

| Module code | Module name | Short description | Semester | ECTS |
|---|-------------------------|--|----------|------|
| Compulsory modules „Scientific-technical Fundamentals" | | | | |
| 4TI-IMA-10 | Engineering Mathematics | <p>The module aims to consolidate and expand the skills for solving simple technical tasks. This includes the confident dealing with arithmetic operations for already known (vectors) as well as newly introduced mathematical objects (complex numbers, matrices) and the use of vectors and matrices, e.g. for simple tasks of computer geometry.</p> <p>For the analysis of nonlinear functions, the function graph generated by the computer is used more frequently, and differential calculus is emphasized. Principle differences between linear optimization tasks and nonlinear extreme value tasks are worked out.</p> <p>Interpolation and compensation calculation for the construction of functions from measured data are explained.</p> <p>Antiderivative functions and numerical approximations are compared for the calculation of definite integrals.</p> | 1 | 6 |
| 4TI-ITG-10 | Engineering Foundations | <p>The module aims to repeat, relearn, capture and understand previously acquired knowledge of physics and elementary electrical engineering as the physical-technical basis of technical informatics. For this purpose, the necessary mathematics, on the level of the admission requirements, is used to underpin physical and electrotechnical modelling in an algebraically abstract way. The module "Engineering Foundations" ultimately aims to train students in the mathematical description of the environment and the explanation of various phenomena from a few simple basic facts. The methods and approaches of the physical description of nature form the basis of the engineering sciences. Their knowledge, in particular knowledge of their essential features, is essential for the proper description and design of technical systems. Basic considerations of electric and magnetic fields facilitate the understanding of advanced information technology contents.</p> | 1 | 7 |
| 4TI-AMA-20 | Applied Mathematics | <p>The module provides an introduction to simple time-continuous deterministic models and the capture of random phenomena. Differential equations are focused on models with constant coefficients and the elementary approximation methods. Random events and random processes are the basic concern of probability theory. For this purpose, simple distribution models are used, whose parameters, however, have to be estimated from observations, which underlines the importance of statistics for modelling. The understanding of the accuracy of estimation procedures is to be promoted. Similar to the approximation methods for deterministic models, stochastic simulation is presented as a method for more complex tasks.</p> | 2 | 6 |

| | | | | |
|---|---|---|---|---|
| 4TI-ETDT-20 | Electrical Engineering / Digital Technology | The module includes the transition from direct current electrical engineering to electrical engineering with time-varying signal variables as the technical basis for the representation of information in technical informatics. Students will then have a command of all basic and advanced variables in electrical engineering and the circuit diagram symbolism of the subject area as well as the mode of operation of elementary passive and active basic switching elements. They have skills both in the calculation of simple linear electrical networks for steady-state uniform and harmonic excitation and in the calculation of elementary transient processes. Special focus of the module is laid on network analysis using complex alternating current calculation as a mathematical basis for avoiding the solution of differential equations. The module also includes the theory of digital representation, processing and storage of information on the basis of complete logical systems and, based on this, the technical implementation of simple switching networks and switching mechanisms. | 2 | 8 |
| 4TI-EB-30 | Electronic Components | The module deals with the function and description of typical components of analog electronics and enables students to understand, analyze and calculate the operation of semiconductor components in simple and complex electronic discrete and integrated circuits. | 3 | 5 |
| Compulsory modules "Subject-specific Foundations of Technical Informatics" | | | | |
| 4TI-GPT-10 | Foundations of Programming Technology | The module aims to enable students to independently formulate simple problems in a procedural programming language and to translate and test the developed programs. | 1 | 5 |
| 4TI-OOP-20 | Object-oriented Programming | The module imparts knowledge and skills that are required to solve a problem in an object-oriented manner. Special emphasis is placed on the development of an abstracting and object-oriented way of thinking. Practical exercises deepen the theoretical knowledge and train both algorithms and programming techniques. | 2 | 5 |
| 4TI-TGI-20 | Theoretical Foundations of Computer Science | The module imparts fundamental knowledge about the concept of information. Focus is laid on the mathematical recording of the collection, coding and transmission of information. Students apply this during the construction and evaluation of procedures or algorithms for data storage and compression. Further principles from the field of relational and complexity theory as well as propositional and predicate logic help them to understand the functioning of compilers and special concepts of programming (functional and logic-based languages). | 2 | 5 |
| 4TI-ALDS-30 | Algorithms and Data Structures | Data structures and the algorithms applicable to them are the essential elements of information-processing systems. In this module students are familiarized with relevant solutions for generally | 3 | 5 |

