sinusoidal excitation, • can calculate voltages and currents in multiphase systems *to* setup electric circuits with defined characteristics.
Learning content	• AC: Characterization of periodic, non-sinusoidal signals, design and characterization of advanced filter circuits, transfer function, amplitude- and phase response, Bode diagram, resonant circuits, multiphase systems • Transients: switching current and voltage in basic RLC-networks • Components: transformers • Tools: Advanced oscilloscope measurements, introduction into measurement automation
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	EE2 (Lecture) EEL2 (Practical Course / Laboratory / Exercises)
Type of Media	EE2: Tuition in seminars, blackboard, slides, computer simulation EEL2: Practical course
Literature	In the current issue: • Bongart, T.: Electric Circuits, McGraw-Hill • Edminister, J.: Schaum’s Outline of Electric Circuits, McGraw-Hill • Boylestad, R.: Introductory Circuit Analysis, Prentice Hall • Alexander, C.K.: Fundamentals of Electric Circuits, McGraw-Hill

Bachelor Information Engineering	
Electronics 1	
Abbreviation	EL1 / ELL1
Module responsibility	Prof. Dr. Lapke
Duration / Semester/ Regular cycle	One semester / 2nd semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Electrical Engineering 1 and Mathematics1
Language	English
Learning outcomes	The students • are able to describe the nonlinear behavior of a diode by means of mathematical formulas, characteristic parameters and characteristic curves, can characterize diodes by measurement and design rectifier circuits to generate DC voltages. • are able to describe the non-linear behavior of bipolar and JFET/MOSFET transistors by means of mathematical formulas, characteristic parameters and characteristic curves and can measure and evaluate the characteristics curves with suitable equipment to design amplifier circuits and use transistors as a switch and constant current source. • can work on technical problems in a team in order to successfully complete the laboratory tasks' scope by applying standard engineering methods.
Learning content	• **Semiconductor basics**: band model, charge transport, pn-junction, Shockley equation • **Diodes**: structure, characteristics, equivalent circuit, maximum ratings, temperature influence, switching properties, half-wave rectifier, bridge rectifier, Z-diode, spice simulation • **Bipolar transistors**: structure, characteristics, parameters and maximum ratings, small signal model, temperature, dependence, power dissipation and cooling, operating point, amplifier circuits, constant current sources, current mirror, spice simulation • **MOS-Transistors:** structure, characteristics, parameters and maximum ratings, small signal model, operating point, amplifier circuit, constant current source, spice simulation Subject to modifications and amendments in light of recent events
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	EL1 (Lecture) ELL1 (Laboratory)
Type of Media	El1: Tuition in seminars, blackboard, slides, computer simulation ELL1: Practical course

Literature	In the current issue: • Tietze, U.; Schenk, C. (2008): Electronic Circuits: Handbook for Design and Application, Springer Publishing

Bachelor Information Engineering	
Intercultural Competence	
Abbreviation	IC
Module responsibility	Prof. Dr. Lapke
Duration / Semester / regular cycle	One semestzer / 2nd semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	3 LP 2 SHW
Workload	Attendance: 36 h Self-study: 54 h
Type of module	Mandatory module
Prerequisites	Recommended: German course of 1st semester
Language	German and/or English
Learning outcomes	**Knowledge**: The students can apply their understanding of cultural differences to effectively work and cooperate in international teams and to master the challenges of everyday life in Germany by • knowing different aspects and examples of cultural differences, • knowing about the importance for success in work and everyday life, • having raised a critical culture awareness, • having improved language abilities in German and/or English, and being able to effectively communicate in intercultural situations
Learning content	• Theory of cultural differences in communicative practices taking into account both verbal and non-verbal communication • Intercultural aspects in business and team building • Intercultural aspects of life in Germany • Building practical skills in group work including blended learning: intercultural group work and language learning on electronic platforms • Depending on the language preferences and abilities of the participants, at least a part of lecture is held in German.
Usability of the module	• Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful paper presentation on the basis of written preparation (R)(SL)
Courses	IC (Lecture)

Type of Media	Lecture: Tuition in seminars, blackboard, slides, TV/DVD/Video
Literature	In the current issue: • Chen, G.; Starosta, W. (1998): Foundations of Intercultural Communication, Allyn & Bacon • Apelthauer, E. (2002, Hrsg.): Interkulturelle Kommunikation, Deutschland – Skandinavien – Großbritannien, Narr Verlag • Jandt, F. (2004): Intercultural Communication: A globe reader, Wadsworth Publishing

Bachelor Information Engineering	
Signals and Systems 1	
Module number	SS1 / SSL1
Module coordination	Prof. Dr. Rauscher-Scheibe
Duration/ semester/ frequency	One semester / 3. semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	attendance: 72 h self-study: 108h
Type of module	Mandatory
Prerequisites	Recommended: Mathematics 1 and 2
Language	English
Learning outcomes	The students • know both the Fourier- and Laplace-transform, • understand basic properties of signals and systems, • can describe continuous-time signals in the time, Laplace and frequency domain, • can describe continuous-time, linear, time-invariant systems (LTI-systems) in the time, Laplace and frequency domain, • can calculate the output signal of a continuous-time LTI-system for an arbitrary input signal, • are familiar with the basic types of continuous-time, frequency-selective filters and the transmission properties of LTI-systems.
Learning content	• Introduction to Fourier- and Laplace transformation • Continuous-time signals in the time, Laplace and frequency domain • Basic system properties: linearity, time-invariance, stability and causality • Description of continuous-time LTI-systems in the time, Laplace and frequency domain: convolution, differential equation, impulse and step response, transfer function, frequency response • Analysis of output signals from arbitrary input signals transmitted via continuous-time LTI-systems • Basic types of continuous-time, frequency-selective filters and the transmission properties of LTI-systems
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
According courses	SS1 (lecture) SSL1 (laboratory)
Teaching methods	SS1: instruction in seminars, blackboard, slides, computer simulation SSL1: practical tuition
Literature	In the current issue: • Oppenheim, A.; Willsky, A. (1996): Signals and Systems, Prentice Hall • Strum, R.; Kirk, D. (1999): Contemporary Linear Systems Using Matlab, Brooks Cole Pub • Lee, E.; Varaiya, P. (2002): Structure and Interpretation of Signals and Systems, Addison Wesley

