Faculty of Engineering - List of English lectures

Lectures may vary, and are not offered every semester.

Valid from Summer Semester 2027

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 adresses can be found on the top right search but-ton at this webpage **https://www.hs-heilbronn.de/en**

BACHELOR:
Automotive Systems Engineering (ASE): No. 302… (SPO 2), No. 304… (SPO 3), No. 610…(SPO4)
Electrical Systems Engineering (ESE): No. 194…(SPO 1), (SPO2), No. 605 (SPO2)
Artificial intelligence and industrial digitalization (KID) No. 608… (SPO1)
Mechanical Engineering (MB): No. 112… (SPO 2), No. 114… (SPO 3), No. 612… (SPO4)
Mechatronics and Robotics (MR): No. 134…(SPO 1), (SPO 2) No. 607…(SPO2)
Technical Management (TEM) No. 611…(SPO1)
Environmental and Process Engineering: (UP) No. 235… (SPO 1), No. 606…(SPO2)
Intelligent Mechatronic Systems No. 609…(SPO1)

MASTER:
Automotive Systems Engineering (MAS) No. 305…(SPO 1),
Electrical Systems Engineering (MEL) No.265…(SPO 1), No. 6155.. (SPO3)
Mechanical Engineering (MMA) No.115…(SPO 4), No. 6160..(SPO5)
Mechatronics and Robotics (MMR) No.135…(SPO 2), No. 6165..(SPO3)
Technical Management (TEM) No. 618…(SPO4)
Artificial intelligence and industrial digitalization (MKD) No. 617… (SPO1)
Applied Artificial Intelligence (MAAI) No. 176.. (SPO1)

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, LP = Portfolio examination

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.
*tbd = to be decided

Contact: **te-international@hs-heilbronn.de**

Degree	Level	Semester	Course	No.	ECTS	Exam	Instructor	Content
Bachelor	First Year	Winter	Engineering Design (IMS)	609260 (IMS)	5	LKBK	Prof. Dr.-Ing. M. Beck	- The drawing in technology - Standardization - Projection types - Surfaces and hardness - Fits and tolerances - Basic functions of a CAD system - Sketching and modeling with the help of features - Detailing and drawing derivation of individual parts and assembly modeling bill of materials - Fundamentals of design (design process, manufacturing processes) - Non-detachable connections (welding, soldering, gluing) - Detachable connections (bolts, pins, screws) - Other machine elements (springs)
Bachelor	First Year	Winter	Electrical Engineering and Electronics 1	607541 (MR)	5	LK	Prof. Dr. rer. nat.Tim Fischer	- Basic quantities of electrical engineering - Direct current circuits - Simple methods for network calculation and analysis - Electric field and capacitor - Magnetic field and coil - Applications of direct current technology
Bachelor	First Year	Summer	Electrical Engineering and Electronics 2	607551(MR) (in combination with 607552)	2,5	LK	Prof. Dr. rer. nat.Tim Fischer	- Switching operations in DC networks - Alternating current (AC) - Complex phasors - AC networks - Semiconductor elements
Bachelor	First Year	Summer	Lab Electrical Engineering	607552 (MR) (in combination with 607551)	2,5	LA	Prof. Dr. rer. nat.Tim Fischer	- Experiments in DC and AC engineering - Introduction to basic electronics (diodes, Transistors, OpAmps)
Bachelor	First Year	Summer	Materials: Plastics (can only be taken in combination with course “Materials: Metals” 607602) (MR2 English)	607601 / 134572 (MR)	2,5	PK	M.Eng J. Gramlich	- Plastic Materials - Polymer reactions - Structure of polymers - Mechanical behaviour - Applications

