Signals & Systems I

Module Code	Workload	Credits	Semester	Frequency of Module	Duration
	180 hrs.	6	1	Only winter semester	1 Semester

1	Module Components	Teaching Language	Contact Hours	Self Study	Class Size
	a) Advanced Control	a) English	a) 67,5 hrs.	a) 112,5 hrs.	a) 24

2 Learning Outcomes

After successful participation in the module the student

Knowledge (1)
... knows the state space models, including state space feedback and Lueneberger observer
... knows the systemtheoretical description of linear timeinvariant systems

Comprehension (2)
... can explain the different feedback methods (classical and state space)

Application (3)
... can solve feedback systems
... can apply the knowledge to practical systems

Analysis (4)
... is able to calculate feedback models by means of simulations
... can break down practical feedback questions to linear time invariant models
... is able to analyse state space models by mathematical descriptions

Synthesis (5)
... is able to design feedback systems by means of root loci technique and state space feedback, including Lueneberger observer and parameter identification

Evaluation (6)
... can compare and criticise different solution approaches of control systems and decide optimal solutions

3 Individual Component Content

a) "Advanced Control" consists of a lecture and an integrated lab.

Lecture

- Description of dynamic systems
- Time continuous/time discrete systems
- Modelling

	- Numerical and analytical methods - State space models - Root locus method - State Space Feedback - Observer - Dynamic state space feedback - Technical realization - Application in MEMS Lab-Work Parallel to the lecture is an integrated lab-work with topics fitting to the lecture. Based on Matlab/Simulink the students get an introduction to this tool, model linear time invariant systems, root loci technique and state space systems, state space feedback and observer included.
4	**Teaching Methods** a) Lecture / Practical
5	**Prerequisites** Mathematics (Linear Algebra, Analysis, Complex numbers). Physics (Basics in Mechanics and Electrical Theory), Basics of System Theory will be good.
6	**Methods of Assessment** a) Graded Assessment 1K (Written Exam) (6 LP insgesamt für alle Teilprüfungsleistung dieser Lehrveranstaltung) a) Non Graded Assessment 1sbL (Laboratory)
7	**Applicability of Module** Smart Systems M.Sc. (SMA)
8	**Person Responsible for Module** Prof. Dr. Robert Hoenl (Module Responsible)

9 Reading List (Core Texts and Recommended Texts)

a) Franklin, Gene F.; Powell, J. David; Emami-Naeini, Abbas: Feedback control of dynamic systems, 7. ed., global ed., Pearson 2015

Levine William S. (ed): The control handbook, IEEE 1996 0-8493-8570-9, HFU Lib RA 533

Croft A., Davidson R., Hargraves M.: Engineering mathematics: A modern foundation for electronics, electrical and control engineers, AddisonWesley 1992, HFU Lib RA 502

Eveleigh, Virgil W.: Introduction to control system design, McGraw Hill 1972, HFU Lib RL 179

Nise, Norman S.: Control Systems Engineering, John Wiley & Sons Inc. 2000

Hönl R.: Lecture notes