

Course Manual ZR

State Space Control

Version: 1 | Last Change: 29.09.2019 10:42 | Draft: 0 | Status: vom verantwortlichen Dozent freigegeben

– General information

Long name State Space Control

Approving CModule ZR_MaET

Responsible Prof. Dr. Norbert Große
Professor Fakultät IME

Valid from winter semester
2020/21

Level Master

Semester in the year winter semester

Duration Semester

Hours in self-study 78

ECTS 5

Professors Prof. Dr. Norbert Große
Professor Fakultät IME

Requirements Basics of control
engineering
differential equations,
Laplace transformation,
frequency domain;
Matrix calculation

Language German

Separate final exam Yes

Literature

Taschenbuch der praktischen Regelungstechnik,
Große, Schorn, Hanser Verlag

Final exam

Details Written exam, similar to
the exercises; Support
by means of matrix
calculation software
Scilab. Comprehension
questions.

Minimum standard Achieving half of the
possible points

Exam Type EN Klausur

– Lecture / Exercises

Learning goals

Goal type	Description
Knowledge	Sampling, quantization describe
Knowledge	describe time-discrete systems in the time domain
Knowledge	Describe time-discrete systems in the frequency domain
Knowledge	Analyze the stability and position of the poles of the transfer function
Knowledge	state space description of a system Describe time-continuously Describe time-discretely
Knowledge	Transform to normal forms
Knowledge	Determine stability, controllability, observability
Knowledge	Design state space controller according to pole assignment
Knowledge	Design optimal state space controller
Knowledge	Prefilter and noise compensation design
Knowledge	Design of observers with pole placement
Knowledge	Design of optimal observers
Skills	Create models from a physical perspective
Skills	Select suitable state variables
Skills	Perform simulation of dynamic systems

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2

Special requirements

Basics Control Engineering from Bachelor

Accompanying material Script for the lecture, Exercise Collection, Math tools for matrix calculation (Scilab), spreadsheet software (Excel)

Separate exam Yes

Separate exam

Exam Type EN Übungsaufgabe mit fachlich / methodisch eingeschränktem Fokus unter Klausurbedingungen lösen

Details Exam with tasks to be calculated, use of the software Scilab; comprehension questions

Minimum standard Achieving half of the possible points

Exercises (whole course)	1
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Exercises (shared course)	0
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Tutorial (voluntary)	0
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– Practical training

Learning goals

Goal type	Description
Skills	Use spreadsheet programs for difference equations
Skills	Use matrix calculation programs
Skills	Perform simulation of dynamic systems
Skills	Review design of complex dynamic systems

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Practical training	1
Tutorial (voluntary)	0

Special requirements

Basics Control Engineering from Bachelor

Accompanying material Script for the lecture, Exercise Collection, Math tools for matrix calculation (Scilab), Spreadsheet (Excel)

Separate exam Yes

Separate exam

Exam Type EN Übungsaufgabe mit fachlich / methodisch eingeschränktem Fokus lösen

Details Face-to-face and self-learning exercises; edit two larger tasks using spreadsheet software and Scilab; create a documentation for this

Minimum standard error-free solving of the two specified tasks