| | | | | |
|---|---|---|---------|---|
| | | valid problem classes. The goal is to formalize informally given tasks step by step with suitable description tools in order to be able to design and implement algorithms afterwards. | | |
| 4TI-SWE-30 | Software Engineering | The module enables students to professionally plan and execute a complex software development process. Particular focus is laid on the modelling of requirements and applications. Exercises on the computer consolidate the understanding of the subject area and strengthen practical skills and abilities. | 3 | 5 |
| 4TI-RN-30 | Computer Networks | The module imparts the foundations of data communication. Using the OSI/ISO basic reference model, the module familiarizes students with network topologies, transmission methods and architectures in LAN and WAN, from media access to basic Internet services. Focus is laid on the development of a fundamental understanding based on current standards of the ITU T, IEEE and IETF with the aim of being able to plan and implement essential features of networks from physical construction to protection. Exercises use practical examples to help students to consolidate and test the planning, configuration and modification of local and wide area networks, including changing network structure requirements. | 3 | 5 |
| 4TI-DB-34 | Databases | This module imparts knowledge and skills of modeling, application and administration of relational database systems. In practical, seminar-like exercises in the computer lab, students can test their skills on the concrete database management system Microsoft SQL Server and deepen their knowledge. | 3 und 4 | 8 |
| 4TI-BSVS-40 | Theory of Operating Systems and Distributed Systems | The module introduces the theory of operating systems for digital computer systems. It imparts fundamental knowledge about the tasks to be solved by modern operating systems and presents solution methods and algorithms for typical problems of this branch of computer science. While the lecture focuses on a comparative analysis of commercially available PC and mainframe operating systems, the practical exercises cover concepts of the Linux system. Students gain a thorough understanding of the structure and functional principles of distributed systems. They understand the problems that arise in the distributed processing of tasks. | 4 | 5 |
| 4TI-RA-40 | Computer Architecture | The module enables students to develop the ability to evaluate current structures and procedures of computer architecture and to design simple components of a computer system. The basic principles of each computer architecture are introduced. After that the module uses the example of a concrete architecture to teach programming at machine level. Exercises on the computer strengthen the students' practical skills and abilities. | 4 | 5 |
| Compulsory modules "Subject-specific Consolidation of Technical Informatics" | | | | |
| 4TI-SISYS-40 | Signals and Systems | Especially in the technical sciences, the concept of the system represents a central and basic concept of engineering thinking and acting. Students learn the essentials of signal and system | 4 | 5 |