	• Ziemer, R. (2005): Continuous and Discrete Signals and Systems, Prentice Hall

Bachelor Information Engineering	
Algorithms and Data Structures	
Abbreviation	AD / ADL
Module responsibility	Prof. Dr. Dierks
Duration / Semester/ Regular cycle	One semester / 3rd semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Programming experience recommended
Language	English
Learning outcomes	• The students understand that choosing data structures and algorithms affects the efficiency of their programs • The students know state-of-the-art solutions for typical problems and they are able to apply them in their own programs to improve the quality thereof. • The students know theoretical limits of sorting and searching and they are able to apply this knowledge to analyze the complexity of new programming problems • The students are able to synthesize efficient programs by applying the taught algorithms and data structures • The students learn that it makes sense to apply state-of-the-art algorithms to produce competitive software that is scalable
Learning content	**Lecture:** • Introduction with elementary algorithms and complexity estimations, complexity • Abstract data types and their implementation • Sorting, Divide-and-Conquer, Pivot, Mergesort, Priority Queue • Search algorithms • Finite-state automata • Introduction to graph- and optimization algorithms **Laboratory:** • Empiric detection of complexity depending on problem size by counting the number of steps • Dynamic behavior of sorting algorithms • Tree traversals, search algorithms
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	AD (Lecture) ADL (Laboratory / Exercises)

Type of Media	AD: Tuition in seminars, blackboard, slides, computer simulation ADL: Practical course
Literature	In the current issue: • Sedgewick, R. : Algorithms, Addison-Wesley • Hopcroft, J.; Motwani, R.; Ullman, J.: Introduction to Automata Theory, Languages and Computation, Addison-Wesley

Bachelor Information Engineering	
Electronics 2	
Abbreviation	EL2 / ELL2
Module responsibility	Prof. Dr. Martin Lapke
Duration / Semester/ Regular cycle	One semester / 3rd semester / academic year
Credits (CP) / Semester hours per week (SHW)	7 LP 4 + 1,5 SHW
Workload	Attendance: 99 h Self-study: 111 h
Type of module	Mandatory module
Prerequisites	Recommended: Electrical engineering 1+2 and Electronics 1
Language	English
Learning outcomes	Analog Electronics • Based on the characteristics of bipolar transistors the students are able to design and build a differential amplifier to understand the fundamentals of operational amplifiers. • The students are able to characterize operational amplifiers by means of mathematical formulas and measurement to design and implement basic operational amplifier circuits using the virtual short circuit concept in order to understand and build amplifier circuits and active filters. Digital Electronics • The students are familiar with the internal structure of digital circuits of modern transistor-family circuit families and can analyze the circuits in terms of inputs, outputs and internal processing, as well as classify the main parameters given in datasheets. • To design and implement simple converters, the students can classify AD / DA converters by their characteristics and the main parameters given in datasheets. • The students are able to simulate and measure simple digital circuits. General • The students can work on technical problems by applying an engineering-like working method in a team within the framework of the laboratory groups to be completed together.
Learning content	• **Differential amplifier**: basic electrical circuit, characteristics, properties, improvement with current mirror, spice simulation • **Operational amplifier**: ideal op-amp, internal structure of real op-amp, feedback circuit, stability and frequency response, non-ideal properties, basic electrical circuits with op-amps, applications with op-amps, spice simulation • **Digital Electronics**: Overview of digital circuit families: characteristic values, characteristic curves • **DA/AD converters:** digital to analog converter, analog to digital converter: parameters, circuit principles, comparisons and applications subject to modifications and amendments in light of recent events
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)

Courses	EL2 (Lecture) ELL2 (Laboratory)
Type of Media	EL2: Tuition in seminars, blackboard, slides, computer simulation ELL2: Practical course
Literature	In the current issue: • Tietze, U.; Schenk, C. (2008): Electronic Circuits: Handbook for Design and Application, Springer Publishing • Ayers, J.E. (2010): Digital Integrated Circuits, 2nd Edition, Tayler & Francis Verlag • Maloberti, F. (2010): Data Converters, Springer Verlag • Kester, W. (2005): Data Conversion Handbook, Analog Devices Verlag

Bachelor Information Engineering	
Digital Circuits	
Abbreviation	DI / DIL
Module responsibility	Prof. Dr.-Ing. Lutz Leutelt
Duration / Semester/ Regular cycle	one semester / 3rd semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Mathematics 1, Software Construction 1, Electrical Engineering 1 + 2
Language	English
Learning outcomes	The students • have the ability to describe digital circuits with logical equations, circuit diagrams, timing- and state-diagrams as well as with a hardware description language (HDL), • have the ability to read digital circuit diagrams and interpret them correctly, • can develop simple combinational and sequential circuits and analyze and verify their correct static and dynamical functionality using computer aided methods and corresponding target hardware in the lab, • have the ability to correctly identify and asses logical and timing relations within digital circuits and to draw correct consequences for an optimum circuit design, • have the ability to analyze combinational circuits with medium scale integrated (MSI) complexity, to synthesise them using minimization schemes and to model them on Register-Transfer- (RT-) Level, • can convert numbers into different number systems, • can perform addition and multiplication with positive and negative numbers, • can chose and apply correct application specific HDL-coding, • can select appropriate digital HW interfaces, • understand the function and timing of latches and flipflops, • can systematically design digital circuits and implement them in programmable logic, • can apply a HDL coding style which assures identical simulation and synthesis semantics, • have the ability to model and implement simple state machines, • have the ability to transfer the gained knowledge from simple applications to more advances applications, in order to design, realize and verify a digital logic based solution for a given technical problem and its requirements.
Learning content	• polyadic number systems and codes, including their arithmetical operations in digital domain • the meaning of twos complement for digital circuits and computer architecture, including basic arithmetic operations • Boolean algebra • analysis of combinational circuits like for example serial, ripple-carry and carry-look-ahead adders resp. subtractors or pseudorandom generators

	• synthesis of combinational circuits using minimization techniques like truth tables, Boolean equations, and Karnaugh-Veitch-Diagrams • synthesis targeted HDL modeling of simple circuits with MSI complexity on register transfer level (RTL), also using symbolic delays • analysis and HDL modeling of special digital circuit outputs • synthesis of combinational logic for programmable circuits • different digital output circuits (push-pull, open drain, tri-state) • introduction into structure and design of Mealy- and Moore- state machines using state diagrams, state tables, including HDL modeling • structure, behavior and HDL modeling of state- and edge- driven latches and flipflops, metastability • structure, design and HDL modeling of controlled counters and shift registers • a HDL coding style which assures identical simulation and synthesis semantics
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	DI (Lecture) DIL (Laboratory / Exercises)
Type of Media	DI: Tuition in seminars, blackboard, slides, computer simulation DIL: Practical course
Literature	In the current issue: • Wakerly, J.F.: Digital Design Principles & Practices, Prentice Hall • Chu, P.P.: RTL Hardware Design Using VHDL (Coding for Efficiency, Portability, and Scalability), John Wiley & Sons • Armstrong, J.R.; Gray, F.G.: VHDL-Design. Representation and Synthesis, Prentice Hall • Brown, S.; Vranesic, Z.: Fundamentals of Digital Logic with VHDL Design, Mc Graw Hill • Reichardt, J.: Lehrbuch Digitaltechnik, Oldenbourg Verlag

