Name of module:	**Electronics, Sensors and Measurement Techniques**
Keywords:	Electronic Systems, Power Stages, Microcontrollers, Sensors, Actuators
Modulenumber:	**ASM 105**
Target group(s):	1. Semester ASM
ECTS-Credits:	7
Language of instruction:	english
Module owner:	Prof. Hermann Vetter

Extent of work (hours)

Workload	Contact hours	Self study	Exam preparation
210	105	75	30

Prerequisites:	- fundamentals of electrical engineering including Ohm's law, Kirchhoff's laws, law of induction - fundamentals of electronic components including capacitors, coils, diodes - basics of programming language C
Total target:	- ability to understand basis functions of electronic systems - ability to evaluate interfaces for sensors - ability to evaluate power stages for inductive loads - ability to apply microcontrollers for basic embedded systems - ability to understand analogue and digital acquisition with sensors
Module content:	- terminology in electronic systems, principal mode of operation, block diagram, ECU technology, circuit design of interfaces, bipolar transistors and MOSFET, power stages for automotive applications, hardware and basic programming of microcontrollers - power stages for inductive loads, programming of an 8-bit microcontroller - analogue and digital acquisition with automotive sensor examples - experiment with three-phase asynchronous motor

Reference material:	• Bosch: Automotive Handbook. Wiley • Infineon: C515C, 8-Bit CMOS Microcontroller • Ronald Jurgen: Automotive Electronics Handbook, McGraw Hill
Offered:	Winter term only

Submodules and assessment

Title of submodule	**Electronic Systems**
Type of instruction / form of learning:	Lecture
ECTS-Credits:	3
Hours per week:	3
Aims, learning outcomes:	• to become familiar with electronic systems for vehicles • to become familiar with basic functions and technology of electronic control units • to understand the basic function of sensor interfaces • to understand the basic function of power stages for inductive loads • to become familiar with 8-Bit Microcontrollers
Type of assessment:	final written examination part I: 60 min

Title of submodule	**Sensors and Measurement Technology**
Type of instruction / form of learning:	Lecture
ECTS-Credits:	3
Hours per week:	3
Aims, learning outcomes:	Automotive Sensor Examples, Analogue and Digital Signal Acquisition and Transmission - Resistive, Capacitive and Inductive based Sensors with linear transfer Characteristics - Analogue Signal Acquisition with Operational Amplifier Circuits basics, analysis of OA Circuits, selected examples of basic circuits (Amplifier, Integrator, Adder, Sign Switch, Comparator and Schmitt Trigger) - Digital Signal Acquisition, Theory of Digital to Analog and Analog to Digital Conversion, DAC principles, ADC circuits (Parallel, Successive Approximation, Voltage and Charge integrating circuitries) - Examples of Automotive Sensor Circuits (Temperature, Pressure, Humidity, Force, etc.)
Type of assessment:	final written examination part II: 60 min

Title of submodule	**Lab Actuators**
Type of instruction / form of learning:	Laboratory
ECTS-Credits:	1
Hours per week:	1
Aims, learning outcomes:	• Experiment: Investigations about three-phase asynchronous motor on system voltage and with frequency converter.
Type of assessment:	Lab report