Faculty of Technology

MECHANICAL ENGINEERING (required language level B1) BACHELOR LEVEL	Description	Lecturer	CP / ECTS	Term (Semester)
LECTURE: **Leadership and Communication**	Communicating and presenting, basics of communication psychology, goals, conducting conversations and negotiations, leading teams and work groups (including motivation and tools, meeting management, creativity in teams, conversation situations, employee discussions, managing conflicts), leadership role, tasks and - instruments, learning and implementing conversation and leadership skills.)	**Mr. Schmidt**	**5**	**fall**
TECHNICALL PROJECTS: e.g. Mechatronics and Robotics, Materials Engineering, Laser Technologies, Additive Manufacturing, Sustainability, etc.	Subjects on Request, please choose one: Mechatronics and Robotics, Materials Engineering, Laser Technologies, Additive Manufacturing, Sustainability	**Esther Held and others**	**5**	**fall and spring**
LECTURE: **Control of and with Smart Products**	Students can choose and program microcontroller boards for products. Students can select and describe microcontroller boards and the necessary sensors and actuators. Students can describe and create programs for microcontroller boards. The module serves as an input for the semester project and provides a foundation for understanding smart products. Content: Assembly of a control system, Data flow in control systems, Hardware for control systems, Microcontroller boards, Sensors, Actuators, Programming of microcontrollers, Documentation of programs and hardware, Case studies.	**Mr. Wings**	**5**	**fall**
LECTURE: **Quality Management and Quality Assurance**	Introduction to quality management; QM philosophies; QM standards: general QM methods, and tools; problem solving tools; management tools; quality costs; quality and law. Basics of statistics; acceptance charts; CAQ; supplier selection and evaluation; quality costs. sampling inspection; capability studies and characteristics; control	**Mrs. Blattmeier**	**5**	**fall**

MECHANICAL ENGINEERING **(required language level B1)** **BACHELOR LEVEL**	**Description**	**Lecturer**	**CP / ECTS**	**Term (Semester)**
LECTURE: **Project Management**	Fundamentals of Project Management, Work Breakdown Structures, Project Scheduling and Budgeting, Earned Value Method, Risk Analysis in Projects, Project Organisations, Project Closure and Audit, PCSimulation, agile project management	**Mr. Passenheim**	**5**	**fall**
LECTURE: **Digital Marketing**	course description will follow soon	**Mr. Hummels**	**5**	**fall**
LECTURE: **Thermal Power Plants** **Prerequisite:** basic knowledge of thermodynamics	Types and applications, renewable heat sources, cycle processes, optimization strategies for efficiency and power output, main machinery and apparatuses, new technologies and applications; simulation of power plant processes using commercial software. Prerequisites: Basic knowledge of thermodynamics.	**Mr. Jakiel**	**5**	**fall**
LECTURE: **Energy Systems Simulation** **Prerequisiste: Basic knowledge of programming/limited no. of participants**	Modelling, simulation and analisys of local energy systems with producers, consumers and prosumers	**Mrs. Pechmann**	**5**	**fall**
LECTURE: **International Marketing** **Prerequisites**: Sufficient knowledge of English and basic knowledge of marketing is required	International marketing activities are explored; international market research, strategic issues, international marketing mix; additional aspects such as generic internationalization strategies, methods of evaluating and selecting countries as target markets, and market entry modes extend the scope of contents to entirely new fields; exercises and case studies are used to apply learned contents to real-life scenarios.	**Mr. Hummels**	**5**	**spring**
LECTURE: **Sustainable Production** **Prerequisite:** basic knowledge of programming/limited no. of participants	Production systems and production management systems in ERP-Systems (SAP S/4 HANA, ERPsim Sustainability)	**Mrs. Pechmann**	**5**	**spring**

