

BERUFSAKADEMIE SACHSEN - Staatliche Studienakademie Riesa

Technology/Field of study: Mechanical Engineering

Module code	Module name	Sort description	Semester	ECTS
6MB-MA1	Mathematics – Linear Algebra and Analysis 1	Students are introduced to typical problems in engineering mathematics with the main focus on finding solutions. From the very beginning, students use a state-of-the-art pocket calculator with a computer algebra system. This enables them to develop routine in the approach and handling of the tool in addition to mathematical know-how. The module provides topic-related information on commercially available software for solving mathematical problems and shows simple approaches to informatics.	1	4
6MB-KO1	Design Theory and CAD 1	Students are able to produce spatial and planar representations of components in accordance with standards in the design process taking into account basic design principles. They are capable of applying their knowledge of the representation and calculations when preparing drafts, workshop drawings and designs of components, assemblies or systems using an up-to-date CAD system.	1	6
6MB-TM1	Engineering Mechanics - Statics and Strength Theory 1	Students know basic physical principles of mechanics and are able to apply them for the construction of simple parts. Emphasis is placed on the generation of mechanical substitute models and the equilibrium conditions of statics. In the field of strength theory, students become familiar with the functional and economic design of machine and structural components, taking into account material data. Emphasis is placed on stress and design calculations for bars and beams.	1	6
6MB-WF1	Materials Technology 1 and Production Engineering 1	Students know the most important materials for mechanical engineering, their properties and treatment options as well as techniques for materials testing. They acquire knowledge of material designations, structure, mechanical properties, wear, and corrosion behavior. Furthermore, students are familiar with the most important forming and cutting processes and are able to assess their suitability from a technical and economic point of view. For these processes, they know the typical materials and criteria for stress and production-oriented component design.	1	5

Module code	Module name	Sort description	Semester	ECTS
6MB-MG	Management Principles	Students know the basic requirements for conceptual and scientific work. They are familiar with the methods for writing a scientific paper. They have knowledge of the principles of teamwork as well as self and time management. They know the processes of information processing, are proficient in learning techniques and how to deal with stress. Students have basic knowledge and skills in the field of presentation techniques.	1	3
6MB-MA2	Mathematics - Analysis 2 and Mathematical Software Systems	Students are offered an introduction to the world of ordinary differential equations. Special emphasis is given to types that describe elementary, fundamental processes in science and technology, namely exponential processes, and oscillations. The topic of functions of one variable is rounded off with the approximation by Taylor and Fourier Series before moving on to the topic of functions of two and more variables. As in the first module on mathematics, a state-of-the-art pocket calculator with a computer algebra system is used, so that students can develop routine in approach and operation of the tool in addition to mathematical know-how. Furthermore, students are given an overview of available computer algebra systems and computer-aided numerical methods.	2	4
6MB-KO2	Machine Components 1 1	The module imparts basic knowledge for the design of machine components such as pins, bolts, shaft-hub connections as well as screw and welded connections. This is based on knowledge of strength calculation from the field of engineering mechanics, which is reflected in the relevant standards and guidelines on machine components and is applied in powerful, specially customized software.	2	5
6MB-TM2	Engineering Mechanics - Strength Theory 1	Students expand their knowledge of the functional and economical design of machine and structural components. This includes in particular the load types of uniaxial and biaxial bending (with regard to main axes and general axes), torsion and transverse force thrust. For all types, both stresses and deformations are calculated.	2	4