| | | | | |
|---|--|--|---|---|
| | | theory and their technical application in modern information and communication technology. They will be able to describe and analyze analog and discrete signals and systems | | |
| 4TI-INT-40 | Internet Technologies | The Internet does not only increasingly influence economic cycles, it also leads to new business models and new strategies of knowledge acquisition. The current phase is characterized by the appearance of new technologies at ever shorter intervals. The lectures and exercises of this module support the students in the classification, evaluation and testing of current technologies with the aim of critically examining their application possibilities at the practice partner and proposing their own solutions, which are to be documented and defended in the form of a paper. | | |
| 4TI-MMT-60 | Multimedia Technology | The module enables students to evaluate multimedia technologies and apply them in a targeted manner. Necessary standards and procedures are introduced, and knowledge is extended through the practical use of multimedia software. | 6 | 6 |
| 4TI-AKTI-60 | Selected Chapters of Technical Informatics | The module takes the form of an introductory seminar series in which students are familiarized with special aspects of technical informatics. This opens up the possibility of reacting to current development trends or short-term needs of the practice partners. Under the guidance of a lecturer, students acquire special knowledge, present it and participate in a professional group discussion. | 6 | 4 |
| Compulsory modules "Interdisciplinary Foundations" | | | | |
| 4TI-WISSA-10 | Academic Work (Language and Self-competence) | Students develop the ability to determine the goal and purpose of academic work and learn the principles and essential methods of academic thinking and work. Students expand their foreign-language, communicative and intercultural skills in a technical-professional context. They acquire networked professional, media and language skills and adopt language learning techniques for independent language and knowledge acquisition (lifelong autonomous learning). | 1 | 6 |
| 4TI-BWPM-50 | Business Administration / Project Management | The module aims to impart the fundamentals of business administration and project management. Students are thus put in a position to understand business management contexts and apply them to their work as computer scientists. They are enabled to plan projects independently and structure and optimize project contents. | 5 | 5 |
| 4TI-BWR-60 | Business Administration / Law | The business administration part of the module focuses on methods and techniques as well as their implementation for efficient sales. It enables students to respond to different customer types with their needs and carry out an optimal benefit argumentation. | 6 | 5 |

| | | | | |
|--|--|---|---|---|
| | | <p>In the law section, the module gives an introduction to the systematics and application of German private law. Through case studies, students are familiarized with the legal forms and possibilities of private autonomy.</p> <p>Moreover, students are introduced to the principles of liability in tortious acts.</p> <p>IT law is a field of law with a cross-sectional character. Students gain a broad insight into a wide range of legal fields by means of a practice-oriented process of an internet-oriented project and are able to identify problems and solve simple questions.</p> | | |
| Compulsory elective modules "Data and Communication Technology" | | | | |
| 4TI-DIS-50 | Data and Information Security | <p>The ever-increasing penetration of information processing systems in both the business and private sector is constantly boosting the need to protect the collected data. The module aims to sensitize students to this topic and present the current state of the art.</p> <p>Further focus is laid on the mathematical foundations of cryptographic methods. These are deepened to the extent necessary to understand the functionality of encryption methods.</p> | 5 | 5 |
| 4TI-ÜT-50 | Transmission Systems / Telematics | <p>Students are familiarized with systems and procedures of mobile communication and are able to compare and apply them in accordance with to specific requirements. In particular, they are able to evaluate and use systems of modern mobile communication, apply methods of associated measurement technology and specify interfaces of transmission technology. Thus, they know modern transmission procedures and their standardization and are able to evaluate them. Based on this fundamental knowledge, applied technologies for voice and data communication in wide area networks are explained and discussed.</p> | 5 | 8 |
| 4TI-DVS-50 | Data Management Systems | <p>The module aims to explore more deeply concrete practical implementations of database technology and show current general and manufacturer-specific lines of development.</p> <p>Furthermore, a connection of the course on software development with the database courses is drawn to link independently developed software applications to database systems via SQL embedding.</p> <p>The course concludes with an overview of object-oriented and non-standard DBMS.</p> | 5 | 6 |
| 4TI-SPN-60 | Special Networks / Network Engineering | <p>Supplementing the module on computer networks and the WAN technologies taught in the module on transmission systems/telematics, current technologies of special local networks are discussed.</p> <p>Using X.509-based PKI structures, students learn how to employ them to manage and utilize digital identities and to protect diverse security and communication processes.</p> | 6 | 6 |