Degree	Level	Semester	Course	No.	ECTS	Exam	Instructor	Content
Bachelor	First Year	Summer	Engineering Mechanics 3 (IMS2 – English program) (from Summer 2026)	607592 (MR) 609092 (IMS)	2,5	LK	Prof. Dr.-Ing. Timo Hufnagel	Kinematics of a point: - Coordinate systems - Position vector, velocity, acceleration, motion diagrams Kinematics of rigid bodies: - Planar motion: pure translation, pure rotation - The instantaneous pole Fundamentals of kinetics: - Basic kinetic concepts: momentum, spin - Return to statics Law of conservation of momentum, law of conservation of angular momentum: - Plane moments of inertia - Moment of inertia when changing the reference system - Equations of motion for plane systems Law of conservation of energy
Bachelor	First Year	Winter	Programming 1 (MR1 English)	194531/ 605561 (ESE) 134531/ 607561 (MR)	5	LK	Prof. Dr. Ipek Sarac-Heinz	- 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
Bachelor	First Year	Summer	Programming 2 (MR2 English)	194534 / 605571 (ESE) 134532 / 607571 (MR)	5	LK	Prof. Dr. Ipek Sarac-Heinz	- 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
Bachelor	First Year	Winter	Engineering Mechanics 1 ((IMS1 – English Program)	607581 (MR), 609081	5	LK	Prof. Dr.-Ing. Georg von Tardy-Tuch	- 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)
Bachelor	First Year	Summer	Engineering Mechanics 2 (IMS2 – English program) (from Summer 2026)	607091 (MR)	2,5	LK	Prof. Dr.-Ing. Georg von Tardy-Tuch	Calculate internal stresses and the elastic deformations caused by them. We will expand on the knowledge gained in Engineering Mechanics I to include elastic but static systems. In addition to stresses and strains, this lecture will also cover beam bending.
Bachelor	First Year	Summer	Materials: Metals (can only be taken in combination with course “Materials: Plastics” 607601)	607602 / 134571 (MR)	2,5	PK	Prof. Dr.-Ing. Marc Wettlaufer	- Basic Concepts of Physical metallurgy - Heat treatment - Iron and non-iron materials - Deformation, plasticity - Extraction and recycling - Materials testing, failure analysis

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Bachelor	from second year	Winter / Summer	Lean Production TEM4	611241 (TEM)	5	LK	Prof. Dr.-Ing. Patrick Balve	The lecture focuses on the practical relevance and application of the principles and methods of the lean manufacturing approach. Specifically, the lecture will present about 20 very concrete methods that revolve around the following topics: - Identifying and eliminating waste (Muda) - Just-in-time production (Kanban) - Fast machine changeover (SMED), OEE - Value stream mapping and improvement - Zoning and 5S - Jidoka, quality and process stability through standardisation - Continuous improvement (Kaizen) and leadership Successful Lean implementation strategies are also discussed in the context of general change management models.
Bachelor	from second year	Winter	Metal Forming Technologies (can only be taken in combination with 114152 /612321 “Spanende und Abtragende Fertigungsverfahren” in German) (Umformende Fertigungsverfahren) (MB3)	612322	2,5	PK	Prof. Dr.-Ing. Dipl.-Wirt.-Ing. Arndt Birkert	- Fundamentals of the theory of plasticity (stresses and deformation) - Sheet metal forming processes: deep drawing, stretch forming, body forming - Solid forming processes: forging, extrusion - Cutting process shearing
Bachelor	from second year	Summer	Project Team Course: Sustainable Process Development (Basic knowledge process technology required)	606321	15	LP	Prof. Dr.-Ing. Jochen Haas,Prof. Dr.-Ing. Lutz BLecher	-Design of a chemical process plant - Material Flow analysis of alle process flows - Investment cost calculation -Life cycle analysis - Sustainable Process development scenarios - Determination of ecoefficiency
Bachelor	from first semester	Winter / Summer	Sustainability Project Week (can only be taken or chosen in combination with “Sustainability Live! 235082 / 606111”. Registration for 235081/ 606112 is done during the lecture of “Sustainability Live!” (Projektwoche Nachhaltigkeit)	235081 / 606112 (UP)	2,5	LA	Prof. Dr.-Ing. Jochen Haas, Prof. Dr. rer. nat. Katja Mannschreck	- Project work in teams on a given technical problem with special emphathis 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.
Bachelor	from first semester	Winter / Summer	Sustainability Live! (UP 1) (Nachhaltigkeit Life)	235082 / 606111 (UP)	2,5		Prof. Dr.-Ing. Jochen Haas, Prof. Dr. rer. nat. Katja Mannschreck	- 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

