

Faculty of Engineering - List of English lectures

Lectures may vary, and are not offered every semester.
Valid from Summer Semester 2024

English lectures are held in all study programs, and can be attended by all interested students. There are **Bachelor** and **Master** (may be visited by advanced Bachelor as well) lectures listed below. Unless explicitly stated otherwise, the lectures are offered in both summer and winter term.

Study programs offered by the Faculty of Engineering

ILIAS registrations are valid only for enrolled students. URL may change. In our university, it is not possible/necessary to register for classes. Registration is only necessary for exams. Registration period is announced in the academic calendar (approx. mid of semester). ILIAS links give access to the course materials and information about changes as well as for submitting assignments if necessary.

You can contact the Professor by sending him/her an Email. The addresses can be found on the top right search button at this webpage: <https://www.hs-heilbronn.de/en>

BACHELOR

Automotive Systems Engineering (ASE): No. 302... (SPO 2) and No. 304... (SPO 3)
 Electrical Systems Engineering (ESE): No. 194...(SPO 1)
 Mechanical Engineering (MB): No. 112... (SPO 2) and No. 114... (SPO 3)
 Mechatronics and Micro Systems Engineering (MM): No. 132 ...(SPO 2)
 Mechatronics and Robotics (MR): No. 134...(SPO 1)
 Manufacturing and Operations Management (PPM) No. 123...(SPO 2)
 Environmental and Process Engineering: (UP) No. 235... (SPO 1)

MASTER

Mechanical Engineering (MMA) No.115...(SPO 4)
 Mechatronics and Robotics (MME) No.135...(SPO 2)
 Electrical Systems Engineering (MES) No.265...(SPO 1)
 Automotive Systems Engineering (MAS) No. 305...(SPO 1)
 Technical Management (M.Sc.) (MTM) No. 320....(SPO 3)

Exam indicates the method of examination. LKBK = Various tests during semester; LL = practical exam in lab; LK = written exam; LR = oral presentation; LA = practical work; LM = oral exam, PK = inter-course exam, BTh= Bachelor Thesis

Disclaimer: Please note that the information in this list serves as a guide. For example, the titles of the subjects may differ slightly from your Transcript of Records due to translation differences. Please double-check the subjects' information on the online platform when creating your schedules and registering for your exams at the beginning of the semester.

Contact: te-international@hs-heilbronn.de

Bachelor (only in winter)	No.	ECTS	Exam	Instructor	Content
Basic Studies (1st Year)					
Programming 1	134531 194531	4	LK	Prof. Sarac-Heinz	<ul style="list-style-type: none"> History of Computers & Computer Science Basics of numeral systems Data types, constants and variables Control structures (if, if-else, switch-case, while, for etc.) Functions, Scoping rules, Array, structs

Introduction to Digital Systems	134533 194532	2	LK	Prof. Fischer	<ul style="list-style-type: none"> • Number systems • Boolean algebra • combinational circuits • optimization of combinational circuits • description, design and verification of sequential circuits
Robotics	134563	2	LK	Prof. Hufnagel, M.Eng. Manuel Schulz	<ul style="list-style-type: none"> • History and classification of the robots • Drives and alternative drives of industrial robots • Internal sensors • Industrial brakes • Kinematics basics • Supporting structure of robots • Control of industrial robots • Programming of robots
Main Studies (from 2nd year)					
Dynamic Image Processing ASE 3	304278	5	LK	Prof. Zoellner Prof. Stache	<ul style="list-style-type: none"> • Introduction to image processing • State and technology • Examples of use • System design and components (cameras, optics, lighting, computers) • Image acquisition (sampling, storage, encoding, data reduction, mathematical description) • Image preprocessing (image improvements, filters, restoration) • Image processing, segmentation • Feature extraction, classification • Motion estimation, depth estimation, stereo vision. Applications, boundary conditions, trends
Optical Engineering MR7 (Lectures 2 ECTS + Laboratory 3 ECTS)	134292	5	LA	Prof. Ott (upon individual appointment, please contact Prof. Ott)	<p>Lecture</p> <ul style="list-style-type: none"> • Basic Principles of Optics • Optical sensors • Radio- and Photometry • Optical imaging with lenses • Selected optical and opto-electronic systems <p>Laboratory:</p> <ul style="list-style-type: none"> • Simulation of an optical system with a Raytracing toolbox • Measuring photometric properties of an LED • Measuring the focal length and principal planes of an imaging lens • Measuring the contrast transfer function (MTF) <p>Please note: the lecture (2 ECTS) takes place as a block course in the week before the start of the lecture. The laboratory then takes place during the semester.</p>
Metal Forming Technologies (can only be taken in combination with 114152 "Spanende und Abtragende Fertigungsverfahren" in German)	114153	2	PK	Prof. Birkert	Teaching the fundamentals of metal forming manufacturing technologies in terms of materials and processes. Special emphasis is placed on conveying a fundamental understanding of the process.