Bachelor Information Engineering	
Economics and Management	
Abbreviation	EM / EME
Module responsibility	Prof. Jörg Dahlkemper
Duration / Semester/ Regular cycle	One semester / 3rd semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	-
Language	English
Learning outcomes	The students • understand general management principles and can apply commonly used management tools in companies like SWOT analysis to derive strategic options in a case study and Balanced Scorecard to monitor the achievement of strategic goals • understand cost concepts with the focus on engineering costs and terms related to investment to judge its attractiveness • have the ability to apply methods of investment analysis to evaluate projects, • have the ability to set up a business work out and present business opportunities.
Learning content	• Basic Concepts • Management: Strategic Planning (e.g. SWOT analysis), Controlling (e.g. Balanced Score Card) • Goods and services: Materials management (Sourcing, Logistics, Supply Chain Management), Production management (Production philosophies, e.g. one-piece-workflow) • Engineering costs and cost estimating: Cost concepts, Engineering costs, cost estimating • Interest and Equivalence: Cash flow, Time value of money, Equivalence, Investment analysis (Present worth analysis, Annual cash flow analysis, Rate of return analysis) • Setting up a business plan with case study
Usability of the module	Bachelor Information Engineering Bachelor Regenerative Energiesysteme und Energiemanagement
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful paper presentation on the basis of written preparation (R)(PVL)
Courses	EM (Lecture) EME (Exercises, Case study)
Type of Media	EM: Tuition in seminars, blackboard, slides, computer simulation EME: Case study, literature
Literature	In the current issue: • Sullivan, W. G.; Wicks, E. M.; Koelling, C. P.: Engineering Economy. Pearson.

	• Newman, D.G. et al.: Engineering Economic Analysis. Oxford University Press • Junge, P.: BWL für Ingenieure. Gabler Verlag

Bachelor Information Engineering	
Signals and Systems 2	
Module number	SS2 / SSL2
Module coordination	Prof. Dr. Rauscher-Scheibe
Duration/ semester/ frequency	One semester / 4. semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	attendance: 72 h self-study: 108h
Type of module	Mandatory
Prerequisites	Recommended: Signals and Systems 1
Language	English
Learning outcomes	The students • know both the discrete and the time-discrete Fourier- and z-transform, • understand basic properties of time-discrete signals and systems, • can describe time-discrete signals in the time, Laplace and frequency domain, • can describe time-discrete, linear, time-invariant systems (LTI-systems) in the time, Laplace and frequency domain, • are familiar with the basic types of time-discrete, frequency-selective filters and master simple layout techniques. • can describe stochastic signals in the time and frequency domain, • are familiar with the basic concepts of the analysis of stochastic signals.
Learning content	• Introduction to discrete Fourier- and z-transformation • Transgression between continuous and discrete signals: sampling, signal reconstruction, sampling theorem • Time-discrete signals in the time, Laplace and frequency domain • Description of time-discrete LTI-systems in the time, Laplace and frequency domain: discrete convolution, difference equation, impulse and step response, transfer function, frequency response • Basic types of time-discrete, frequency-selective filters • Stochastic signals: noise, power-density spectrum, auto-correlation-function, cross-correlation-function, transmission of stochastic signals via LTI-systems
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
According courses	SS2 (lecture) SSL2 (laboratory)
Teaching methods	SS2: instruction in seminars, blackboard, slides, computer simulation SSL2: practical tuition
Literature	In the current issue: • Oppenheim, A.; Willsky, A.: Signals and Systems, Prentice Hall • Strum, R.; Kirk, D.: Contemporary Linear Systems Using Matlab, Brooks Cole Pub

	• Lee, E.; Varaiya, P.: Structure and Interpretation of Signals and Systems, Addison Wesley • Ziemer, R.: Continuous and Discrete Signals and Systems, Prentice Hall

Bachelor Information Engineering	
Software Engineering	
Abbreviation	SE / SEL
Module responsibility	Prof. Dr.-Ing. Marc Hensel
Duration / Semester/ Regular cycle	One semester / 4. semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Software Construction 2
Language	English
Learning outcomes	The student systematically craft useful, reliable, and maintainable software – by • elaborating customer needs and transforming these into requirements, • modeling the structure and time-behavior of object-oriented software, and • testing software to fulfill technical requirements and user needs.
Learning content	• Basic ideas of the software engineering process (including analysis, design, realization, and test), process models, and modelling using UML (Unified Modelling Language) • Requirement analysis and use case studies • Modelling by selected UML diagrams (e.g., class, object, activity, state machine, sequence, and/or communication diagrams) based on requirements • Introduction to a software engineering tool • Construction of object-oriented software for small applications using software engineering methods (e.g., selected design patterns)
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	SE (Lecture) SEL (Laboratory / Exercises)
Type of Media	SE: Tuition in seminars, blackboard, slides, computer simulation SEL: Practical course
Literature	In the current issue: • Booch, G.; Rumbaugh, J.; Jacobson, I.: The Unified Modeling Language User Guide, Addison-Wesley • Douglass, B.P.: Real Time UML: Advances in the UML for Real-Time Systems, Addison-Wesley • Rumbaugh, J.; Jacobson, I.; Booch, G.: The Unified Modeling Language Reference Manual, Addison-Wesley • Sommerville, I.: Software Engineering, Addison-Wesley