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Bachelor	from second year	Winter / Summer	Powertrain ASE 6 (Antriebsstrang)	304280 / 610701 (ASE)	5	LK	Prof. Dr.-Ing Hermann Koch-Groeber	- 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
Bachelor	from second year	Winter / Summer	Laboratory Powertrain (will be recognised as “Selected Topics ASE” / “Ausgewählte Kap. ASE) To take this, the attendance at “Powertrain“ Lecture 304280 above or equvalent is mandatory	304291 / 610714 (ASE)	2,5	LA	Prof. Dr.-Ing Hermann Koch-Groeber	- Laboratory Powertrain (Parallel or prior attendance of lecture PT or equivalent is mandatory) - Projects in groups of 2 or 3 students by simulation of a conventional and hybridized powertrain operation within various vehicle driving modes focusing on fuel consumption. - The result interpretation is to be turned in as a short written report, which is graded.
Bachelor	from second year	Winter	Microcontroller and Software Engineering” (IMS). Can only be taken in combination with “Microcontroller” and “Software Engineering”	609270 = 609271 + 609272 (IMS)	5	LA	Dr. Mihai Kocsis	- basic measurements in digital technology - digital technology tasks - serial interfaces (e.g., I2C, SPI, USART) in programs and diagnose errors (debugging), - interrupts (e.g., for timing, ADC, etc.) in programs, - time grids, loops, and branches - microcontroller datasheets - Software Development Processes - Unified Modeling Language (UML) - Design Patterns - Verification - Version Control
Bachelor	from second year	Summer	Image Processing 2 ESE 6 (Bild Verarbeitung 2)	194302 (ESE)	5	LA	Prof. Dr. rer. nat. Dieter Maier	Requires basic knowledge of computer vision - local filters, blurring filters, edge filters, Bandpass filters, non-linear filters geometric objects - Edge detection: Harris-Operator, Hough-Transformation: Line & circle detection - Segmentation, adaptive threshold detection, morphologic filter, object extraction - Object features, geometrical features with geometrical invariances, signature features, correlation methods
Bachelor	from second year	Summer	Laboratory Chemistry & Analytics (can only be taken with a proven chemical background) (Labor Chemie & Analytik)	606242 (UP)	2,5	LA	Prof. Dr. rer. nat. Katja Mannschreck	- Introduction to laboratory work with safety instruction; - Experiments from the fields of kinetics, reaction technology, chemical equilibrium, organic syntheses, chromatography & spectroscopy

Degree	Level	Semester	Course	No.	ECTS	Exam	Instructor	Content
Bachelor	from second year	Summer	Microcontroller and Networks ASE 3 (Mikrocontroller)	610301 (ASE)	5	LKBK	Prof. Dr.-Ing. Ansgar Meroth	- Microcontroller architectures - Instruction set and execution - Microcontroller peripherals - Programming in C and assembly language - Handling interrupts - Controlling sensors via bus systems and, in particular, the physical layer
Bachelor	from second year	Winter / Summer	Human Machine Interaction ASE 6, ASE 7	304277 (ASE)	2.5	LA	Prof. Dr.-Ing. Ansgar Meroth	- Media technology - Displays - Car-Multimedia - Perception - User Centered Design Process - HMI Evaluation - Media design - Prototyping (includes a team project)
Bachelor	from second year	Winter / Summer	Laboratory electrical engineering (Electronic Systems Lab) ASE 6 (Projekt Labor - Elektronische Systeme)	304275 / 610715 (ASE)	5	LL	Prof. Dr.-Ing. Ansgar Meroth, M.Eng. Pascal Keller	Project work in a team with presentations. Requires project management knowledge, and programming and electronics skills.
Bachelor	from second year	Summer	Computational Fluid Dynamics (CFD) 1	612703	5	LK	Prof. Dr.-Ing. Jennifer Niessner	- Overview of the range of applications for CFD - Conservation equations - Turbulence - RANS and turbulence models - Discretisation in space and time - Numerical solution - Error analysis - Post-processing, evaluation - Application to practical fluid dynamics tasks in mechanical engineering
Bachelor	from second year	Winter / Summer	Student Project 611331 (TEM 6) Project Work 235316 (Projektarbeit) UP TEM	611331 (TEM 6) 235316 (UP)	5 up to 12,5		On Demand Prof. Dr. Georg Pisinger for UP or Prof. Dr.-Ing. Patrick Balve for TEM	Research project assigned in a current research programme OR enginieering application project through individual contact. The project may be carried out in a team and should be completed within one semester. The project includes a seminar presentation and a written report.
Bachelor	from second year	Winter / Summer	Digital Signal Processing MR 6 (Digitale Signalverarbeitung)	134682 / 607282 (MR)	2,5	LK	Prof. Dr.-Ing. Peter Ott	- Continuous Signals und Systems: Fourier-Transform, Laplace-Transform (Repetition) - Sampled Systems and Signals, Z-Transform - Discrete Fourier-Transform - FIR-Filter - MATLAB-Examples