Recycling Seminar UP	235304	2,5	LA	Prof. Kuntz	<ul style="list-style-type: none"> A topic on recycling is selected based on current publications, for example Li-ion batteries, electrical recycling, strategic raw materials, plastics recycling. Groups of 3-4 students each work on their own topic, and all participants also work on an individual topic. Kick-off, 2-3 coaching meetings and a final presentation are compulsory. Within the given topic and the basic question, the groups define their respective objectives and discuss these with the supervisor during the coaching sessions. Towards the end of the semester, the groups give their presentations. Individual tasks are completed in written form.
Bachelor (only in summer)	No.	ECTS	Exam	Instructor	Content
Basic Studies (1st Year)					
Programming 2	134532 194534	4	LK	Prof. Sarac-Heinz	<ul style="list-style-type: none"> Headers and libraries, how to define a header file Call by value/call by reference Pointers String functions Complex data types (e.g. structs) Linked lists (singly and doubly) Adding, removing, sorting for linked lists
Electrical Engineering 2	134542 194543	4	LK	Prof. Fischer	<ul style="list-style-type: none"> electrostatic field, stationary flow field, magnetic field, induction processes multi-phase systems transformators
Engineering Design 1 (can only be taken in combination with 134564 Technical Drawing in German/English)	134561 (134561 +134564 = 134567)	2	LA	Prof. Schillo	<ul style="list-style-type: none"> Basics in engineering design Product planning Teamwork Solving problems, finding solutions <u>Includes the participation in the construction competition</u>
Materials: Metals (can only be taken in combination with course "Materials: Plastics" 134572)	134571	2	PK	Prof. Wettlaufer	<ul style="list-style-type: none"> Basic Concepts of Physical metallurgy Heat treatment Iron and non-iron materials Deformation, plasticity Extraction and recycling Materials testing, failure analysis
Materials: Plastics (can only be taken in combination with course "Materials: Metals" 134571)	134572 (134572+134571 =134579)	2	PK	Prof. Gleiter	Plastic Materials <ul style="list-style-type: none"> polymer reactions structure of polymers mechanical behaviour applications
Engineering Mechanics 1	134551	4	LK	Prof. Rützel	<ul style="list-style-type: none"> Introduction (force and moment) Equilibrium of rigid bodies Determination of the center of mass Static and kinetic friction Internal forces and moments Stress and strain (plain stress, main stress, stress-strain diagram, influence of heat)
Main Studies (from 2nd year)					
Image Processing 2 ESE 6	194302	5	LA	Prof. Maier Option of Recognition:	Requires basic knowledge of computer vision <ul style="list-style-type: none"> local filters, blurring filters, edge filters, Bandpass filters, non-linear filters geometric objects Edge detection: Harris-Operator, Hough-Transformation: Line & circle detection