Bachelor Information Engineering	
Microcontrollers	
Abbreviation	MC / MCL
Module responsibility	Prof. Dr. Paweł Adam Buczek
Duration / Semester/ Regular cycle	One semester / 4th semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	7 LP 4 + 1,5 SHW
Workload	Attendance: 99h Self-study: 111h
Type of module	Mandatory module
Prerequisites	Recommended: Software Construction 1 and 2, Digital Circuits, good proficiency in programming in C and digital logic/arithmetic, fundamentals of digital hardware
Language	English
Learning outcomes	**Knowledge:** The students: • can name different architectures, components and peripheral modules of microcontroller systems and explain their function and characteristics, • understand how high level language constructs translate into machine level programs, • have an understanding of the memory organization, the data types and data structures in controller hardware, • know and understand microcontroller software concepts and constructs including interrupt based design, • have a basic understanding of handling asynchronous events and time dependencies in programs, **Skills:** The students • can apply high-level programming languages (e.g. C) to solve hardware oriented tasks, • can use integrated development tool environments and measurement equipment in order to program and debug microprocessor systems, • can program internal and external peripheral processor units (e.g. parallel and serial input/output, timer unit, digital to analog converters and analog to digital converters) with direct register addess and/or peripheral driver libraries, **Competencies:** The students • are able to make an appropriate microcontroller and/or software architecture decision for a given technical application or task, • are able to familiarize oneself with a new type of microcontroller and/or new peripheral modules.
Learning content	• principles, components and basic functions of a processor • types, cycles and steps of machine instructions • comparison of high level programs and assembly programs • programming and application of: ○ general purpose input/output ports

	○ serial interfaces ○ digital to analog converters and analog to digital converters ○ timer • basic concepts of subroutines, exceptions and interrupts • exceptions and interrupts as method to deal with asynchronous events • hard- and software mechanisms for servicing interrupts • examples of recent aspects and industrial applications of processor systems • practical training in teams by implementing laboratory projects combining software and hardware aspects, like parallel input, time controlled output, digital voltage, time or frequency measurement, interrupt driven software design
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	MC (Lecture) MCL (Laboratory / Exercises)
Type of Media	Lecture: Tuition in seminars, blackboard, slides, computer simulation, lab development equipment Laboratory: Practical course in a lab with actual microcontrollers
Literature	In the current issue: • Kernighan, B.; Ritchie, D. (2000): C Programming Language (ANSI C), Markt+Technik Verlag • Patterson, D. (2012): Computer Organization and Design, Morgan Kaufmann Series • Tanenbaum, A. (2012): Structured Computer Organization, Prentice Hall • Yiu, J. (2010): The definitive guide to the ARM Cortex-M3, Newnes • Manual and documentation of the used microcontroller

Bachelor Information Engineering	
Digital Systems	
Abbreviation	DS / DSL
Module responsibility	Prof. Dr.-Ing. Lutz Leutelt
Duration / Semester/ Regular cycle	one semester / 4th semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Digital Circuits
Language	English
Learning outcomes	The students • have the ability to design finite state machines using state diagrams and state tables, including the relative timing between the state machine components, • have the ability to optimize simple and coupled state machines with respect to hardware resources and clock frequency, • have the ability to let digital subsystems communicate with each other, also under different clock rates, • have the ability to let digital subsystems communicate with each other, also under different clock rates, • can model state machines using algorithmic state machine (ASM) descriptions, • can describe complex digital systems like coprocessors with the concept of partitioned data- and control-path components, • can apply a CAE based development flow for FPGA implementations, including hardware verification in order to design, implement and evaluate a complex digital system solution with programmable logic for a given technical problem and its requirements.
Learning content	• A Register-Transfer (RT-) –level based HDL-coding style which is targeted for synthesis, including suitable datatypes and the design of test benches • A CAE based design method for FPGAs, including critical path analysis and performing post-layout timing simulations • Design and modeling of finite state machines on RT-level • Decoupling of combined state machines aiming at higher clock frequencies and removal of combinational loops • Synchronization of sequential circuits (metastability of flip flops, critical path analysis, clock distribution, clock skew) • Handshake methods to couple digital subsystems • Methods for state reduction • Strategies for state encoding including their consequences for transition- and output-logic • The ASM chart formalism and the generation of ASM charts from textual- and pseudocode-descriptions

	• Design principles for coprocessors (system partitioning into data- and control-path, optimization strategies like pipelining and resource sharing
Usability of the module	Bachelor Information Engineering Bachelor Elektrotechnik und Informationstechnik Bachelor Mechatronik
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	DS (Lecture) DSL (Laboratory / Exercises)
Type of Media	DS: Tuition in seminars, blackboard, slides, computer simulation DSL: Practical course
Literature	In the current issue: • Chu, P.P.: RTL Hardware Design Using VHDL (Coding for Efficiency, Portability, and Scalability), John Wiley & Sons • Wakerly, J.F.: Digital Design Principles & Practices, Prentice Hall • Jasinski, R.: Effective Coding with VHDL, MIT Press • Armstrong, J.R.; Gray, F.G.: VHDL-Design. Representation and Synthesis, Prentice Hall • Brown, S.; Vranesic, Z.: Fundamentals of Digital Logic with VHDL Design, Mc Graw Hill • Reichardt, J.: Lehrbuch Digitaltechnik, Oldenbourg Verlag

Bachelor Information Engineering	
Databases	
Abbreviation	DB / DBL
Module responsibility	Prof. Dr.-Ing. Sebastian Rohjans
Duration / Semester/ Regular cycle	One semester / 4. semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Basic knowledge and ability of module Software Construction 1, 2
Language	English
Learning outcomes	Students can use database development methods and techniques to design state of the art database systems for different sized data sets by • understanding database concepts, • applying database management systems and • using Entity Relationship Modeling, Normalization and Structured Query Language.
Learning content	• History • Database Management Systems • Entity Relationship Model • Algebra of Relations • Normalization • Structured Query Language
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL)
Courses	DB (Lecture) DBL (Laboratory / Exercises)
Type of Media	DB: Tuition in seminars, blackboard, slides, computer simulation DBL: Practical course
Literature	In the current issue: • Feuerstein, S. and Pribly, B.: Oracle PL/SQL Programming, O'Reilly and Associates • Lemahieu, W. et al.: Principles of Database Management: The Practical Guide to Storing, Managing and Analyzing Big and Small Data, Cambridge University Press