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Bachelor	from second year	Winter / Summer	Modelling MR 6 (Modellbildung)	134308 (MR)	2,5	LK	Prof. Dr. rer. nat. Markus Scholle	- Introduction on PDE: historical overview, terms, definitions - 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
Bachelor	from second year	Winter / Summer	Model-Based Software Engineering (ASE 6) (For 6th Semester Students) (Modellbasierte Softwareentwicklung)	304274 / 610713 (ASE)	5	LA	Prof. Dr.-Ing. Frank Tränkle	- Model-based software engineering process - Model-based design of digital control functions - Function and software modeling in MATLAB/Simulink - Middleware ROS2 for automated driving and robotics - Automated embedded code generation for ROS2 - Testing by vehicle dynamcis / robot simulation - Application and testing in lab project Mini-AutoDrive Requires experiences in MATLAB/Simulink, control theory, dynamical systems simulation
Bachelor	from second year	Winter / Summer	Term paper/ project MM6, ASE 6 (Seminararbeit / Projekt)	302191 (ASE) 304171 (ASE) 132221 134161 (MR)	8	LA	Various Professors	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.
Bachelor	from second year	Winter / Summer	Applied Studies TEM7 (Angewandte Studie)	123271 611381 (TEM)	7,5	LA	Various professors	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	from second year	Winter / Summer	Bachelor Thesis UP TEM ASE MR	611392 (TEM) 235902 (UP) 304261 (ASE) 134761 (MR)	12	BTh	Various professors	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. Bachelor theses can also be conducted in a lab of the university upon agreement with a professor.
Bachelor	from second year	Winter / Summer	Colloquium to Bachelor Thesis TEM (Kolloquium Bachelor Thesis) UP (Kolloquium)	611391 (TEM) 235903 (UP)	3	LR	Various professors	Presentation of Bachelor Thesis Content.

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Bachelor	from second year	Summer	Neuronale Netze & Deep Learning / Neural Networks & Deep Learning	608301	5	LKBK	Prof. Dr. Laura von Rueden	This lecture provides an introduction into Artificial Neural Networks and Deep Learning. It presents the foundation of Artifical Neural Networks and their training as well as established Deep Learning methods such as CNNs and Autodencoders. Prerequisites: - A basic understanding of Machine Learning (ML) (e.g. supervised vs. unsupervised learning) - An understanding of basic ML techniques such as Classification, Decision Trees, Regression and Clustering - First hands-on experience in ML using Python
Bachelor	from second year	Winter / Summer	Einführung in die KI / Introduction to AI	608281 (KID)	5	LKBK	Prof. Dr. rer. nat. Marco Wagner	This lecture gives an overview on different AI methods, both in theory and hands-on. No previous knowledge needed, Python skills are an advantage. - Introduction into Artificial Intelligence (AI) - Knowledge-based Systems - Data in AI - Introduction into Machine Learning - Decision Trees and Random Forests - Clustering - Regression - Classification - Intro to Neural Networks & Deep Learning Prerequisits: initial knowledge in Programming
Bachelor	from second year	Winter / Summer	Internal Combustion Engines MB 4 (Verbrennungsmotoren)	114290 / 612715 (MB)	5	LK	Prof. Dr.-Ing. Karsten Wittek	- 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 en-gines - Special aspects of hydrogen combustion - Gas exchange process - Engine mechanics and engine design
Bachelor	from second year	Summer	Industrial Internet of things 1 (IIoT Sys 1) MR1 TEST (In conjunction with double-degree program HHN-VGU) (IIoT1)	609281	5	LA	Prof. Dr.-Ing. Carsten Wittenberg	Network Technologies and Protocolls for Industrial Sensor and Actuator Networks
Bachelor	from second year	Winter / Summer	Automotive Embedded Systems ASE 6 (Embedded Systems im Kfz)	304272 / 610705 (ASE)	5	LKBK	Prof. Dr.-Ing. Raoul Daniel Zöllner	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. Requires advanced C programming