Module code	Module name	Sort description	Semester	ECTS
6MB-WF2	Materials Technology 2 and Production Engineering 2	Students expand their knowledge in the fields of materials and production engineering. Focus is placed on the topics of forming and joining. Students look at the processes that take place in materials during the forming process and the corresponding limitations of this process. They understand the interactions between the intended use, choice of material, manufacturing process and the constructive design of components under economic aspects, especially the number of pieces. Emphasis is put on joining processes and handling technology as well as the resulting assembly-oriented construction.	2	5
6MB-ET1	Electrical Engineering - Foundations 1	Students understand and master the vocabulary and application of important principles of electrical engineering. They are able to classify and calculate direct and alternating current parameters, circuits and networks by means of mesh and nodal point theorem as well as electric and magnetic fields. They are able to record, display and evaluate measurement results and become familiar with protective measures.	2	3
6MB-EN1	Englisch - Basics	Students gain knowledge and skills to communicate in English both orally and in writing. They are enabled to express themselves about scientific, technical, and economic topics. Apart from the purely foreign-language aspect, further essential focus is laid on the development of an appropriate and professional presentation style and the acquisition of intercultural communication skills.	2	2
6MB-KO3	Machine Components 2	Students acquire the competence to draft, calculate and design or select simple drive assemblies and the necessary components (axles, shafts, bearings, springs). They are able to understand the requirements of constructional tasks and use their knowledge to solve these tasks in a goal-oriented way. Students can independently create drafts, 3D models and drawings. They know the necessary valid standards and calculation regulations, can work with standard calculation software and be able to economically evaluate the developed technical solutions.	3	6

Module code	Module name	Sort description	Semester	ECTS
6MB-TM3	Engineering Mechanics - Strength Theory 3, Friction, Kinematics, Kinetics 1 and FEM 1	Students expand their knowledge by being familiarized with dynamic loads and other types of stress. Main focus is placed on kinematics and kinetics of the mass point. Work, energy, power, and momentum become the basis for modelling. In strength theory, emphasis is put on the composite types of stress and their combination via hypotheses. This provides the basis for design calculations, safety checks and load capacity calculations, which are important for design engineers.	3	8
6MB-ET2	Electrical Engineering - Foundations 2	Students understand and are proficient in the application of important basic laws of electrical engineering and electronics. They are able to deal with alternating current parameters and circuits both mathematically and metrologically and have insight into three-phase systems and their application, electrical safety and aspects of electrical power supply. Students become familiar with electrical quantities as information carriers as well as components and principles of analog signal processing. Binary and digital signals, their application in circuits and in practical implementations are a further field of interest. Students learn how to apply signal technology in metrology.	3	4
6MB-BWL1	Business Administration 1	Students gain an insight into basic business management knowledge and skills, which enables them to view a company and its components not only from a technical but also from an economic point of view and possibly to become familiar with its management.	3	3
6MB-EN2	Business English	Students gain knowledge and skills to communicate in English both orally and in writing. They are enabled to express themselves about scientific, technical, and economic topics. Apart from the purely foreign-language aspect, further essential focus is laid on the development of an appropriate and professional presentation style and the acquisition of intercultural communication skills.	3	2

Module code	Module name	Sort description	Semester	ECTS
6MB-FT3	Production Engineering 3 and CAD 2	Students complete their knowledge of manufacturing processes. This includes coating, changing material properties, closed loop management and recycling as well as the basics of welding. The latter offers an overview for all students and, at the same time, serves as an introduction to the compulsory elective specialization in the fifth and sixth semester, which qualifies participants as an international welding specialist. Students understand the processes and know the respective process limits and resulting requirements for technically and economically efficient constructions, including the selection of materials. The output of data for numerically controlled machine tools, if necessary with prior simulation of, for example, a milling process, forms a major subject complex in CAD 2.	4	6
6MB-KO4	Machine Components 3	Upon completion of the module, students have acquired the competence to draft, calculate, design, and evaluate drive systems. They are able to dimension drives, in particular toothed gears, friction gears and enveloping gears, and to select brakes and clutches according to their function. Students can analyze and compare the effects of the construction on the production process. They are able to understand the requirements of constructive tasks for complete drives and to use their knowledge in a target-oriented way to solve such tasks. Students are capable of presenting their work results in the form of drafts, 3D models and workshop drawings. They are familiar with the necessary valid standards and calculation regulations and are able to work with industry-standard calculation software.	4	4
6MB-SMFM	Fluid Mechanics and FEM 2	Students understand and master the application of important basic laws of fluid mechanics under mechanical engineering aspects. They learn ways to set up calculation equations for the dimensioning and recalculation of technical constructions and processes involving static or moving liquids and gases. They acquire skills to numerically simulate thermo-fluid dynamic processes with established software.	4	5