	• Gillenson, M.: Fundamentals of Database Management Systems, Wiley

Bachelor Information Engineering	
Scientific and project work	
Abbreviation	SP
Module responsibility	Prof. Dr. Lapke
Duration / Semester/ Regular cycle	Block seminar / 5th semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	4 LP 2 SHW
Workload	Attendance: 36 h Self-study: 84 h
Type of module	Mandatory module
Prerequisites	-
Language	English
Learning outcomes	The students • have the ability to organize and to present the project results and other presentations as well as writing the bachelor report methodically correct and successful by applying the individual learning contents below. • know the basic principles of project management to be able to plan, implement and work effectively in small to medium size projects.
Learning content	• Writing of scientific papers, methodically preparing the Bachelor report • Scientific work • Analysis of source material, working with literature and references (investigation, online-search, reference rules) • Working in teams/projects/group work • Fundamentals of project management • Conflict management • Students practice project work with a small technical or non-technical task
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Lecture: Successful passing in oral presentations and written report (R)(PL)
Courses	SP (Lecture)
Type of Media	Lecture: Tuition in seminars, blackboard, slides, computer simulation
Literature	In the current issue: • Rossig, W.E.; Prätsch, J. (2005): Wissenschaftliches Arbeiten, Print-Tec Druckverlag Weyhe • Esselborn-Krumbiegel, H. (2004): Von der Idee zum Text: Eine Anleitung zum wissenschaftlichen Arbeiten, Schöningh Verlag • Stickel-Wolf, C.; Wolff, J. (2005): Wissenschaftliches Arbeiten und Lerntechniken: Erfolgreich studieren – gewusst wie!, Gabler Verlag • Schulz v. Thun, F. (2006): Miteinander reden (Band 1-3), Rowohlt Tb

Bachelor Information Engineering	
Praxissemester mit Kolloquium	
Abbreviation	IP / IPP
Module responsibility	Praktikumsbeauftragter
Duration / Semester/ Regular cycle	One semester / 5th semester / academic year
Credits (CP) / Semester hours per week (SHW)	20 + 5 LP 20 Wochen
Workload	Präsenzstudium: 54 Praktikumszeit: 20 Wochen entsprechend 696 Stunden
Type of module	Mandatory module
Prerequisites	Das Praxissemester kann grundsätzlich erst dann begonnen werden, wenn das erste Studienjahr erfolgreich absolviert wurden.
Language	Englisch oder Deutsch
Learning outcomes	**Fachlich-inhaltliche und methodische Kompetenzen:** Entsprechend der Profilbildung wird das Fachwissen vorrangig durch Selbststudium vertieft, die Arbeit im Team sowie die Schlüsselqualifikationen zur Herausbildung der Ingenieurpersönlichkeit geübt und vervollkommnet. Die Studierenden sollen die im Studium erworbenen fachlichen und sozialen Kompetenzen im Rahmen eines betrieblichen Praktikums in Unternehmen anwenden und dabei die Anforderungen, die an einen Ingenieur in einem Unternehmen gestellt werden, kennen lernen. Die Studierenden sollen die komplexen Zusammenhänge industrieller Aufgabenstellungen bewerten können und die im Studium erworbenen fachlichen Kenntnisse und Problemlösungsmethoden zur Lösung der Aufgaben anwenden. Die Studierenden sollen die Strukturen, Abläufe und Organisation in einem Unternehmen kennen lernen und die Einordnung ihrer Aufgabe in die Forschungs-, Entwicklungs- und Projektarbeit in dem Unternehmen bewerten. Die Studierenden sollen die Randbedingungen, die der Stand der Technik und die gesetzlichen Regelungen, Normen und Standards, auf die Lösung der Aufgabenstellung erfasst haben. **Sozial- und Selbstkompetenzen:** Erstellung von Aufgabenstellungen mit fachübergreifendem Charakter Koordination von Arbeitsaufgaben im Rahmen der Aufgabenbearbeitung Führung und Anleitung im Team Erkennung und Definition von Schnittstellen bei der Bearbeitung von fachübergreifenden Aufgabenstellungen Auswertung und Bewertung der ingenieur-technischen Lösung sowie eine wirtschaftliche Betrachtung der Ergebnisses, sie sind in der Lage fachfremde Mitarbeiter in die Lösung zu integrieren. –

	Die Studierenden sollen die Normen und Regeln der Zusammenarbeit in einem Unternehmen kennen und deren Einfluss auf den Erfolg des Unternehmens bewerten lernen. Die Studierenden sollen die internationale Verflechtung in einem bzw. eines Unternehmens mit der globalisierten Welt kennen lernen und daraus die Anforderung an ihre eigene Person ableiten. Die Studierenden sollen die Notwendigkeit der Teamfähigkeit erkennen und ihre individuellen Stärken und Schwächen in einem beruflichen Umfeld einschätzen können.
Learning content	Das Hauptpraktikum umfasst 20 Wochen. Individuelle Aufgabenstellung entsprechend der Lernziele in Abstimmung zwischen einem Professor und dem Unternehmen.
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regelhafte Prüfungsform für die Modulprüfung: Praktikum: vom Unternehmen bestätigte Anwesenheit Kolloquium: Praktikumsbericht und Präsentation (SL)
Courses	IP (Praktikum) IPP (Kolloquium)
Type of Media	IP: Praktikum IPPErstellung von Bericht und Präsentation
Literature	

Bachelor Information Engineering	
Bussystems and Sensors	
Abbreviation	BU / BUL
Module responsibility	Prof. Dr. Paweł Adam Buczek
Duration / Semester/ Regular cycle	One semester / 6th semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Electronics 1 and 2, Microcontrollers
Language	English
Learning outcomes	The students can • choose the proper sensor in order to implement specific measurement application • have the knowledge of circuits of processing of sensor signals, in order to read out the sensor signal • have the knowledge of characteristics of bus systems and of requirements for bus systems, in order to plan the communication network of a distributed system • analyze, develop, and check important components of circuits for the processing of sensor signals in order to include the sensors in larger applications • define requirements for linking solutions and to choose bus systems for the realization and integrate electronic devices into bus systems, in order to devise distributed measurement systems
Learning content	• Structure of data acquisition and distribution systems • Principles of sensors, characteristics and time behavior • Processing of sensor signals • Application examples for circuits with sensors • Introduction into bus systems • Basics of bus systems • Bus lines • Special bus systems (e.g. PCI, CAN, LON, I²C) • The right to chance and add actual topics is reserved
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL) Further possible examination types: oral exam, presentation (paper) Where more than one possible examination type is used in the module, the examination type to be used is to be made known by the responsible lecturer at the start of the course.
Courses	BU (Lecture) BUL (Laboratory / Exercises)
Type of Media	BU: Tuition in seminars, blackboard, slides, computer simulation BUL: Practical course in a laboratory
Literature	In the current issue:

	• Tietze, U.; Schenk, C. (2012): Halbleiter-Schaltungstechnik, Springer Verlag • Weissel, R.; Schubert, F. (1995): Digitale Schaltungstechnik, Springer Verlag • Schanz, G. (2004): Sensoren, Hüthig Verlag • Dembowski, K. (2001): Computerschnittstellen und Bussysteme, Hüthig Verlag • References to actual bus systems