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Bachelor	from second year	Winter	Dynamic Image Processing ASE 3 (Dynamische Bildverarbeitung)	304278 (ASE)	5	LK	Prof. Dr.-Ing. Raoul Daniel Zöllner, Prof. Dr.-Ing. Nicolaj Stache	- 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
Bachelor	from third year	Winter	Sustainable Product Design (MR 6) (Nachhaltige Produktentwicklung)	607712	5	LA	Prof. Dr.-Ing. Sebastian Schillo	- 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
Master	all	Winter / Summer	Project Management Training	176121 (MAAI)	2,5	LA	Prof. Dr.-Ing. Patrick Balve	This course is not designed to be a stand-alone course, but rather to be combined with any student project. Students should have project management knowledge from previous lectures. The course then helps students deepen their proficiency in applying project management methods to their student project. The deliverables are a written report and a brief poster presentation.
Master	all	Winter	Computer Graphics and Multimedia	615460	5	LA	Prof. Dr.-Ing. Ansgar Meroth	3D rendering pipeline, graphics hardware, languages, modeling, unreal and unity, game engines
Master	from first semester	Winter	Designing with Composites	616956	5	LP	Prof. Dr.-Ing. Uwe Gleiter	Design and development of a fiber-reinforced composite structure for an annual design competition with changing project requirements. Documentation and presentation of results through a technical report and oral presentation.
Master	from first semester	Winter / Summer	Statistical methods	616401 616902 615902 615402	2,5	LK	Prof. Dr. rer. nat. Priska Jahnke	Introduction to regression analysis: - Probability distributions - Conditional probability distributions - Regression line and regression function - Estimation in the linear regression model
Master	from first semester	Winter / Summer	Advanced Additive Manufacturing MMA, MMR, MEL, MAS	616951	5	LK	Prof. Dr.-Ing. Sebastian Schillo	- Develop parts for additive manufacturing from ideas to the final product - Apply state of the art methods for engineering design and the use of lattice structures - Deep dive in the Laser powder bed fusion technology or liquid deposition modelling