Module code	Module name	Sort description	Semester	ECTS
6MB-BWL2	Business Administration 2	The module deals with investment, financing, accounting, calculation, and project management as well as production planning and control. Particular focus is placed on the management of employees and entire companies under various aspects, which is also indispensable for university graduates with a technical orientation, be it in the rank of a head of department in a large company or as a self-employed freelancer.	4	3
6MB-EN3	Technical English	Students gain knowledge and skills to communicate in English both orally and in writing. They are enabled to express themselves about scientific, technical, and economic topics. Apart from the purely foreign-language aspect, further essential focus is laid on the development of an appropriate and professional presentation style and the acquisition of intercultural communication skills.	4	3
6MB-QMF	Quality Management and Production Metrology	Students know the role, organization and structure of quality management and the structure of QM systems. They become familiar with special methods and procedures of quality assurance for the product development process (parameter diagram, D-FMEA, FTA), work preparation (process flow plan, P-FMEA, inspection plan) and the production process (SPC). Furthermore, the module imparts the basics of statistics. A second focus is placed on the areas of interchangeable components and production metrology. In this area students acquire basic knowledge and skills (laboratory exercises) for the definition and metrological determination of geometric properties of components.	5	4

Module code	Module name	Sort description	Semester	ECTS
6MB-AT	Automation Engineering	Students understand and master the basics of automation technology with a focus on control engineering for mechanical engineers. They get to know the structure, the function, and the application conditions of programmable logic controllers (PLC) as well as the design, the analysis, and the realization of linear control loops with frequency domain methods. Students can describe the transmission behavior of typical mechanical engineering devices as a function of time and frequency from the perspective of control engineering. Practical experiments in the automation engineering laboratory provide students with a high degree of application-oriented expertise.	5	4
6MB-TM4	Engineering Mechanics – Kinematics, Kinetics 2 and FEM 3	Students expand their knowledge especially in the areas of rotation, oscillation, and impact in the kinetics/kinematics of the body as well as the composite types of stress, their combination via hypotheses, bending and buckling in the theory of strength. This provides the basis for design calculations, safety checks and load capacity calculations, which are important for design engineers.	5	6
6MB-TD	Thermodynamics	Students learn the principles of the behavior of substances in the individual states of matter as well as important basic laws of thermodynamics and their effects. Focus is placed on heat transport processes, temperature distribution as well as time behavior and its numerical simulation. An overview is given of the ways in which forms of energy can be converted into each other, the value of forms of energy, circular processes, and thermal machines.	5	3
6MB-OT	Surface Engineering	Students are given an overview of the various surface technologies and detailed knowledge of various coating processes. This includes various applications of processes from the field of thin-film technology. Special emphasis is placed on topics with direct relevance to mechanical engineering, such as wear protection coating of cutting tools or friction-optimized surfaces for machine parts.	5	3

Module code	Module name	Sort description	Semester	ECTS
6MB-KT	Plastics Engineering	Students know the most important plastics, their properties and processing possibilities as well as methods for testing processing and component properties. They are able to select plastics and processes in a target-oriented manner and know typical process requirements. They are also able to design plastic parts in accordance with stress and production requirements. Students can evaluate their decision technically and economically.	5	3
6MB-ISF1	Welding Methods and Equipment (International Welding Expert - Part 1)	Building on the physical processes during welding and their interactions, students are familiarized with the most important welding processes and the necessary technical equipment. With the acquired knowledge, students can explain process interrelationships and their effects. Completion of this module is a prerequisite for obtaining an additional qualification as International Welding Specialist (IWS).	5	3
6MB-ISF2	Practical Welding Training / Basic Procedures (International Welding Specialist - Part 2)	Building on the physical processes during welding and their interactions, students are familiarized with the most important welding processes (gas, manual arc, metal shielding gas and tungsten inert gas welding) by gaining their own welding experience. The practical application of the processes helps students to back up their acquired knowledge with practical experience. Completion of this module is a prerequisite for the acquisition of an additional qualification as International Welding Specialist (IWS).	5	3
6MB-ISF3	Practical Welding Training / Special Procedures (International Welding Specialist - Part 3)	Building on the physical processes during welding and their interactions, students are familiarized with the most important special welding processes (submerged arc welding, resistance spot welding, stud welding, plastic welding, soldering and thermal spraying) by gaining their own welding experience. The practical application of the processes helps the students to back up their acquired knowledge with practical experience. Completion of this module is a prerequisite for the acquisition of an additional qualification as International Welding Specialist (IWS).	5	3

