Ostfalia
Hochschule für angewandte
Wissenschaften

Curriculum Mechanical Engineering in English Language

The following lectures are based on two years of fundamental Mechanical Engineering or Industrial Engineering studies.

Single Lecture	Class hour	ECTS	Period	Lecturer
Fluid Mechanics (Strömungslehre)	4	5	SS	Klinge
Design (and Simulation) with Plastics (Konstruktion (und Simulation) mit Kunststoffen)	4	5	WS	Yagimli
Microcontroller	4	5	WS	Roskam
Sensor Engineering (Sensortechnik)	4	5	WS	Balan
Circuit Technology (Schaltungstechnik)	4	5	WS	Hartwig
Handling and Assembly Technology (Handhabungs- und Montagetechnik)	2	2,5	WS	Brüggemann
Machine and Factory Planning (Anlagen- und Fabrikplanung)	2	2,5	WS	Borbe
Process Chain of Sheet Metal Working (Prozesskette Blechverarbeitung)	4	5	WS	Rambke
Internet of Production	4	5	WS	Triltsch
Internet of Things	4	5	WS	Strube
Sum	36	45	WS/SS	10

Project Work	Class hour	ECTS	Period	Lecturer
Project	1	2	WS/SS	All
Student Project I	-	12	WS/SS	All
Student Project II	-	12	WS/SS	All
Colloquium (topic of Student Project I or II)	1	1	WS/SS	All
Bachelor Thesis	-	12	WS/SS	All
Bachelor Colloquium	-	2	WS/SS	All

Period: WS: Winter Semester: Monday, September third week to January 31st, SS: Summer Semester: March 1st to July second week, Exams are given in Englisch and German language.

Wolfenbüttel, 07.05.2026, R. Roskam

Module Description

Fluid Mechanics	
Learning objective	The students attending this course will understand fundamentals of fluid mechanics. They are able to apply this knowledge to simple tasks and to explain them. By preparing and presenting experiments of fluid mechanics, each student will have a close look to major effects of fluid mechanics and the possibility to improve his knowledge by experimenting with them on its own.
Content	Types of fluid motions, boundary layer, viscosity, mechanism of flow separation, conservation of momentum, lift and drag forces of bended plates (airfoils), supersonic flows, pressure losses of tubes and installations. Fundamental principles of computational fluid mechanics (CFD), general overview to theoretical background and application of cross correlation based optical flow and structure measurement techniques.

Design (and Simulation) with Plastics	
Learning objective	The module "Design (and Simulation) with Plastics" offers a comprehensive introduction to the design and dimensioning of plastic components. • Understand Fundamentals: Develop knowledge of the chemical and physical principles, as well as the classification, of plastics. • Evaluate Material Properties: Analyze and understand the mechanical, thermal, and chemical properties of plastics. • Master Dimensioning: Apply the fundamentals of dimensioning and tolerancing for plastic components, and account for safety factors. • Design for Specific Loads: Develop design strategies for various types of loading to ensure the strength and reliability of components. • Consider Manufacturing: Apply design principles to ensure the cost-efficient and high-quality manufacturing of plastic components. • Integrate Recycling: Incorporate recycling principles into the design process and create environmentally friendly plastic products. • Design Rib Structures: Apply principles of rib design to enhance the stiffness and strength of components. • Apply Joining Techniques: Select and evaluate methods for joining plastic components. • Utilize Simulation: Apply simulation methods—specifically Finite Element Analysis—to analyze and optimize plastic components.
Content	The course "Design (and Simulation) with Plastics" offers a comprehensive overview of the various aspects of designing with plastic materials. It begins with an introduction to the significance and evolution of plastics engineering, followed by a detailed explanation of the chemical and physical fundamentals, as well as the classification of plastics into thermoplastics, thermosets, and elastomers. The course examines how the mechanical, thermal, and chemical properties of plastics influence material selection and design.various types of loading are analyzed, and strategies for optimizing strength and reliability are developed. The impact of manufacturing processes—such as injection molding and extrusion—on design is addressed, as is the design-for-manufacturing approach aimed at achieving cost-efficient and high-quality production. Plastic recycling is also covered, with a discussion of methods for enhancing recyclability and environmental compatibility The course also encompasses the design and optimization of rib structures to improve component strength and stiffness. Joining techniques for plastic components—including welding, bonding, and mechanical fastening—are presented and evaluated in terms of their strength and reliability. Finally, the application of simulation methods, such as Finite Element Analysis (FEA), is discussed as a means of analyzing and optimizing plastic components.