Degree	Level	Semester	Course	No.	ECTS	Exam	Instructor	Content
Master	from second semester	Summer	Lightweight Car Body Engineering MMA, MMR, MEL, MAS	115552 135508 265504 305504 616459	2,5	LK	Prof. Dr.-Ing. Dipl.-Wirt.-Ing. Arndt Birkert	Basics car body structures and principle design concepts Requirements to the body and body components: - dimensional requirements - structural requirements - surface/optical requirements - other functional requirements Body components (structural components, outer skin) Lightweight aspects: - lightweight body materials - lightweight design structures Body development process Component production process Assembly processes and joining technologies Body quality aspects and measuring technologies
Master	from second semester	Winter	Ausgewählte Kapitel der Robotik – Roboterdynamik • Self-Paced Learning • No lectures in English • Slides can be provided in English on request • Supplementary video tutorials in English • Presentations by incoming students may be given in English	616969	5	LA	Prof. Dipl.-Ing. Andreas Hoch	- Rotationsmatrizen und Homogene Matrizen - Eulerwinkel - Koordinatensysteme nach Denavit- Hartenberg - Homogene Matrizen nach Denavit- Hartenberg - Vorwärtstransformation - Rückwärtstransformation - Entkoppelte Handachsen - Jacobimatrix
Master	from second semester	Winter	Seminar on Particles and Porous Media MMA, MMR, MEL, MAS	616463	2,5	LK	Prof. Dr.-Ing. Hermann Koch-Groeber, Prof. Dr.-Ing. Jennifer Niessner	Current research topics from various fields of the faculty. This includes, for example, 3D printing, flow simulation, surface technology etc.
Master	from second semester	Summer	Exhaust (gas) treatment MMA, MMR, MEL, MAS (Abgasnachbehandlung)	115541 135481 265481 305441 616451	2,5	LK	Prof. Dr.-Ing. Hermann Koch-Groeber	- Component and system functions of particu- late 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 devel- opers - Basics of kinetics of chemical reactions and their catalysis - Basics of substrates and body characteristics
Master	from second semester	Summer	Lab Exhaust Gas Treatment MMA, MMR, MEL, MAS (Labor Abgasnachbehandlung)	115604 135506 265503 305453 615467	2,5	LA	Prof. Dr.-Ing. Hermann Koch-Groeber	Parallel or prior attendance of lecture EGT required: Data from a RDE (real drive emission) vehicle test using a PEMS (portable emission measurement device) has to be analyzed thoroughly with special focus. The result interpretation is to be turned in as a short written report, which is graded Parallel or prior attendance of lecture EGT required.

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Master	from second semester	Winter	Machine Learning for Computer Vision MMA , MMR , MEL , MAS	115591 135441 265441 305482 615956	5	LA	Prof. Dr. rer. nat. Dieter Maier	- 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, Algo-rithms for autonomous motion: SLAM-Algorithm, uv-Histogram
Master	from second semester	Winter / Summer	Engineering Project MMA, MMR, MEL, MAS	616060 615560 615060 616560	15		On Demand	- Research work in a lab Please contact the Faculty's International Office Coordinator
Master	from second semester	Summer	Optical Sensors MMA, MMR, MEL, MAS (Optische Sensorik)	115607 135450 265453 305506 616963	5	LA	Prof. Dr.-Ing. Peter Ott	Systems Theory of Optical Imaging - 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 - Introduction in Metrology for Production - 2D camera metrology - Triangulation methods - Time- of- flight methods - Interferometry - Lab experiment (camera calibration)
Master	from second semester	Winter / Summer	Numerical Methods and Optimization MMR, MEL, MAS (Numerische Methoden / Optimierungsmethoden)	135416 (MMR) 265416 (MEL) 305416 (MAS) 616901 (MMR) 615901 (MEL) 615401 (MAS)	2,5	LA	Prof. Dr.-Ing. Peter Ott	Numerical Methods: - Numerical Differentiation - Interpolation - B- Splines - Numerical Integration - Root Finding - Ordinary Differential Equations Optimization: - Linear Least- Square Problems - Nonlinear Least Square Problems - Learning Algorithm for Neural Networks
Master	from second semester	Winter / Summer	Design of Experiments MMA2, MMR2, MEL2, MAS2	115513 135413 265413 305413 616402 616904 615904 615404	2,5	LK	Prof. Dr. rer. nat. Carsten Pargmann	- Statistical analysis - Experim1ntal methods - Factorial design of experiments - Optimisation of experiments

