Name of module:	Simulation and Control 1
Keywords:	Repet. Classical Control Theory; Modeling and Simulation of Control-Loops in MATLAB/SIMULINK; Fuzzy Control, State Machines as Controllers, Modern Control Theory (State Space Control)
Modulenumber:	**ASM 103**
Target group(s):	1. Semester ASM
ECTS-Credits:	8
Language of instruction:	english
Module owner:	Prof. Dr.-Ing. Hermann Kull

Extent of work (hours)

Workload	Contact hours	Self study	Exam preparation
240	120	90	30

Prerequisites:	• Knowledge in a Simulation Language (e.g. MATLAB/Simulation) • Basic knowledge in Control Theory (Transferfunctions, LaPlace)
Total target:	• Ability to understand the structure of SISO control loops (single in / single out). • To handle heavy to control systems by a Fuzzy Governor • Be prepared to design a State Space Controller
Module content:	1. **Basic Control** • Transferfunctions and Blockdiagrams • Stability and Frequency Response • Computer-aided Control (MATLAB/SIMULINK) • PID-Rules (e.g. Reswick) • Systematic Modeling • System Identification 2. **Advanced Control** • State Space Design of Regulator Systems • Observer • Digital Control / Discrete State Space Design • Optimization • Fuzzy Control • State Machines (FSM) 3. **Lab** • Projects in Fuzzy Design, FSM Design and State Space Controller Design

Reference material:	• J Ogata: Modern Control Engineering • Moktari: Engineering Applications in Process Control, Fuzzy Control,
Offered:	Winter term only

Submodules and assessment

Title of submodule	**Lecture: Basic Control**
Type of instruction / form of learning:	Lecture
ECTS-Credits:	3
Hours per week:	3
Aims, learning outcomes:	• To understand the classical control design (PID) • To model (incl. normalization and linearization) and to simulate Control loops with MATLAB / SIMULINK
	final written examination part I: 50 min

Title of submodule	**Lecture: Advanced Control**
Type of instruction / form of learning:	Lecture
ECTS-Credits:	3
Hours per week:	3
Aims, learning outcomes:	• To know the structure of Fuzzy and State Space Controller incl. State Machines • Be able to analyze and to design Fuzzy Controller processes • Be able to analyze and to design State Space Controller processes
	final written examination part II: 70 min

Title of submodule	**Lab: Classical and Modern Control Design**
Type of instruction / form of learning:	Lab
ECTS-Credits:	2
Hours per week:	2
Aims, learning outcomes:	• To handle and elaborate PID-, Fuzzy- and State Space Controller applications
Type of assessment:	Lab report