Microcontroller	
Learning objective	The students can develop control tasks using a microcontroller. This includes the design of the hardware as well as the programming and testing of the software.
Content	Basics (state information, information presentation and processing), development environment, memory, IO control, structured programming, timer, D/A converter, PWM control, A/D converters, interrupts, time/frequency measurement, project task

Sensor Engineering	
Learning objective	Learning of metrological procedures and selection of suitable sensors for measuring physical quantities. Understanding of the functioning of sensors and their applications. Students are able to select suitable sensors, practical dimension the measurement circuit and amplifier circuit with operational amplifiers, build filter circuits and perform the programming of data acquisition. The static and dynamic properties of sensors are considered. The influence of factors such as: construction of the measuring system, bus system, type of measurement, software and operating system for data acquisition is theoretically and practically studied. Laboratory setups in combination with various types of sensors, and the data acquisition and measurement data processing in LabView complete the theoretical knowledge acquired. Measuring practice.
Content	Operation and applications of sensors such as resistive, capacitive, inductive, optical, Hall, ultrasonic, piezoelectric. Static and dynamic characteristics, advantages and disadvantages of practical applications. Data Processing: bus systems, bandwidth and latency, sampling of a measurement system. Modulation schemes for data transmission. Protocols. The ISO-OSI-reference model. Structure and function of amplifier and filter circuits. Operational amplifier in practice. A/D conversion method including: successive approximation, two ramps method, delta-sigma, as well as D/A conversion process such as: binary-stepped resistances R/2R network. Circuits with operational amplifiers. Experimental investigation of sensors on laboratory setups as well as the programming of data acquisition in LabView. Experimental design of circuits for data acquisition and amplification. Embedded-Systems.

Circuit Technology	
Learning objective	Students understand and are able to analyze the non-linear characteristics of semiconductor devices, basic analog and digital circuits. They can calculate basic analog circuits based on technical data and thresholds. Students have basic knowledge about the control of electromagnetic actuators with switching amplifiers. They know how to use transistors both as linear and switch amplifier. Students are able to calculate and simulate the basic functions of switching power supplies and switching circuits.
Content	Voltage stabilization with a Z-diode. Current stabilization with a junction field effect transistor. Switching amplifier and pulse width modulation (frequency). Stabilized power supplies. Optocoupler. Automotive sensor technology. Combinatorial and sequential digital circuits. Electromagnetic compatibility.

Handling and Assembly Technology	
Learning objective	Teaching basic skills of handling and assembly technology; Application of methods for assembly planning, practical laboratory.
Content	Basics of handling and assembly technology, feeding systems, robotic systems, assembly systems, planning of assembly systems, assembly-friendly product design, case studies for handling and assembly technology, programming exercises and tasks for programming of robots in the laboratory.

Process Chain of Sheet Metal Working	
Learning objective	Students are able to explain the development process for sheet metal parts. They can decide on the correct usage of simulation tools (incremental FEA / 1-Step) at the right time. They know the importance of using virtual prototypes as well as physical prototypes close to production. They can interpret process layouts for progressive and transfer tools based on the manufacturing by deep drawing, hydroforming, press hardening and (fine-)blanking. They can explain the influence of different materials and lubricants on sheet metal forming processes.
Content	Material values which are relevant for the forming technology; stamping simulation with incremental and 1-step FEA; basic principles concerning tool layout, tool design, tooling and planned maintenance; Integration of the tooling process into the product development process.

Internet of Production	
Learning objective	The aim is to acquire and apply in-depth knowledge of digital technologies in the production environment, e.g. networking, simulation and analysis using digital tools. With a particular focus on the current industrial landscape, current trends are examined, analysed and discussed. Particular emphasis is placed here on the increased application of previously acquired knowledge to current issues relating to the Internet of Production. Through group work, students develop a work-oriented ability to cooperate and communicate. Students are encouraged to methodically analyse applications of data analysis and networked production and to develop relevant solutions. Students develop a professional self-image that qualifies them for professional work in an industrial environment.
Content	Components of the Internet of Production, case studies from manufacturing and production planning illustrating application scenarios for these components, tools for data processing and visualisation, assistance systems and agents, M2M communication, digital twins, machine learning.

Internet of Things	
Learning objective	Students achieve necessary expertise within two of the main aspects of cyber physical systems – communication and computation. Students understand how and why CPS technologies enabling new business models. Students understand which kind of communication technologies are used in cyber physical systems and how to choose the one which suits to a concrete task. The understand how the principles of cloud and edge computing are used within cyber physical systems.
Content	Business models for cyber physical systems, smart sensors, IoT radio technologies, IoT Frameworks and concepts, IoT communication protocols, cloud and edge computing in cyber physical systems.