Bachelor Information Engineering	
Operating Systems	
Abbreviation	OS / OSL
Module responsibility	Prof. Dr.-Ing. Holger Gräßner
Duration / Semester/ Regular cycle	One semester / 6th semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 CP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Programming knowledge required. Microprocessor knowledge recommended.
Language	English
Learning outcomes	The students • know the basic properties and functionalities of operating systems and • know the most common available operating systems. The students can • use the functionalities of a given operating system to realize specific programming tasks, • design and implement complex systems by making use of an operating system.
Learning content	• Multitasking, threads and processes, • Communication and synchronization, • Ressource allocation and timing, • Interaction with external signals, • Input-/Output programming (e. g. in C), • Current topics regarding operating systems, • Lab tasks to gain deeper knowledge using typical applications.
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL) Further possible examination types: oral exam, presentation (paper) Where more than one possible examination type is used in the module, the examination type to be used is to be made known by the responsible lecturer at the start of the course.
Courses	OS (Lecture) OSL (Laboratory / Exercises)
Type of Media	OS: Tuition in seminars, blackboard, slides, computer simulation OSL: Practical course
Literature	In the current issue: • Stallings, W.: Operating systems, internals and design principles. • Tanenbaum, A. S.: Modern operating systems.

	• Kernighan, B. W.; Ritchie, D. M.: The C programming language. • Kerrisk, M.: The Linux Programming Interface. • Manuals of the operating systems discussed in the lecture.

Bachelor Information Engineering	
Digital Signal Processing	
Abbreviation	DP / DPL
Module responsibility	Prof. Dr.-Ing. Ulrich Sauvagerd
Duration / Semester/ Regular cycle	One semester / 6. semester / offered during summer semester only
Credits (CP) / Semester hours per week (SHW)	6 CP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Profound knowledge in theory of complex numbers (MA1 and MA2) Continuous and discrete signals and systems theory (SS1 and SS2) ANSI C programming (SO1), MATLAB
Language	English
Learning outcomes	The students know (knowledge) • the typical set-up of a DSP-system and its key components • and understand basic techniques of digital signal processing and how to realize real-time DSP-programs can (skills) • analyze typical problems arising in digital signal processing and work out proposals for the solution • use MATLAB for the simulation of algorithms • implement these algorithms using ANSI C programs on a DSP for real-time signal processing • design digital filters • carry out spectral analysis using DFT/FFT and judge the measurement results are competent/capable • to analyse and judge typical problems arising in the field of digital signal processing and create solutions
Learning content	**Lecture (3 SWS)** Introduction into • Development methods for a discrete-time system • Simulation tools MATLAB/ Simulink • DSP-architectures • real-time DSP-development systems Basics of digital signal processing • Sampling and reconstruction of a continuous-time signal • number representation • overflow- and round-off errors • limit cycles • Convolution Discrete Fourier-transformation • Frequency- and amplitude resolution • Windowing • Fast Fourier Transform (FFT) Filter design

	• Window techniques • Computer-aided filter designs • Impulse invariant method • Bilinear-Transformation **Laboratory (1 SWS)** • Working with Matlab/Simulink • Working with a real-time DSP-development system • Simulations and DSP implementations of FIR Filters • Simulations and DSP implementations of IIR Filters • Simulations and DSP implementations of Fast-Fourier Transforms
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL) Further possible examination types: oral exam, presentation (paper) Where more than one possible examination type is used in the module, the examination type to be used is to be made known by the responsible lecturer at the start of the course.
Courses	DP (Lecture) DPL (Laboratory)
Type of Media	DP: Tuition in seminars, blackboard, slides, computer simulation DPL: Practical course
Literature	In the current issue: • Oppenheim, Schafer: Discrete-time signal processing, Pearson • Manolakis, Proakis: Digital Signal Processing, Pearson, 2013 • Tretter, Steven A.: Communication System Design Using DSP, Algorithms, Springer, 2008 • Mitra, S.K.: Digital Signal Processing: A Computer Based Approach, McGraw-Hill, 2000 • R.Chassaing: Digital Signal Processing and Applications with TMS320C6713, Wiley, 2010 • Gerdsen, Kröger: Digitale Signalverarbeitung in der Nachrichtenübertragung, Springer, 1997

Bachelor Information Engineering	
Digital Communication Systems	
Abbreviation	DC / DCL
Module responsibility	Prof. Dr.-Ing. R. Schoenen
Duration / Semester/ Regular cycle	One semester / 6. semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	6 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 108 h
Type of module	Mandatory module
Prerequisites	Recommended: Adequate knowledge of mathematics, signals and systems
Language	English
Learning outcomes	The students • understand the structure and context of digital communication systems, • are able to split a complete system into suitable known system blocks, • are able to describe the main properties of these blocks and to define the block requirements with respect to a given application, • are able to describe the behavior of the blocks by mathematical equations, • have the knowledge and ability to apply basic measurement techniques.
Learning content	Lecture: • system blocks and context in the ISO/OSI reference model • digitizing and reconstruction of analog signals • source coding and information theory • distortionless digital signal transmission and channel models • channel equalization and clock recovery • disturbed signals by noise and interference • bit error rate for AWGN-channels and channel coding • digital modulation, link budget calculus and Shannon capacity limit • medium access control (e.g., multiple access, ARQ) • modern radio communication systems (e.g., software-defined radio) Changes and additions due to actual occasions reserved Laboratory: • set parameters and verification of digital systems hardware blocks • implementation and test of a complete transmission system • examples of hardware blocks: A/D converter and interpolation filters, correlative encoder/decoder, equalizer, OOK/FSK-modulator/demodulator Other topics of the lecture are also possible
Usability of the module	Degree program relevance

Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Laboratory: Successful participation in exercises (LA)(PVL) Further possible examination types: oral exam, presentation (paper) Where more than one possible examination type is used in the module, the examination type to be used is to be made known by the responsible lecturer at the start of the course.
Courses	DC (Lecture) DCL (Laboratory / Exercises)
Type of Media	DC: Tuition in seminars, blackboard, slides, computer simulation DCL: Lab exercises and computer simulations
Literature	In the current issue: • Gerdsen, P.: Digitale Nachrichtenübertragung, Teubner Verlag • Sklar, B.: Digital Communications Fundamentals and Applications, PrenticeHall • Proakis, J.: Digital Communications, McGraw-Hill