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Master	from second semester	Summer	Advanced Control Engineering	616974	2,5	LK	Prof. Dr. Ipek Sarac-Heinz	- Controllability and Observability - State Space Controllers - State Observers - Linear Quadratic Regulators
Master	from second semester	Summer	Advanced Modelling and Simulation (from Winter 2026 / Summer 2027) (IMS Master, MMA, MMR, MEL, MAS)	tbd	2,5	LA	Prof. Dr. rer. nat. Markus Scholle	- Mathematical foundations - Scalar, vector and tensor fields - Physical balance equations in fluid and solid mechanics, Maxwell equations - Dimensional analysis, non- dimensional numbers, similarity solutions - Potential fields, Green's function methods - Variational calculus of fields, Noether's theorem, second variation - Ritz's direct method - Numerical methods
Master	from second semester	Summer	Autonomous Systems: Deep Learning MMA, MMR, MEL, MAS	115588 135491 265493 305446 615457	5	LA	Prof. Dr.-Ing. Nicolaj Stache	- 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
Master	from second semester	Winter	Digital Signal Processing and Pattern Recognition MMR, MEL, MAS (Digitale Signalverarbeitung und Mustererkennung)	135497 265446 305450 615461	5	LA	Prof. Dr. Volker Stahl	Sampling and Aliasing, D/A Conversion, Modulation, Digital Filters, Fast Fourier Transform, Fast Convolution
Master	from second semester	Winter	Advanced Suspension Systems MMA, MMR, MEL, MAS	115581 135483 265483 305442 615452	2,5	LA	Prof. Dr.-Ing. Georg von Tardy-Tuch	- Material considerations - Kinematic suspension design - Dynamic suspension elements - Elastokinematic elements - Kinematic vehicle behavior - Kinematic suspension analysis
Master	from second semester	Winter	Autonomous Systems: Reinforcement Learning MMA, MMR, MEL, MAS	115589 135445 265494 305447 615459	5	LA	Prof. Dr.-Ing. Frank Tränkle	- Definition and classification of driver assistance systems and automated driv-ing - Sensors for ADAS: complementary and concurrent measurement methods and signal processing - Longitudinal and lateral control - Trajectory planning and control - Requires knowledge in control theory and system dynamics simulation

Degree	Level	Semester	Course	No.	ECTS	Exam	Instructor	Content
Master	from second semester	Winter	Embedded AI from WS 26/27	615463	5	LKBK	Prof. Dr. rer. nat. Marco Wagner	Advanced lecture on how to create AI algorithms for embedded Systems: - Model optimization and compression are important measures in order to allow efficient execution of neural networks, especially in resource-constrained embedded systems. - Furthermore, additional hardware elements and software frameworks for embedded AI are discussed, both in training and inference. Prerequisites: - Understanding of Machine Learning (ML) - Understanding Artifical Neural Networks and Deep Learning Models (e.g. CNNs, Autoencocer, …) - hands-on experience in ML using Python, C/C++ experience is beneficial
Master	from second semester	Summer	Industrial Processes in Materials Engineering MMA, MMR, MEL, MAS	115551 135504 265502 305502 616458	2,5	LK	Prof. Dr.-Ing. Marc 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
Master	from second semester	Winter	Autonomous Systems: Architecture and Planning MMA , MMR , MEL , MAS	115587 135490 265492 305445 615456	2,5	LKBK	Prof. Dr.-Ing. Raoul Daniel Zöllner	- Introduction to autonomous systems - Architectures of autonomous systems - Characteristics, strengths & weaknesses of different set-ups - Planning
Master	from second semester	Summer	Autonomous Systems: Perception and Situation understanding MMA, MMR, MEL, MAS	115590 135492 265495 305448 615458	5	LA	Prof. Dr.-Ing. Raoul Daniel Zöllner, M.Eng. Nico Hessenthaler	- 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
Master	from second semester, in principle from first semester	Summer, from SS2027	Selected Topics of Mathematics (Master Intelligent Mechatronic Systems (IMS))	615903	2,5	LK	Prof. Dr. rer. nat. Nikolas Akerblom	- Rotations in two and three dimensions (complex numbers, linear mappings, rotation matrices, quaternions) - Complex analysis and conformal mappings (complex numbers, complex functions, differentiation, integration, conformal mappings)
Master (Bachelor)	from second year	From Winter 2027/28	Sustainable Engineering	tbd	2,5	LA	Prof.-Dr.-Ing. Dirk Ringhand MBA	Sustainable Engineering combines technical, economical, social and environmental aspects within the product lifecycle. Main topics are: Fundamental elements of sustainable development, sustainable product development and production, design for „R“, materials selection and recycling, sustainable sourcing and management, technology and product assessment.