| | | | | |
|--|-------------------------------------|--|---|---|
| | | <p>Students learn about the mechanisms and advantages of IPv6 as opposed to IPv4. They are familiarized with central aspects of systematic, engineering-based planning, design and operation of application-neutral networks.</p> <p>On the basis of case studies, typical scenarios and problems that occur in practice are examined and solutions are developed.</p> | | |
| Compulsory elective modules "Process Informatics" | | | | |
| 4TI-CXX-50 | Cxx Technologies | <p>This module offers an introduction to the Cxx technologies CAD and CAE.</p> <p>Working with design software leads to a better understanding of design processes in industry. Programming in AutoLISP expands the students' programming skills. The connection of CAD with databases leads to a broader knowledge of the application potential of databases. The linking of design software with databases leads to a more in-depth knowledge of SQL and databases.</p> | 5 | 6 |
| 4TI-IP-50 | Industrial Processes | <p>The Students acquire the necessary basics of operational work systems and processes. This knowledge forms the foundation for various task areas of work planning and control within a process-oriented work organization. They get to know and apply various methods for determining process data. Students gain insights into corporate departments of process planning and control. The aim is to show the students universal principles and methods for the planning and control of processes and sequences, primarily in industrial companies</p> | 5 | 5 |
| 4TI-ES-50 | Embedded Systems | <p>Students learn the foundations, structure and application of embedded systems in a systematic sequence.</p> <p>Starting from basic hardware architectures and system software for time-critical applications, such as real-time operating systems, the module focuses on the signal flow from the sensor system via the electronic components for signal processing and digitization, the application software for control and regulation tasks to the output to the periphery of the actuator system. Further module contents include the description of control systems and approaches to solutions in the time and frequency domain. After introducing the Laplace transformation and the resulting calculation possibilities, the module deals with continuous, discontinuous and digital control algorithms.</p> <p>The implementation of practical examples in the computer laboratory considerably increases the comprehensibility of the treated dynamic systems.</p> | 5 | 8 |
| 4TI-SPLS-60 | Control and Process Control Systems | <p>The module imparts fundamental knowledge about industrial control systems thus providing a basic understanding of the use of industrial control systems. Students are enabled to analyze control engineering tasks and use complex industrial control systems. Programming skills are trained by means of selected examples. The fields of application and possible uses of</p> | 6 | 6 |

| | | | | |
|--------------------------|--|--|---|---|
| | | programmable logic controllers are developed, especially with regard to control engineering applications and complex sequence controls. | | |
| Practical modules | | | | |
| 4TI-PM1-10 | IT Processes in the Company | <p>The first practical phase familiarizes students with their workplace, their practice company and elementary processes and activities. They deal with the information systems used in the company and are able to use them to solve pending tasks.</p> <p>They are directly integrated into practical teams and thus receive essential impulses for the development of new or consolidation of existing social skills.</p> <p>Students consolidate the professional knowledge acquired in the theoretical modules and apply it in an exemplary manner in operational practice.</p> | 1 | 6 |
| 4TI-PM2-20 | Company-specific Software and Hardware | <p>This practical phase focuses on possible applications and functionalities of existing hardware/software solutions. Students extend their basic skills in the evaluation of technical documentation in terms of information content for relevant assemblies and products.</p> <p>Students consolidate the specialist knowledge acquired in the theory modules and apply it in an exemplary manner in the paper to be produced.</p> | 2 | 6 |
| 4TI-PM3-30 | Engineering Work | <p>In this practical phase, students get to know engineering contexts. They are able to capture and allocate the necessary input information for internal documentation processing.</p> <p>Students are enabled to design necessary solutions from the customer's or contractor's point of view and take first steps towards their implementation.</p> | 3 | 6 |
| 4TI-PM4-40 | Independent Engineering Work | <p>Upon completion of this module, students are able to apply and use specialist skills. They can work scientifically on complex tasks and participate constructively in the solution of tasks.</p> <p>Students work on in-depth problems and prepare a corresponding written paper.</p> | 4 | 6 |
| 4TI-PM5-50 | Independent Problem Solving | <p>Taking into account the knowledge acquired in the theoretical modules, students work independently on suitable specialist tasks, sub-areas and documentation sections with a focus on their future field of activity. The module aims to integrate the solution into the company's processes, including the analysis of the associated information paths.</p> | 5 | 6 |
| 4TI-BT-60 | Bachelor Thesis | <p>With the bachelor thesis, students demonstrate their ability to independently work on a practice-relevant problem within a given period of time, to critically evaluate it and develop it further.</p> | 6 | 9 |

| | | | | |
|--|--|---|--|--|
| | | They are supposed to apply previously acquired practical and theoretical knowledge and scientific methods. The result is to be explained in a presentation. | | |
|--|--|---|--|--|