Bachelor Information Engineering	
Elective Project 1	
Abbreviation	CJ1
Module responsibility	Prof. Jörg Dahlkemper
Duration / Semester/ Regular cycle	One semester / 6th semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	5 LP 3 SHW
Workload	Attendance: 54 h Self-study: 96 h
Type of module	Mandatory module
Prerequisites	-
Language	English or German
Learning outcomes	The students • know how to explore a subject of Information Engineering at greater depth by finding literature and acquisition of the required theoretical and practical knowledge to solve a technical problem, • know how to organize the given subject by applying methods of project management to achieve the goal in an efficient manner, • know how to manage a project and to organize teams to fulfil the given task with efficiently and effectively, • can apply methods during the project preparation phase to foresee and avoid typical mistakes in the very early project phase, • apply methods to manage complexity and uncertainty in projects to act in a professional manner in an industrial context, • can handle conflicts within the team or with the customer and improve social competencies by independent and responsible work attitude to achieve an optimum result with a team.
Learning content	• The team has to explore a subject of Information Engineering organized as project. Typical examples are hardware or software development projects, simulations, the systematic analysis and interpretation of measurement data or theoretical work. Either the project team or the lecture proposes the subject. • Project teams must consist of 3, 4 or 5 members. A number of 4 teammates is considered to be ideal. Only in exceptional duly justified cases the number of teammates it is allowed to deviate from the regulation. The team agrees the times of presence with the lecturer. In case of geographically distributed teams the appropriate communication procedure is to be agreed within the team including the lecturer to enable an efficient work flow. • The subject must be demanding enough so that the achievement of the project goal requires a good cooperation within the team. The workload of each person must meet the module workload and must respect the fact that the project is intended to be run simultaneously to the internship. • The project requires a final project presentation and a written project report. The students must specify who contributed to which part of the project report.
Usability of the module	Bachelor Information Engineering Bachelor Elektro- und Informationstechnik Bachelor Regenerative Energiesysteme und Energiemanagement
Requirements for the recognition of credits (Study and exam requirements)	Project: Successful participation in the project with task completion and quality of results and a written report (Pj)(SL)
Courses	CJ1 (Project)

Type of Media	CJ1: literature, internet, working independently in the project within a team
Literature	Depends on project

Bachelor Information Engineering	
Elective Course 1	
Abbreviation	CM1 / CML1
Module responsibility	Prof. Dr. Dierks
Duration / Semester/ Regular cycle	One semester / 7th semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	5 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 78 h
Type of module	Mandatory module
Prerequisites	Recommended: Adequate knowledge of mathematics, programming skills in a language like JAVA, software construction 1 and 2
Language	English
Learning outcomes	The students • have the knowledge of formal description of both syntax and semantics of programs, • have the knowledge of verification methods for partial and total correctness.
Learning content	**Lecture:** • sequential programs, correctness formulas, operational semantics, partial correctness, total correctness, proof rules, soundness, completeness • parallel programs with disjoint and shared variables, interference and interference freedom • parallel programs with synchronization, deadlock, deadlock-freedom • recursive programs, termination thereof **Laboratory:** • application of theoretical contents to standard JAVA programs • introduction to verification tools, e.g. Model-checkers
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Further possible examination types: oral exam, presentation (paper) Laboratory: Successful participation in exercises (LA)(PVL) Further possible examination types: presentation (paper) (PVL) Where more than one possible examination type is used in the module, the examination type to be used is to be made known by the responsible lecturer at the start of the course.
Courses	CM1 (Lecture) CML1 (Laboratory / Exercises)

Type of Media	CM1: Tuition in seminars, blackboard, slides, computer simulation CML1: Laboratory- and computerpractical course
Literature	In the current issue: • Apt, K.; Olderog, E.-R. (2009): Verification of Sequential and Concurrent Programs, Springer

Bachelor Information Engineering	
Elective Course 2	
Abbreviation	CM2 / CML2
Module responsibility	Prof. Dr. Reichardt
Duration / Semester/ Regular cycle	One semester / 7th semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	5 LP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 78 h
Type of module	Mandatory module
Prerequisites	Required: Successful completion of modules Digital Circuits, Digital Systems and Microcontrollers
Language	English
Learning outcomes	The students • have the ability to configure a FPGA based HW/SW system, • have the ability to apply FPGA design and verification tools correctly, • have the ability to design and integrate VHDL based user IP-cores into an existing HW/SW system, • have the ability to program FPGA based embedded SW for real-time applications.
Learning content	• State of the art platform FPGA technologies • FPGA based processor technologies • Embedded system HW/SW design environment • SW driver technology for HW-IPs • Embedded SW concepts • Embedded SW verification concepts
Usability of the module	Degree program relevance
Requirements for the recognition of credits (Study and exam requirements)	Regular examination type for module testing: Lecture: Successful passing in written exam (K)(PL) Further possible examination types: oral exam, presentation (paper) Laboratory: Successful participation in exercises (LA)(PVL) Further possible examination types: presentation (paper) (PVL) Where more than one possible examination type is used in the module, the examination type to be used is to be made known by the responsible lecturer at the start of the course.
Courses	CM2 (Seminar) CML2 (Laboratory / Exercises)
Type of Media	CM2: Tuition in seminars, blackboard, slides, computer simulation CML2: Laboratory- and computerpractical course
Literature	In the current issue: • Sass, R.; Schmidt, G. (2010): Embedded System Design with Platform FPGAs, Morgan Kaufmann

	• Chu, P.P. (2008): Prototyping by VHDL Examples: Xilinx Spartan-3 Version, Wiley • Reichardt, J.; Schwarz, B. (2012): VHDL Synthese, Oldenbourg Verlag • Reichardt, J. (2011): Lehrbuch Digitaltechnik, Oldenbourg Verlag • FPGA manufacturers design- and application notes