NEW: MECHANICAL ENGINEERING MASTER LEVEL	**Description**	**Lecturer**	**CP / ECTS**	**Term (Semester)**
LECTURE: **Computational Simulation in Energy Engineering**	Clarification of lightweight design tasks; strategic approach; structural design; selection of lightweight materials; sustainability and cost efficiency; dimensioning; manufacturing and assembly methodsProject: Design, dimensioning, manufacturing and testing of an aluminum lightweight structure	**Mr. Böcker**	**5**	**spring**
LECTURE: **Turbomachinery Design**	Basic concepts and applications, Machine-specific thermodynamic and fluid dynamics fundamentals, Performance, efficiency and main operating data of machines, Euler's equation of turbomachines, velocity triangles, energy conversion in the stage, Key figures for selection, dimensioning and evaluation, Off-design, characteristic curves and maps, operational limits , Development processes, design of a radial compressor stage, optimization options, Operation of professional design and simulation software	**Mr. Jakiel**	**5**	**spring**
LECTURE: **Structural Dynamics**	PDEs in structural dynamics systems, Solutions for mode shapes and eigenfrequencies, Solutions for wave propagation, Excitation and unstable dynamics, Reduction of vibration and influences on vibrations, Human response to vibration, Measurement of vibration with spatial distribution	**Mr. Graf**	**5**	**spring**
LECTURE:**Thermodynamics of Real - World Processes**	Entropy as a fundamental quantity in thermodynamic processes, adiabatic accessibility, and the Lieb-Yngvason engine. This course demonstrates how entropy is used to describe and evaluate thermodynamic processes.	**Mr. Böcker**	**5**	**spring**
LECTURE: **Lightweight Structures and Innovative Materials**	Clarification of lightweight design tasks; strategic approach; structural design; selection of lightweight materials; sustainability and cost efficiency; dimensioning; manufacturing and assembly methodsProject: Design, dimensioning, manufacturing and testing of an aluminum lightweight structure	**Mr. Helms**	**5**	**spring**
LECTURE: **ERP Systems I: Processes and Sustainability Data**	The course introduces the essentials and architecture of ERP systems and links them to production processes, PPC logic, and the plan#to#produce integration cycle. Students gain an overview of core data models and data flows and learn how ERP systems support reporting on sustainability and quality. The module also clarifies the distinction between configuration, customizing, and system enhancements as different levels of system adaptation in industrial environments.	**Mrs. Pechmann**	**5**	**spring**
LECTURE: **Applied Statistical Methods for Mechanical Engineering**	The module covers a large spectrum of applied statistics required in mechanical engineering: descriptive statistics and data visualisation, measurement uncertainty evaluation, hypothesis testing, linear regression, design of experiments (full and fractional factorial, Taguchi, response surface methods), robust optimisation and signal to noise analysis, reliability and life time modelling (Weibull analysis, accelerated testing), statistical process control (control charts, capability indices), uncertainty quantification for simulation models. Each topic is illustrated with engineering focused case studies and/or hands on laboratory projects.	**Mrs. Held**	**5**	**spring**
LECTURE: Digital Process Engineering	Students learn about key methods and equipment used in mechanical, thermal, and chemical process engineering. During the lessons, they formulate fundamental mass and energy balances for process engineering equipment and model them using numerical methods. Through project-based examples, students address realistic tasks—such as the design, optimization, and troubleshooting of process engineering systems—by employing mathematical models	**Mr. Hüppmeier**	**5**	**spring**
LECTURE: **Life Cycle Assessment**	course description will follow soon	**Mr. Ebel**	**5**	**spring**