				<ul style="list-style-type: none"> • Computer and Robotic of Vision • Image Processing 2 (Please contact Prof. Maier)	<ul style="list-style-type: none"> • Segmentation, adaptive threshold detection, morphologic filter, object extraction • Object features, geometrical features with geometrical invariances, signature features, correlation methods
Technical cleanliness with laboratory	235323	2,5	LA	Prof. Mannschreck	<ul style="list-style-type: none"> • Technologies of industrial cleaning processes • Importance of technical cleanliness as a quality criteria within production processes • Methods of analysing contamination of parts. • Methods of measuring quality relevant process parameters with regard to technical cleanliness
Chemical Engineering Laboratory (UP) can only be taken with a proven chemical background)	235325	2,5	LA	Prof. Mannschreck	<ul style="list-style-type: none"> • Organic synthesis incl. processing of the product by recrystallization and distillation • Experimental determination of reaction kinetics • Calorimetric determination of reaction heats • Electrochemical experiments
Bachelor (Winter/Summer)	No.	ECTS	Exam	Instructor	Content
Multi-body Dynamics Simulation ASE 6	304281	5	LKBK	Prof. Leimbach	<ul style="list-style-type: none"> • Orientation of a rigid body in space (Bryant angles, Euler angles) • Cinematic differential equation of the angular velocities in space • Equations of motion of an unconstrained rigid body in space • Modeling of passive and active force elements • Equations of motion of unconstrained rigid body systems in space • Equations of motion of a constrained rigid body in space • Equations of motion of constrained rigid body systems in space • Modeling spatial joints
Powertrain ASE 6	304280	5	LK	Prof. Koch-Gröber	<ul style="list-style-type: none"> • Powertrain systems introduction, Vehicle driving conditions revisited • Test cycles, procedures, emission limits, immissions • Energy storage and conversion in batteries, fuel cells • Chemical reactions mass and energy balances, air to fuel ratio • Internal combustion engine operation basics: indication, mean pressures, combustion process features • Engine management such as Injections systems and functions, injectors • Hybrid vehicles, driving strategies, fuel and range economy
Laboratory Mechanical Systems	304284	5	LA	Prof. Leimbach	<ul style="list-style-type: none"> • Handling of commercial rigid body simulation software • Definition of coordinate systems • Entering of rigid bodies (inertia parameters, local coordinate systems) • Entering of force elements (passive, active components) • Definition and input of joints • Choice of suitable integration routines

					<ul style="list-style-type: none"> Output of the generated simulation results in time histories <p>Projects in groups of 2 or 3 students introducing a commercial simulation tool on simulation of hybrid powertrain operation within driving vehicle focusing on fuel consumption, result interpretation in short written report</p>
Laboratory Multi-Body-Systems	302223	3	LA / LK	Prof. Leimbach	<p>Laboratory Multi-Body-Systems:</p> <ul style="list-style-type: none"> Handling of commercial rigid body simulation software Definition of coordinate systems Entering of rigid bodies (inertia parameters, local coordinate systems) Entering of force elements (passive, active components) Definition and input of joints Choice of suitable integration routines Output of the generated simulation results in time histories
Laboratory Drive Train	302222	3	LA	Prof. Koch-Gröber	<p>Laboratory Drive Train:</p> <p>Projects in groups of 2 or 3 students introducing a commercial simulation tool on simulation of hybrid powertrain operation within driving vehicle focusing on fuel consumption, result interpretation in short written report</p>
Human Machine Interaction ASE 6, ASE 7	304277	2.5	LA	Prof. Meroth	<ul style="list-style-type: none"> Media technology Displays Audio Haptics Car-Multimedia Perception User Centered Design Process HMI Evaluation Media design Prototyping <p>(includes a team project)</p>
Microcontroller ASE 3	304132	3	LK BK	Prof. Meroth (on demand)	<ul style="list-style-type: none"> Architecture of Microcontrollers Programming in embedded C Digital and analog IO of the AVR family Interrupts of the AVR family Timers of the AVR family Serial communication (UART, SPI, TWI/I2C) <p>Lecture includes a project</p>
Automotive Embedded Systems ASE 6	304272	5	LK BK	Prof. Zoellner	<p>Students learn the principles and standards of realtime operation systems with focus on automotive systems. Further topic is the implementation of realtime functions on micro controller.</p> <p>Requires advanced C programming</p>
Laboratory electrical engineering ASE 6	304275	5	LL	Prof. Meroth	<p>Project work in a team with presentations. Requires project management knowledge, and programming and electronics skills. Contact the Prof.</p>
Modelling MR 6	134308	2,5	LK	Prof. Scholle	<ul style="list-style-type: none"> Introduction on PDE: historical overview, terms, definitions