Module code	Module name	Sort description	Semester	ECTS
6MB-RGA1	REFA - Work System and Process Design (REFA Basic Training 2.0 - Part 1)	How can material and operating resources be used, and people be involved in such a way that market-driven products and services can be realized in a cost-effective, quality-oriented, resource-efficient, and environmentally friendly manner? The performance and success of a company are decisively influenced by the design of processes and workplaces. For this purpose, process data must be professionally determined and applied. These topics and the corresponding instruments are subject of the REFA basic training 2.0. Acquire the basic know-how in industrial engineering!	5	3
6MB-RGA2	REFA - Process Data Management (REFA Basic Training 2.0 - Part 2)	How can material and operating resources be used, and people be involved in such a way that market-driven products and services can be realized in a cost-effective, quality-oriented, resource-efficient, and environmentally friendly manner? The performance and success of a company are decisively influenced by the design of processes and workplaces. For this purpose, process data must be professionally determined and applied. These topics and the corresponding instruments are subject of the REFA basic training 2.0. Acquire the basic know-how in industrial engineering.	5	3
6MB-RGA3	REFA - Process Management Applications (REFA Basic Training 2.0 - Part 3)	How can material and operating resources be used, and people be involved in such a way that market-driven products and services can be realized in a cost-effective, quality-oriented, resource-efficient, and environmentally friendly manner? The performance and success of a company are decisively influenced by the design of processes and workplaces. For this purpose, process data must be professionally determined and applied. These topics and the corresponding instruments are subject of the REFA basic training 2.0. Acquire the basic know-how in industrial engineering.	5	3

Module code	Module name	Sort description	Semester	ECTS
6MB-BMK	Construction of Operating Resources	Students have a basic understanding of the methodical planning, design and construction of devices and automation equipment as well as knowledge of the principles of tool design. They are familiarized with the design and function of tools for sheet metal and solid forming, injection molding tools, die casting tools, clamping and assembly devices and linking devices. Students are able to evaluate the technical, safety-related, ergonomic, economic and scheduling requirements that arise in the process and develop appropriate solutions.	6	3
6MB-MD	Machine Dynamics	Students are able to apply the knowledge of dynamics to special mechanical engineering problems, such as free and forced flexural vibrations, vibration propagation and isolation or balancing of rigid rotors and to derive statements about component strength from this knowledge. They deal with the measurement and analysis of vibrations and the simulation of dynamic processes with an FEM program package.	6	4
6MB-MPE	Methods of Product Development	Students have acquired the competence to use established methods in all phases of constructive development: They know methods to plan, analyze and structure development goals. Building on this, they are able to apply methods to find innovative solutions and effectively determine their characteristics. Students also master the methods of risk assessment and decision making. Furthermore, they know the basic rules, principles, and guidelines for the process of methodically designing individual parts and assemblies. The module focuses on the conscious application of different methods for the development of innovative solutions.	6	2
6MB-RAS	Law and Occupational Health and Safety	Upon completion of the module, students are familiar with the content-related principles and basic structure of the German legal system as well as the meaning, fields of influence and terminology of selected areas of general law. They have a basic understanding of the most important legal categories that affect the productive production process. In addition, participants acquire basic knowledge of the rights and obligations of those involved in occupational health and safety.	6	4

