

Module code	Module name	Short description	Semester	ECTS
Compulsory modules „Electrical Engineering“				
1ET-MATH1-ET	Mathematics 1	Students are enabled to solve basic mathematical problems. They are able to recognize them and formulate solution approaches. They are familiarized with basic mathematical models and can apply them to concrete engineering tasks.	1	4
1ET-TPHY1-ET	Technical Physics 1	The module provides students with the basic knowledge of physical quantities, equations, and relationships, which is essential for the understanding and solution of technical problems. Students are able to describe technical processes with physical methods. This knowledge is a fundamental prerequisite for understanding subsequent modules of the degree program.	1	4
1ET-ET1-ET	Foundations of Electrical Engineering 1	Upon successful completion of the course, students have acquired fundamental electrical engineering knowledge and solution competence for tasks in the field of analysis of electrical circuits, which is required for all areas of specialization. In particular, students possess the skills and abilities to calculate and design electrical DC networks and to determine the field sizes and respective parameters of symmetrical electrical and magnetic fields.	1	5
1ET-INFDT-ET	Informatics/Digital Technology	Students are brought to a homogeneous level of knowledge in order to attend the courses offered in the field of Informatics and digital technology in the following semesters without significant deficits in basic knowledge. In this respect, the subject areas of digital number representation complement each other. While the first section aims to consolidate and secure general principles of the subject area, the subsequent topics are designed as a bridge to courses that build up on this knowledge or deepen it.	1	4
1ET-KGR-ET	Construction Principles	The module imparts knowledge of how to create and describe technical drawings of simple components and assemblies in accordance with standards. Students understand the function, operating principle, and application areas of selected construction elements in industrial practice and independently apply the principles of selecting and constructing machine elements.	1	4
1ET-BWL-ET	Business Administration	Upon completion of the module, students are able to apply the principles of business administration and economics in a practical way. This includes the basics of the operational performance process and constitutional decisions. The acquired knowledge is practiced in the form of a board game in groups which simulates basic business processes. The connection to macroeconomic processes is to be established. Students are enabled to recognize and understand the basic	1	4

		functioning of market economies, and to understand elementary economic interrelations as well as macroeconomic methods.		
1ET-PRAX1-ET	Basic Production Skills	In the first practical module, students are integrated into their practice team and thus receive essential impulses for the development of new or the consolidation of previously acquired social skills. They strengthen first professional competences acquired in the theoretical modules and apply them directly in a presentation that is to be prepared. Students get to know their practice company as well as its elementary processes and activities. Furthermore, they gain an overview of the work processes in the company as well as the equipment technology used.	1	5
1ET-MATH2-ET	Mathematics 2	Students are also familiar with more complicated mathematical models and can apply them to concrete engineering tasks. Through mathematics, they have learned to analyze a concrete problem and to solve it by adopting a logical approach. Special emphasis is put on higher order linear differential equations with constant coefficients, homogeneous and inhomogeneous differential equations, special differential equation types and differential equation systems.	2	4
1ET-ET2-ET	Foundations of Electrical Engineering 2	Upon successfully completing the module, students are familiar with the basic electrical engineering knowledge and solution competencies required in all fields of specialization for solving electrical engineering tasks in the areas of alternating current theory as well as energy and force effects in the electromagnetic field. In particular, students have acquired essential methods in the analysis of electrotechnical problems. They are able to perform network analysis in the image area on the basis of the complex rms values of the sinusoidal variables and the complex resistance and conductance operators.	2	5
1ET-TPHY2-ET	Technical Physics 2	Students know the physical basics of important effects for understanding measurement, analysis and production processes in industry and research. They have learned to describe physical problems by applying suitable models and to independently work on them by using appropriate measurement setups. Students are able to critically review their results and indicate ways to improve measurement technology.	2	4
1ET-ELDT-ET	Electronics/Digital Technology	<i>Electronics:</i> The module imparts detailed knowledge of common components of analog electronics. Students understand how basic circuits work and are able to	2	6