					<ul style="list-style-type: none"> • Physical problem formulation: Nabla calculus, Continuum and Fluid Mechanics, Maxwell equations, Heat transport, associated boundary conditions • Mathematical problem formulation: Dimensional analysis, non-dimensional numbers, Potentials • Finite Differences: Formulation, Implementation with Python, Accuracy, Neumann boundary conditions, Stability analysis • Finite Elements: Variational Calculus, Given and Natural boundary conditions, Ritz's direct method, Implementation with Python, FEM
Digital Signal Processing MR 6	134682	2,5	LK	Prof. Ott (upon individual appointment)	<ul style="list-style-type: none"> • Continuous Signals und Systems: Fourier-Transform, Laplace-Transform (Repetition) • Sampled Systems and Signals, Z-Transform • Discrete Fourier-Transform • FIR-Filter • MATLAB-Examples
Internal Combustion Engines MB 4	114290	5	LK	Prof. Wittek	<ul style="list-style-type: none"> • The role of internal combustion engines for the decarbonizing of the transport sector • Regenerative fuels, H₂, Bio-ethanol, e-Fuels • 4-stroke working process, work diagram, stroke function, engine designs • Design and operating parameters • Ideal models for engine cycles • Combustion process in spark-ignition engines • Special aspects of hydrogen combustion • Gas exchange process • Engine mechanics and engine design
Term paper/ project MM6, ASE 6	302191 /304171 132221 / 134161	8	LA	Various, ask Prof. Meroth	This is a 200 hrs research project assigned in an actual research program upon individual contract. The project can be performed in a team and should be completed within one semester. The project includes a seminar presentation and a written report.
Mechatronic Systems Engineering	134273	2,5	LK	Prof. Schillo	<ul style="list-style-type: none"> • Introduction to mechatronics • Modelling of mechatronic systems • Sensors • Actuators • Electrical machines • Laser and material processing • Artificial Intelligence (NN, reinforcement learning) • Metaverse architecture and mechatronicalo devices • Micro Electro mechanical systems
Sustainable Product Design	134300	5	LA	Prof. Schillo	<ul style="list-style-type: none"> • Product development methodologies and Ecodesign • Methods for analysis of sustainability of products • Application of life cycle analysis of a certain product (e.g. gripper) • Redesign of the product using ecodesign methods
Model-Based Software Engineering	304274	5	Project	Prof. Tränkle	<ul style="list-style-type: none"> • Vehicle dynamics simulation • Motion control design including speed control, longitudinal position control, path following control