Module code	Module name	Sort description	Semester	ECTS
6MB-STA	Student Research Project	The student research project is a preparation for the bachelor thesis, which constitutes the conclusion of the studies at the University of Cooperative Education. It aims to practically apply the theoretical and practical knowledge acquired during the course of study, including scientific methods, in a problem-oriented and comprehensive manner. The conditions and standards regarding self-reliance, procedure, documentation, and presentation are already very similar to those of the typical professional environment of an engineer.	6	2
6MB-SEN	Sensor Technology	Building on the foundations of electrical engineering, students acquire practical knowledge in sensor technology. Starting from physical-technical fundamentals, the module deals with sensors for electrical, optical, thermal, mechanical, and magnetic quantities. Focus is placed on the typical sensors of an electrical drive system. Students apply their basic knowledge to engineering tasks. Furthermore, the module provides the basis for an interdisciplinary cooperation of engineers and technicians in mechatronic applications.	6	3
6MB-HY	Hydraulics and Pneumatics	Students possess knowledge of the fundamentals and application areas of hydraulics and pneumatics. Based on knowledge from fluid mechanics and thermodynamics, they master the interrelationships of hydraulic/pneumatic and mechanical energy and power conversion. Students know the structure and function of hydraulic and pneumatic components. Plant design, energetic optimization of plant concepts and project planning of basic circuits are mastered.	6	3
6MB-EA	Mechatronic Drives	Students are familiarized with various electric motors and their possible control and regulation through practical laboratory work. Elements of mechanics, electrical machines, power electronics and control engineering are considered as a system. Upon successful completion of the course, students are able to develop electrical drive systems and find innovative solution concepts. In the laboratory internship, students apply the acquired knowledge in practice and acquire skills in PLC programming in a complex system and in the acquisition of motor characteristics.	6	3

Module code	Module name	Sort description	Semester	ECTS
6MB-ISF4	Material Behavior during Welding (International Welding Expert - Part 4)	Students learn to assess the foundations for the weldability of common ferrous and non-ferrous materials. Emphasis is placed on the practical application of knowledge in order to be able to make an initial analysis of the causes of possible damage. Completion of this module is a prerequisite for the acquisition of an additional qualification as International Welding Specialist (IWS).	6	3
6MB-ISF5	Construction and Design of Welded Joints (Int. Welding Expert - Part 5)	Students get to know design possibilities in dependence of the different types of stress and environmental conditions. Furthermore, they examine the mechanism of component fatigue, the calculation of load cycles as well as the influence of notches and their avoidance under welding aspects. Completion of this module is a prerequisite for obtaining an additional qualification as International Welding Specialist (IWS).	6	3
6MB-ISF6	Manufacturing and Application Technology (International Welding Specialist - Part 6)	Building on the modules "Production Engineering 3 (Joining)" and "International Welding Specialist 1-5", students get to know the connections between the individual modules and how to combine their contents. This results in the tasks for welding supervisors which students could perform upon completion of this module. Completion of this module is a prerequisite for obtaining an additional qualification as International Welding Specialist (IWS).	6	3
6MB-RQM1	REFA - Quality Assurance (REFA Quality Manager - Part 1)	The training as REFA Quality Manager provides students with comprehensive knowledge of standards-related methods. With this know-how, students make a professional contribution to securing and increasing quality in the company - the best prerequisite for sustainably increasing customer satisfaction and competitiveness.	6	3
6MB-RQM2	REFA - Quality Management (REFA Quality Manager - Part 2)	The training as REFA Quality Manager provides students with comprehensive knowledge of standards-related methods. With this know-how, students make a professional contribution to securing and increasing quality in the company - the best prerequisite for sustainably increasing customer satisfaction and competitiveness.	6	3