		<p>determine essential characteristics of such circuits by means of analytical approximations and numerical simulations. Furthermore, they are familiar with the dimensioning of the values of components.</p> <p><i>Digital Technology:</i></p> <p>The second part of the module focuses on dynamic processes. Students are able to read and correctly interpret circuit diagrams of digital technology and to develop simple sequential and combinational circuits.</p>		
1ET-INF-ET	Informatics	<p>Upon completion of the module, students are active users of a programming language on the example of ANSI-C. They know basic syntactical elements and structures and can use the programming tool to create algorithms.</p> <p>The module teaches the analysis of algorithms and data structures: design principles, complexity, asymptotic analysis, and elementary data structures.</p>	2+3	5
1ET-MG-ET	Management Principles	<p>Students are able to apply management principles as a formative and control mechanism in companies as well as selected working techniques for management. Focus is placed on the technical functions of management. Students also learn a methodical approach to problem solving.</p> <p>The module includes the TOPSIM series of business games, which have been successfully used in education and training for many years.</p>	2+3	5
1ET-PRAX2-ET	Tasks of Quality Assurance	<p>In this practical phase, students gain an overview of the entire practice company. They understand essential operational processes in selected functional areas. Students further develop their basic skills by strengthening their social competencies, adding professional skills, and applying initial electrical engineering methods.</p>	2	6
1ET-MATH3-ET	Mathematics 3	<p>Students know basic solution characteristics and explicit solution methods for ordinary differential equations as well as the basics of complex function theory. The module further develops skills in mathematical modelling of technical and physical problems, the ability to use literature and tools, and the ability to independently broaden mathematical knowledge.</p>	3	4
1ET-ET3-ET	Foundations of Electrical Engineering 3	<p>After successful completion of the module, students are able to assemble electrical circuits and systems, and to calculate symmetrical and asymmetrical three-phase systems using various methods. They know how to correctly handle standard measuring instruments in practical tests. Students are familiar with the fundamentals of calculating practice-relevant multiwave processes in linear</p>	3	5

		networks and have the skills and abilities to analyze linear networks with non-periodic excitation and in dynamic operation.		
1ET-ELSCH-ET	Electronics/Circuit Technology	Upon completion of this module, students are able to understand and apply the most important applications and physical properties of active electronic components. They can analyze the behavior of components and simple circuits with theoretical means and simulation programs and are capable of evaluating the suitability of components for given applications on the basis of data sheets. Students are able to perform dimensioning and accuracy calculations. They can independently extrapolate the function and application of electronic components from current research.	3	5
1ET-EMT-ET	Electrical Metrology	Students acquire the necessary knowledge and proficiency for measuring various physical quantities with electrical tools based on selected analog and digital methods and devices. They possess the knowledge relevant to practical applications regarding the interactions between the static and dynamic behavior of measuring devices on the one hand and the achievable measurement accuracy on the other.	3+4	5
1ET-MCTST-ET	Microcomputer Technology and Control Engineering	Students know the basic function of microprocessors and are able to design a microcomputer system with its CPU, memory and IO components. They are familiar with the principles of hardware-oriented programming of microprocessors in assemblies. The practical part of the module focuses on conveying knowledge of the structure and mode of operation of microcomputers and their effective programming. Based on this knowledge, students learn how to work with the Siemens PLC S7.	3+4	7
1ET-PRAX3-ET	Engineering Work	Students are enabled to combine theory and practice in order to methodically analyze and solve engineering tasks. Furthermore, they gain an understanding of applicable techniques and methods as well as their limitations. Students are able to comprehensively present the results of their work in written and oral form. Subject-related knowledge and expertise is combined with the theoretical knowledge acquired in the preceding theoretical part of the course.	3	6
1ET-SSKT-ET	Signals and Systems/ Communication Technology	<i>Signals and Systems:</i> The module imparts the most important mathematical methods from the fields of analysis and algebra as a basis for numerical solution methods. Upon	4	6