(For 6th Semester Students)					<ul style="list-style-type: none"> • C++ programming of ROS nodes for vehicle dynamics simulation and motion control • Working in project teams <p>Requires experiences in C++ programming, control theory, dynamical systems simulation</p>
Sustainability project week	235081	2,5	LA	Prof. Haas, Prof. Mannschreck	<ul style="list-style-type: none"> • Project work in teams on a given technical problem with special emphasis on sustainability aspects. • Knowledge from the Sustainability Live lecture is applied here in theory and practice. Literature survey, scientific discussions, organisation within the team, and presentation of results will be accompanied by the coaches.
Sustainability Live!	235082	2,5		Prof. Haas, Prof. Mannschreck	<ul style="list-style-type: none"> • Present environmental problems and topics • Political measures, international and national actors of sustainable development • Sustainability as a concept, strategies for sustainable development • Basics of life cycle analysis, application on technical systems • Basics of industrial ecology
Student Project (UP)	235316	5	LA	Various lecturers	A research project on a posted of self-chosen topic which is to be worked on individually. The project includes a written report.
Operations Management PPM 4	123201	5	LK	Prof. Patrick Balve	The lecture focuses on principles, methods, and tools of the lean manufacturing approach, but also touches on its various applications and benefits in other work areas. Reference is made to successful implementation strategies of lean against the background of general change management models. Specifically, the lecture deals with the following methods and tools: Eliminating Muda, Just-in-Time Production, Quick Machine Changeover, Value-Stream Mapping, Jidoka Concept, Stable and Standardised Processes, Continuous Improvement and Leadership.
Practice oriented module "Learning Factory" (Lernfabrik) PPM 6	123231	5, 7 or 15	LA	Prof. Patrick Balve et al.	<p>The Heilbronn Learning Factory is a large scale student project based on the problem-based teaching approach.</p> <p>The main objective of each Learning Factory course is the development and manufacturing of a roughly specified product within time and budget constraints. The product itself differs from semester to semester.</p> <p>The activities performed by the students cover a wide range of industrial-like activities starting with prototyping and design, covering production engineering issues as well as quality management, ending with parts manufacturing, product assembly, and packaging.</p> <p>On occasion of the project kick-off, students are asked to decide for their functional specialization. Due to the overall interdisciplinary character of the course, project supervision is carried out by a team of professors.</p> <p>Important information for exchange students: Please consult with the lead supervisor Prof. Balve to find out ahead of time if your individual knowledge level is suitable for the participation in the learning factory! Please be also aware that there is a series of scheduled dates throughout the semester with mandatory participation.</p>

Student Project (Projektarbeit) PPM 4	123181	5	LA	Various lecturers	The student project focuses on a posted or self-chosen topic which can be worked on individually or in a group of 2 to 3 students. The project should be completed within one semester term.
Applied Studies PPM7	123271	7,5	LA	Various lecturers	This project focuses on a posted or self-chosen academic topic which is to be worked on individually. The project should be completed within one semester term.
Bachelor Thesis UP PPM	123281 (PPM) 235902 (UP)	12	BTh	Various lecturers	The bachelor's thesis is preferably carried out at a manufacturing company based on a real-life engineering or manufacturing topic. While solving the respective assignment, the student demonstrates his or her ability to successfully apply engineering methods and knowledge. The thesis has to be completed within a timeframe of 4 months.
Colloquium to Bachelor Thesis UP PPM	123282 (PPM) 235903 (UP)	3	LR	Various lecturers	Presentation of Bachelor Thesis Content.
Student Project 123181 (PPM) Project Work 235316 (235316) UP PPM	123181 (PPM) 235316 (UP)	5 up to 12,5		On Demand Contact Prof. Pisinger for UP or Prof. Balve for PPM	Research project assigned in an actual research program upon individual contract. The project can be performed in a team and should be completed within one semester. The project includes a seminar presentation and a written report.
Master (only in winter)	No	ECTS	Exam	Instructor	(may be visited by advanced bachelor students as well)
Computer and Robot Vision MMA 2, MMR 2, MEL 2, MAS 2	115591 135441 265441 305482	5	LA	Prof. Maier	<ul style="list-style-type: none"> • Feature identification • Gauß-Laplace Pyramid • SIFT features • SURF and other features • Matching- Algorithms: Brute-Force-Matcher • Classification and machine learning: SVM, kmeans, etc. • 3D-Features and recognition processes, e.g: Kalman-Filter; temporal tracking, Algorithms for autonomous motion: SLAM-Algorithm, uv-Histogram
Exhaust (gas) treatment MMA 2, MMR 2, MEL 2, MAS 2	115541 135481 265481 305441	2,5	LK	Prof. Koch-Gröber	<ul style="list-style-type: none"> • Component and system functions of particulate filters and NOx-reduction by SCR and storage catalysts, gasoline 3-way-catalysts • Principles of exhaust gas legislation for the collaboration with system and motor developers • Basics of kinetics of chemical reactions and their catalysis • Basics of substrates and body characteristics •
Lab Exhaust Gas Treatment MMA1/2, MMR 1/2, MEL1/2, MAS 1/2	115604 135506 265503 305453	2,5	LA	Prof. Koch-Gröber	Applying commercial SW GT suite to system functions, incl. parameter variations Parallel or prior attendance of lecture EGT required