Bachelor Information Engineering	
Compulsory Elective Project 2	
Abbreviation	CJ2
Module responsibility	Prof. Dr.-Ing. Lutz Leutelt
Duration / Semester/ Regular cycle	one semester / 7. semester / winter and summer semester
Credits (CP) / Semester hours per week (SHW)	5 CP 3 + 1 SHW
Workload	Attendance: 72 h Self-study: 78 h
Type of module	Compulsory elective module 2
Prerequisites	Recommended: Digital Circuits, Microcontrollers, Electronics 1+2, Software Construction 1+2
Language	English
Learning outcomes	The students • can create a project plan and can justify it in presentations, • can design a PCB for a microcontroller with a PCB layout editor program and bring it to production stage, • can successfully design and realize a microcontroller circuit with analog and digital peripherals and bring it into service, • can develop firmware for a microcontroller board in programming language C in order to plan (in terms of time and content) and successfully carry out a complex electronic project.
Learning content	• planning of a complex electronic project • development of a microcontroller circuit with analog and digital peripherals • using a PCB layout editor to realize a microcontroller circuit on a PCB • Population and start-up a microcontroller board • Debugging of a microcontroller board • Development and debugging of firmware for a microcontroller board
Usability of the module	Degree program Information Engineering Degree program Elektro- und Informationstechnik Degree program Regenerative Energiesysteme und Energiemanagement
Requirements for the recognition of credits (Study and exam requirements)	Project work (presentations of project planning and results, final project report) (PJ(PL)
Courses	CJ2 (project)
Type of Media	CJ2: blackboard, computer simulation, practical work at PC and in electronics lab
Literature	In the current issue: • Monk, S., Duncan, A.: Make Your Own PCBs with Eagle: From Schematic Designs to Finished Boards, McGraw Hill • von Simon Monk Kernighan, B.; Ritchie, D.: The C Programming Language, Prentice Hall Software • Barnett, R., Cox, S., O'Cull, L.: Embedded C Programming and the Atmel AVR, Delmar Cengage Learning

	• Juana Clark Craig - Project Management Lite: Just Enough to Get the Job Done...Nothing More • Data sheets of selected electronic devices

Bachelor Information Engineering	
Bachelorarbeit mit Kolloquium	
Modulkennziffer	BA
Modulkoordination/ Modulverantwortliche/r	Prüfungsausschussvorsitzender
Dauer/ Semester/ Angebotsturnus	ein Semester / 7. Semester / Wise und SoSe
Leistungspunkte (LP)	12 LP Bachelorarbeit 3 LP Kolloquium
Arbeitsaufwand (Workload)	Selbststudium: 450
Art des Moduls	Thesis
Teilnahmevoraussetzungen / Vorkenntnisse	Die Bachelorarbeit kann angemeldet werden, wenn alle bis auf drei Modulprüfungen erfolgreich abgelegt worden sind. Der Umfang der noch fehlenden Studien-, Prüfungsvor- und Prüfungsleistungen darf 15 Kreditpunkte nicht übersteigen.
Lehrsprache	Englisch oder Deutsch
Zu erwerbende Kompetenzen / Lernergebnisse	**Fachlich-inhaltliche und methodische Kompetenzen:** Die Studierenden sind in der Lage, eine komplexe Aufgabenstellung aus den wissenschaftlichen, anwendungsorientierten oder beruflichen Tätigkeitsfeldern des Studiengangs selbstständig unter Anwendung wissenschaftlicher Methoden und Erkenntnisse zu bearbeiten und dabei in die fächerübergreifenden Zusammenhänge einzuordnen, können ihr Theorie- und Methodenwissen selbstständig anwenden, verfügen über vertiefte Problemlösungskompetenz, kennen die Randbedingungen, den Stand der Technik und die gesetzlichen Regelungen, Normen und Standards, der für die Lösung der Aufgabenstellung relevanten Gegenstandsbereiche, können die Lösungsansätze darstellen, bewerten und diskutieren - in schriftlicher Form und als Referat. **Sozial- und Selbstkompetenzen:** Die Studierenden können Aufgabenstellungen mit fachübergreifendem Charakter bearbeiten und können dabei Schnittstellen erkennen und definieren, können ingenieurtechnische Lösungen auswerten und bewerten und die Ergebnisse wirtschaftlich betrachten, können die Ergebnisse wissenschaftlich darstellen und präsentieren und komplexe Zusammenhänge in kurzer schriftlicher Form möglichst umfassend darstellen und das Wesentliche vom Unwesentlichen

	unterscheiden.
Inhalte des Moduls	Die Bachelorthesis ist eine theoretische, programmiertechnische, empirische und/ oder experimentelle Abschlussarbeit mit schriftlicher Ausarbeitung. In der Bachelorarbeit sollen die Studierenden zeigen, dass sie in der Lage sind, ein Problem aus den wissenschaftlichen, anwendungsorientierten oder beruflichen Tätigkeitsfeldern dieses Studiengangs selbständig unter Anwendung wissenschaftlicher Methoden und Erkenntnisse zu bearbeiten und dabei in die fächerübergreifenden Zusammenhänge einzuordnen. Die Bearbeitung erfolgt in der Regel in folgenden Phasen: Einarbeitung in die Thematik und in den aktuellen Stand der Technik/Forschung. Einarbeitung/Auswahl der Methoden und Techniken zur Problemlösung. Entwicklung eines Lösungskonzeptes. Implementierung/Realisierung des eigenen Konzeptes/Ansatzes. Validierung und Bewertung der Ergebnisse. Darstellung der Ergebnisse in schriftlicher Form. Kolloquium bestehend aus einem Referat mit anschließender Diskussion. In der Bachelorarbeit wird eine individuelle Aufgabenstellung entsprechend der Lernziele in Abstimmung zwischen einer Professorin oder einem Professor und einem Unternehmen oder eine Aufgabenstellung im Rahmen der Projektbearbeitung an der Hochschule bearbeitet. Die Festlegung der Aufgabenstellung erfolgt immer durch eine Hochschullehrerin oder einen Hochschullehrer.
Verwendbarkeit des Moduls	Studiengang Information Engineering
Voraussetzungen für die Vergabe von Leistungspunkten (Studien- und Prüfungsleistungen)	Regelhafte Prüfungsform für die Modulprüfung: Schriftliche Ausarbeitung (12 CP) und Kolloquium mit Vortrag und Prüfungsgespräch (3 CP)
Zugehörige Lehrveranstaltungen	BA (Bachelorarbeit mit Kolloquium)
Lehr- und Lernformen/ Methoden / Medienformen	BA: Selbständige wissenschaftliche Arbeit
Literatur	Jeweils in der aktuellen Ausgabe: • H. Corsten, J. Deppe: Technik des wissenschaftlichen Arbeitens. 3. Auflage. München. • N. Franck, J. Stary: Die Technik wissenschaftlichen Arbeitens. Eine praktische Anleitung, 15. Aufl., Paderborn. • M. Kornmeier: Wissenschaftlich schreiben leicht gemacht: für Bachelor, Master und Dissertation, 4. Aufl., UTB (Haupt- Verlag) Bern. • Brink: Anfertigung wissenschaftlicher Arbeiten. München/Wien. • T. Plümper: Effizient Schreiben: Leitfaden zum Verfassen von Qualifizierungsarbeiten und wissenschaftlichen Texten, Oldenbourg Verlag.