		<p>completion of the course, students are familiar with continuous signals and systems as well as the principles of discrete signals and systems.</p> <p><i>Communication Technology:</i></p> <p>The part on communication technology deals with the theoretical foundations of system theory, which helps students to develop an understanding of the basic principles of message transmission. For this purpose, students acquire fundamental knowledge of the transmission, mediation and processing of information and become familiar with the safe use of communication technology terms.</p>		
1ET-RT1-ET	Control Engineering 1	<p>Upon completion of the module, students understand the behavior of dynamic systems and the effect of back coupling. They are familiar with the principles of handling dynamic systems in the time and frequency domain. They know different methods for the analysis and design of time continuous controllers as well as the principles for the practical use of controllers. The lecture provides an introduction to the subject and is thus limited to linear single-loop control loops to illustrate in an exemplary way the terminology and methods of analysis and synthesis of feedback control systems.</p>	4	4
1ET-EE-ET	Electrical Power Engineering	<p>The module enables students to know and understand systems of electrical power engineering, including future power supply models and safety aspects. Upon completion of the course, students are able to calculate, select and evaluate important components. They are able to make technical as well as economic and ecological connections. This module covers electrical engineering equipment, plants and systems for the generation, transmission, storage, and application of electrical energy and thus forms the basis for energy supply, rail transport and industrial production.</p>	4	4
1ET-ENG-ET	English	<p>Students gain a comprehensive introduction to the field of English for engineering. Upon completion of the module, students are able to communicate effectively in this field, describe their working environment and themselves, and deal with everyday communication situations in both written and oral form. At the same time, students acquire knowledge of basic techniques of scientific work (literature research, excerpting, documentation of sources, etc.) and thus learn to master different forms of oral and written presentation.</p>	4+5	5
1ET-PRAX4-ET	Participation in Operational Tasks	<p>In this module, students improve general skills (e.g. time management, teamwork, communication skills, learning and working techniques) and are thus</p>	4	6

		well prepared for lifelong learning and employment in different professional fields. They are able to apply knowledge in different fields in a responsible manner and to deepen this knowledge independently.		
Compulsory elective modules „Electrical Engineering“				
1ET-EMA	Electrical Machines and Drives	Upon completion of the module, students have acquired sound knowledge of the setup, mode of operation, stationary and dynamic operating behavior of electromagnetic energy converters as well as their mathematical description. Furthermore, they are able to engage in experimental work. Students are familiar with the setup and operation of DC, synchronous and asynchronous machines. They are capable of designing electrical drives.	5+6	5
1ET-LE	Power Electronics	With this module, students gain an understanding of modern principles of electrical energy conversion and acquire the competence to select, design and technically/economically evaluate power electronic circuits. Students know the most important line-commutated and self-commutated (conventional and modern) circuits of power electronics with controllable and non-controllable semiconductor valves and the associated modulation methods. They are able to mathematically describe these topologies and formulate or solve problems. Students know how to apply basic principles of the measurement methods.	5+6	5
1ET-ANL	Systems Engineering	The lecture imparts knowledge of the operation and functioning of industrial plants. Emphasis is placed on production plants for metal and plastics processing as well as on mechatronic components in process engineering plants. Apart from plants and components, the module also introduces and discusses relevant control and regulation approaches.	6	6
Compulsory modules „Electrical Engineering“ (Automation Engineering+Renewable Energies)				
1ET-RT2-AT	Control Engineering 2	Upon successful completion of the course, students are able to transfer basic methods of time domain control to time-discrete systems. Digital control and the comparison to the continuous system are examined in a practical way. Students master the planning of time-discrete controllers by means of quasi-continuous design and direct digital design. They have acquired the ability to design a discrete-time controller for a given controlled system in such a way that the control loop fulfills given specifications regarding stationary and transient behavior.	5	4

1ET-PIN-AT	Process Informatics	Students are familiar with the algorithms of process informatics and know their operating systems and programming language. They know the interface structure and understand how to integrate safety and real-time aspects. Based on the automation pyramid, the part on SCADA shows the connection between the different levels of process informatics in the different areas of industry. The section on man-machine communication addresses the different systems, starting from the classic individual operation to the process control system.	5	5
1ET-ATS1-AT	Automation Systems 1	Upon completion of the module, students are familiar with hierarchical and distributed systems in automation technology. They can design and validate process control and automation systems for continuous and discontinuous processes and use modern tools for process control and visualization. Taking an application-oriented approach, the course imparts basic knowledge of the use both computer-aided and complex automation systems.	5	4
1ET-PHA-AT	Pneumatic and Hydraulic Systems	The module imparts knowledge of the characteristics of fluidic functional units and their role in automation technology. In this context, particular focus is laid on the design, mode of operation and application of hydraulic and pneumatic functional units and their supplementary components. Electro-hydraulic and electro-pneumatic functional units are also regarded as mechatronic systems. The module deals with the use of these hydraulic and pneumatic functional units by comparing variants for alternative solutions.	5	4
1ET-EMA-EE	Electrical Machines and Drives	see module 1ET-EMA	5+6	5
1ET-LE-EE	Power Electronics	see module 1ET-LE	5+6	5
1ET-RT2-EE	Control Engineering 2	see module 1ET-RT2	5	4
1ET-EAN-EE	Electrical Systems/Grids	After completing the course, students have in-depth knowledge of the design, calculation, and selection of electrical equipment. They are familiar with the interaction of equipment in switchgears, transformer stations and substations at all voltage levels. They can define and calculate protective measures. Students acquire detailed knowledge of the interaction of the individual equipment required to plan and operate complex structures of electrical power supply networks.	5	5
1ET-GT-EE	Building Services Engineering	Upon completion of the module, students are able to work with electrical installation systems for buildings. The course addresses topics such as low voltage main distribution boards, building connections, distribution, and	5	4