Module code	Module name	Sort description	Semester	ECTS
6MB-RQM3	REFA - Integrated Management Systems (REFA Quality Manager - Part 3)	The training as REFA Quality Manager provides students with comprehensive knowledge of standards-related methods. With this know-how, students make a professional contribution to securing and increasing quality in the company - the best prerequisite for sustainably increasing customer satisfaction and competitiveness.	6	3
6MB-PRAX1	Practical Module 1	The degree program begins with the 1st practical module. 6 weeks of it take place before the 1st theoretical phase. Within the complete practical training program, the first practical phase serves as an introduction. This includes, for example, the basic structure and operations of the company, co-workers, the object of work, material flows including trade chains between suppliers and customers, information flows, legal framework conditions as well as the role, area of responsibility and possible employment conditions of a future graduate of the degree program. In this respect, a former skilled worker who opted to pursue a course of study can of course be deployed in a different way than a high school graduate who is not yet employed by the company. If the company disposes of appropriate resources, it would be appropriate to employ the student in metalworking processes.	1	6
6MB-PRAX2	Practical Module 2	The course contents in the practical modules provide on the one hand the prerequisites for the necessary understanding of technical or economic interrelationships in later theoretical phases. On the other hand, students consolidate and deepen the knowledge they have acquired in previous theoretical phases. In the practical stages of studies, students work on engineering or business management tasks and thus develop special abilities and skills that are required for their future work. In the second practical module, focus is strongly aligned to the company strategy and can be oriented towards trainee phases in various departments, further familiarization and inclusion, as well as further training or the completion of concrete work tasks under guidance in the product development process, especially in the production process.	2	6

Module code	Module name	Sort description	Semester	ECTS
6MB-PRAX3	Practical Module 3	The course contents in the practical modules provide on the one hand the prerequisites for the necessary understanding of technical or economic interrelationships in later theoretical phases. On the other hand, students consolidate and deepen the knowledge they have acquired in previous theoretical phases. In the practical stages of studies, students work on engineering or business management tasks and thus develop special abilities and skills that are required for their future work. In this stage of their studies, participants are increasingly entrusted with responsible tasks and are thus partly involved in the normal work of the practice companies. This increases students' motivation and improves the efficiency of the learning process. With their detailed knowledge of the company and industrial sector acquired during the practical phases, graduates can be employed in the company without a costly and time-consuming orientation phase.	3	6
6MB-PRAX4	Practical Module 4	The course contents in the practical modules provide on the one hand the prerequisites for the necessary understanding of technical or economic interrelationships in later theoretical phases. On the other hand, students consolidate and deepen the knowledge they have acquired in previous theoretical phases. In the practical stages of studies, students work on engineering or business management tasks and thus develop special abilities and skills that are required for their future work. In this stage of their studies, participants are increasingly entrusted with responsible tasks and are thus partly involved in the normal work of the practice companies. This increases students' motivation and improves the efficiency of the learning process. With their detailed knowledge of the company and industrial sector acquired during the practical phases, graduates can be employed in the company without a costly and time-consuming orientation phase.	4	6

Module code	Module name	Sort description	Semester	ECTS
6MB-PRAX5	Practical Module 5	The course contents in the practical modules provide on the one hand the prerequisites for the necessary understanding of technical or economic interrelationships in later theoretical phases. On the other hand, students consolidate and deepen the knowledge they have acquired in previous theoretical phases. In the practical stages of studies, students work on engineering or business management tasks and thus develop special abilities and skills that are required for their future work. In this stage of their studies, participants are increasingly entrusted with responsible tasks and are thus partly involved in the normal work of the practice companies. This increases students' motivation and improves the efficiency of the learning process. With their detailed knowledge of the company and industrial sector acquired during the practical phases, graduates can be employed in the company without a costly and time-consuming orientation phase.	5	6
6MB-PRAX6	Bachelor Thesis Mechanical Engineering	In the practical phase of the 6th semester, students write their Bachelor thesis. The topic of this thesis is set by the company and is to be submitted to Staatliche <i>Studienakademie</i> for assessment approximately 3 months before it is assigned to the student. The topic is then assigned to the student by the examination board at the beginning of the practical phase of the last semester. The assignment can, for example, include an experimental, theoretical, or constructive problem or consist of any combination of these three options. The thesis is to be handed in by the deadline set by the <i>Studienakademie</i> . This deadline is exactly three months after the assignment of the topic. Students must be given a sufficient period of time by the practice company to work on their bachelor thesis.	6	12