NEW: MECHANICAL ENGINEERING MASTER LEVEL	**Description**	**Lecturer**	**CP / ECTS**	**Term (Semester)**
LECTURE: **Wind Energy Technology**	Students learn the fundamental principles of wind energy conversion, wind turbine aerodynamics, design and operation. They assess wind resources, estimate enery yields and analyse the technical and economic performance of wind energy systems	**Mr. Herraez**	**5**	**spring**
LECTURE: **Process Visualisation**	In order to design processes in a process-oriented organisation, various modelling options have developed: 1. Differentiation of processes in the structures of strategic management 2. Identification of processes 3. Analysis of processes 4. Management of processes 5. Classification of processes in the phases of the process life cycle	**Mrs. Blattmeier**	**5**	**spring**
LECTURE: **Scientific Working**	Writing a scientific paper/ report/ thesis, including the setup/content of mandatory chapters, Literature research and use, literature organization, referencing styles, publication process, Presentation of scientific results, Software use in scientific working, Usage of AI in scientific working	**Mrs Ottink**	**5**	**fall**
LECTURE: **Power Plant Engineering**	Energy and power plants (basic concepts and classification), Energy sources for power plants, Thermodynamic fundamentals of energy conversion, efficiency, cycle processes for heat engines, Steam power process: function, efficiency and performance indicators, main components, optimization potential; overview of combustion systems, Gas turbines and combined cycle processes: function, efficiency and performance indicators, main components, optimization potential, EBSILON® Professional: introduction, setup and simulation of steam power and gas turbine, processes based on real power plant examples, Non-technical indicators: Levelized Cost of Electricity (LCOE), CO2 production, etc.	**Mr. Jakiel**	**5**	**fall**
LECTURE: **ERP Systems II: Integrated Business Processes and Data Analysis**	Within a business simulation game, you will produce and distribute a product according to economic and environmental criteria. To do this, you will use standard transactions from an ERP system (SAP S4/HANA) to generate data for a business process. You will represent the data flows using BPMN 2.0 notation. With the help of ODATA connections, calculation, and visualisation software (e.g., Excel, SAP SAC), you generate suitable reports as a basis for decisions. You then configure an ERP system for manufacturing a new product, create your own QuickViews in SAP, and use them to verify your configured production process.	**Mrs. Pechmann**	**5**	**fall**
LECTURE: **Simulation of Production Systems**	Identification of key resources and flows (energy, materials, data), creation of suitable models and their dynamic simulation (time-discrete/agent-based), data availability and provision for simulation, introduction to simulation software, simulation of a case environment	**Mrs Pechmann**	**5**	**fall**

NEW: MECHANICAL ENGINEERING MASTER LEVEL	**Description**	**Lecturer**	**CP / ECTS**	**Term (Semester)**
LECTURE: **Software Development**	Basics of software development, role of the software developer. Software development processes, basics of software architecture, introduction to the Python programming language(syntax, semantics, object-oriented programming), software quality, basics of software testing, test types, test methods, test tools, introduction to agility and Scrum, roles, artefacts, processes, software development in a team (teamwork, communication, conflict resolution, roles and responsibilities), requirements and restrictions in an industrial environment, software development in a production environment.	**Mr. Wings**	**5**	**fall**
LECTURE: **Application of Nonlinear Finite-Element-Analysis**	Overview of various commercial FEA (Finite Element Analysis) software packages and their field of application, Development of complex models in Abaqus, Sources of nonlinearities, Displacement-controlled and force-controlled analyses, and snap-through problems, Newton iteration, implicit and explicit algorithms, mass scaling, Contact: penalty method, (augmented) Lagrange method, True stress and true strain, nonlinear material models and parameter identification from tensile test data, Application example: short-time dynamics crash simulation	**Mr. Graf**	**5**	**fall**
LECTURE: **Data Science and Analytics**	The importance of data analysis, particularly of large datasets (big data), is growing in the fields of science and business. This course covers concepts, algorithms, and technologies for analyzing large datasets. It addresses methods from the field of machine learning, their integration into the CRISP-DM and KDD processes, and their alignment with Industry 4.0 standards. Analyses generated using digitized data and information — such as that provided by industrialcyber-physical systems — are an essential component of digitized environments and support decision-making at various levels within the ecosystems of industry, transportation, energy and healthcare	**Mr. Wings**	**5**	**fall**
LECTURE: **Industrial Laser Material Processing**	Overview of the interactions between laser beams and materials in laser material processing. Assignment of the processes in relation to the production technology with the laser beam as a tool. In-depth treatment of manufacturing processes with laser beams in terms of quality, speed and cost. The manufacturing processes are: cutting, joining, processing of surface layers, additive manufacturing. Examples from industrial production.	**Mr. Schüning**	**5**	**fall**
LECTURE: **Advanced Project Management for Engineers**	Agile Project Management, Scrum Framework, Scrum Roles, Product Backlog, User Stories, Requirements Engineering, Story Points, Planning Poker, Sprint Planning, Sprint Execution, Daily Scrum, Kanban, Sprint Review, Sprint Retrospective, Definition of Done, Metrics, Velocity, Burndown Charts, Scaling Scrum, Multi-Team Coordination, Simulation Game	**Mr. Haja**	**5**	**fall**
TECHNICAL PROJECT: Hypleroop	Hyperloop is set to be a new mode of transport for the future. As part of the HSEL's test infrastructure, students are introduced to the relevant technology and deepen their knowledge through projects in areas including design, operating systems, management and future technologies.	**Mr. Schüning**	**5**	**fall and spring**