		consumer installations in dependence on the type of building. The module also includes basics of protective measures in low voltage networks. The course takes a holistic approach also considering the information-technical infrastructure of the buildings.		
1ET-HT-EE	High Voltage Engineering	Students know the tasks of high voltage engineering. They are able to apply essential procedures for the generation of high voltages (alternating, direct and surge voltages for test and experimental fields) in a focused manner. They are familiar with the principles of high-voltage measurement technology as well as special procedures and circuits for measuring high alternating, direct and surge voltages. Students can calculate the electrostatic field on simple geometries and form substitute arrangements.	5	4
1ET-PRAX5-ET	Technical Training/Specialization	At this stage, students of power engineering have a profound knowledge of the generation, transmission and application of electrical energy. Having gained expertise in protection technology, future graduates will become competent engineers when it comes to the safety of electrical installations. Building on their basic studies, students of automation technology receive a comprehensive overview of the many different practical applications of automation technology in the field of automation systems.	5	6
1ET-ST-AT	Software Engineering	The course imparts basic technical knowledge and hands-on application skills that include the architecture and functionality of application-oriented microprocessors, which are basically complete computers consisting of a single component, and signal processors which specialize in the digital processing of analog signals. Students get to know the components these microprocessors are made of and how they interact. Upon completion of the module, students possess all the skills needed to work independently on software projects.	6	5
1ET-ATS2-AT	Automation Systems 2	Students are able to understand current developments and trends in automation technology as well as development processes for automated technical systems, and know how to apply appropriate design methods. Based on the overview of modern computer-aided automation solutions, from ASICs, integrated controllers and signal processors to PLC, CNC and DNC and control systems, the course consolidates targeted approaches to solving typical automation tasks and selecting appropriate industrial process and fieldbus systems for networking.	6	5

1ET-NAU-EE	Grid Automation	The module addresses the object-specific automation technology for electrical power plants and grids in their hazardous state, both from the point of view of project planning and the operation of electrical power supply systems. Students are familiar with the generally applicable fundamentals of the subject, in particular the causes and consequences of faults in the electrical power system, the task of selective protection technology, the types of protective systems, as well as the design principles and characteristics of protective devices and transformers in electrical power distribution networks and practical solutions of selective protection.	6	6
1ET-EEN-EE	Renewable Energies	Students are familiar with the foundations of renewable energies, which are particularly influenced by legislation, and know the structure, mode of operation and possible applications of photovoltaics and wind power plants. Students understand the structure and mode of operation of electrical storage systems, electro-mechanical storage systems (flywheel, spring, compressed air, water), electro-chemical storage systems and are able to dimension them.	6	5
1ET-PP-EE	Planning and Project Engineering	Starting from basic project organization, the module deals with approaches and methods of the individual project phases. This includes aspects such as the assessment of the economic effects of dimensioning and protection decisions in the life cycle of an installation and principles of project planning of installations or low-voltage distribution networks for industrial and building installations, low-voltage main distribution boards including the use of installation bus systems in accordance with the relevant standards.	6	5
1ET-PRAX6-ET	Final Thesis	With their final thesis, students show that they are able to independently solve complex technical and operational problems within a given period of time. They apply the knowledge and scientific working methods gained in the theoretical phases as well as the skills and competences acquired in the practical phases. Students are able to present the results of their work in accordance with scientific principles and in a comprehensible manner. They prove their ability to work independently and professionally using engineering methods that are appropriate to the task.	6	9