Autonomous Systems: Architecture and Planning MMA 2, MMR 2, MEL 2, MAS 2	115587 135490 265492 305445	2,5	LK BK	Prof. Zoellner	Introduction to autonomous systems architectures of autonomous systems Characteristics, strengths & weaknesses of different set-ups Planning
Digital Signal Processing and Pattern Recognition MMR 2, MEL 2, MAS 2	135497 265446 305450	5	LA	Prof. Stahl	Joint lecture with the following topics: speech recognition with hidden Markov models, maximum likelihood parameter estimation, sampling and aliasing, modulation, digital filters, fast Fourier transform, fast convolution
Autonomous Systems – Path Planning and Control MMA1/2, MMR 1/2, MEL1/2, MAS 1/2	115589 135445 265494 305447	5	LA	Prof. Traenkle	<ul style="list-style-type: none"> • Definition and classification of driver assistance systems and automated driving • Sensors for ADAS: complementary and concurrent measurement methods and signal processing • Longitudinal and lateral control • Trajectory planning and control <ul style="list-style-type: none"> • Requires knowledge in control theory and system dynamics simulation •
Heat Transmission	115556	5	LK BK	Dr.-Ing. Römisch	<ul style="list-style-type: none"> • Introduction and definitions • Heat conduction (stationary, geometrically one-dimensional) • Convective heat transfer (stationary, single-phase) • Determination of heat transfer coefficients • Transient heat transfer • Thermal radiation
Product Strategy and Brand Management	320212	4	LK	Annette Allweil	<ul style="list-style-type: none"> • Customer-Based Brand Equity Framework • Building Brand Equity • Measuring Brand Equity • Customer Analysis • Customer-Based Brand Equity • Integrated Marketing Communications •
Meeting Facilitation and Communication (To be taken in combination with 320262)	320261	2	LR	Prof. Patrick Balve	<ul style="list-style-type: none"> • Understanding the nuts and bolts of “meeting for results”. • Facilitating meetings in projects • Using the appropriate process tools • Preparing and running regular meetings as well as distinguished workshops in a virtual environment (for the time being, most exercises will be executed in the online team collaboration tool Miro). • Joint exam with intercultural Management Presentation at the end of the course.
Intercultural Management (To be taken in combination with 320261)	320262	2	LR	Prof. Rolf Blumentritt	<ul style="list-style-type: none"> • Comparative cross-cultural management • Corporate culture and employee behaviour • Managing workforce diversity • Global teams • International projects • Motivation and performance Management • Leadership styles • Negotiation in international context Presentation at the end of the course.
Selected Topics in Applied Research MMA1/2, MMR1/2, MEL1/2, MAS1/2	115610 135511 265509 305509	2,5	LK	Prof. Gleiter Prof. Niessner	Current research topics from various fields of the faculty. This includes, for example, 3D printing, flow simulation, surface technology etc.

Master (only in summer)	No	ECTS	Exam	Instructor	(may be visited by advanced bachelor students as well)
Advanced Suspension Systems MMA1/2, MMR1/2, MEL1/2, MAS1/2	115581 135483 265483 305442	2,5	LA	Prof. von Tardy-Tuch	<ul style="list-style-type: none"> • Material considerations • Kinematic suspension design • Dynamic suspension elements • Elastokinematic elements • Kinematic vehicle behavior • Kinematic suspension analysis
Industrial Processes in Materials Engineering MMA1/2, MMR1/2, MEL1/2, MAS1/2	115551 135504 265502 305502	2,5	LK	Prof. Wettlaufer	Typical product generation processes in Materials Engineering, such as simultaneous engineering, parallelization, project management in materials engineering, systematic materials selection, purchasing, development, manufacturing, acquisition, sales, standardization, specification
Lightweight Car Body Engineering MMA1/2, MMR1/2, MEL1/2, MAS1/2	115552 135508 265504 305504	2,5	LK	Prof. Birkert	<p>Basics car body structures and principle design concepts</p> <p>Requirements to the body and body components:</p> <ul style="list-style-type: none"> • dimensional requirements • structural requirements • surface/optical requirements • other functional requirements <p>Body components (structural components, outer skin)</p> <p>Lightweight aspects:</p> <ul style="list-style-type: none"> • lightweight body materials • lightweight design structures <p>Body development process</p> <p>Component production process</p> <p>Assembly processes and joining technologies</p> <p>Body quality aspects and measuring technologies</p>
Autonomous Systems: Perception and Situation understanding MMA1/2, MMR1/2, MEL1/2, MAS1/2	115590 135492 265495 305448	5	LA	Prof. Zoellner/ Prof. Stache	<ul style="list-style-type: none"> • Overview on Advanced Driver Assistance Systems and automated driving • Sensors for perception of environment • Calibration: sensors as measuring tools, Transformation of sensor data • Recording 3D data and movements • Object identification in sensor data • Object-Tracking
Autonomous Systems: Deep Learning MMA1/2, MMR1/2, MEL1/2, MAS1/2	115588 135491 265493 305446	5	LA	Prof. Stache	<ul style="list-style-type: none"> • Introduction to deep learning and differences to AI and machine learning • Tools for data processing • Convolutional Neural Networks (object recognition in images) • Recurrent neural networks (language recognition) • Generative adversarial networks

Optical Sensors (MMA1/2) (MMR1/2) (MEL1/2) (MAS1/2)	115607 135450 265453 305506	5	LA	Prof. Ott	<ul style="list-style-type: none"> • Systems Theory of Optical Imaging <ul style="list-style-type: none"> ○ Basics of diffraction ○ Discrete Fourier transform for simulating optical diffraction and imaging ○ MATLAB examples and assignments ○ Point spread function of optical imaging ○ Optical transfer function of optical imaging ○ Measurement methods of the transfer function ○ Lab experiment (measurement of the transfer function of a camera) • Optical Metrology for Production <ul style="list-style-type: none"> ○ Introduction in Metrology for Production ○ 2D camera metrology ○ Triangulation methods ○ Time-of-flight methods ○ Interferometry ○ Lab experiment (camera calibration)
International Sales Management	320234	2	LA	Prof. Rolf Blumentritt	<ul style="list-style-type: none"> • Basics of International Marketing • Basics of Industrial Goods Marketing • Position of global distribution • Success factors of global sales • Tasks and roles in the global distribution • Structure of global sales • Managing global sales • Requirements in intercultural surroundings • Qualification for global Distribution
Master (Winter/Summer)	No	ECTS		Instructor	(may be visited by advanced bachelor students as well)
Numerical Methods and Optimization MMA1/2, MMR1/2, MEL1/2, MAS1/2	135416 MMR; 265416 MEL; 305416 MAS; 115639 MMA	2,5	LA	Prof. Peter Ott	Numerical Methods: <ul style="list-style-type: none"> • Numerical Differentiation • Interpolation • B-Splines • Numerical Integration • Root Finding • Ordinary Differential Equations Optimization: <ul style="list-style-type: none"> • Linear Least-Square Problems • Nonlinear Least Square Problems • Learning Algorithm for Neural Networks
Design of Experiments MMA1/2, MMR1/2, MEL1/2, MAS1/2	115513 135413 265413 305413	2,5	LK	Prof. Pargmann	<ul style="list-style-type: none"> • Statistical analysis • Experimental methods • Factorial design of experiments • Optimisation of experiments
Engineering Project Duration: 2 Semesters	115650 305550	12,5		On Demand	<ul style="list-style-type: none"> • Research work in a lab Please contact the Faculty's International Office Coordinator