

Module Handbook (<https://modhb.uni-kl.de/>)

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Module EIT-LRS-505-M-7

Nonlinear and Adaptive Control (M, 5.0 LP)

Module Identification

Module Number	Module Name	CP (Effort)
EIT-LRS-505-M-7	<i>Nonlinear and Adaptive Control</i>	5.0 CP (150 h)

Basedata

CP, Effort	5.0 CP = 150 h
Position of the semester	1 Sem. in SuSe
Level	[7] Master (Advanced)
Language	[EN] English
Module Manager	Liu, Steven, Prof. Dr.-Ing. (PROF DEPT: EIT) (/staff/345/)
Lecturers	Liu, Steven, Prof. Dr.-Ing. (PROF DEPT: EIT) (/staff/345/)
Area of study	[EIT-LRS] Control Systems
Reference course of study	[EIT-88.781-SG#2010] M.Sc. Electrical and Computer Engineering [2010] (/mhb/FB-EIT/cos-556/)
Lifecycle-State	[NORM] Active

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
4V	EIT-LRS-505-K-7 (/mhb/courses/EIT-LRS-505-K-7/)	P	-	PL1	5.0	SuSe

- About [EIT-LRS-505-K-7]: Title: "Nonlinear and Adaptive Control"; Presence-Time: 56 h; Self-Study: 94 h

Examination achievement PL1

- Form of examination: **written exam (Klausur) (180 Min.)**
- Examination Frequency: each semester

Evaluation of grades

The grade of the module examination is also the module grade.

Contents

From [EIT-LRS-505-K-7] **Nonlinear and Adaptive Control** (/mhb/courses/EIT-LRS-505-K-7/):

- System analysis using describing function, Popov and circle criterion
- Stability analysis according to Lyapunov and hyperstability
- Concept of state linearization and zero dynamics
- Flatness based control
- Sliding Mode Control and Integral Backstepping
- Adaptive control concepts
- Model Reference Adaptive Control

Competencies / intended learning achievements

After completing this module you can...

- ... analyze simple nonlinear dynamic systems.
- ... explain classical stability concepts for nonlinear systems.
- ... explain and apply the most important synthesis methods for the design of nonlinear controllers.
- ... explain differential geometric and differential algebraic methods for system analysis and their application to nonlinear systems.
- ... explain the concept of sliding mode and backstepping control.
- ... explain the most important applications of non-linear control.
- ... list and explain concepts of adaptive control and structure of Model-Reference-Adaptive-Control.

Requirements for attendance (informal)

Modules:

- [EIT-LRS-504-M-3] Linear Control (M, 5.0 LP) (/mhb/modules/EIT-LRS-504-M-3/)

Requirements for attendance (formal)

None

References to Module / Module Number [EIT-LRS-505-M-7]

Course of Study	Section	Choice/Obligation
[EIT-88.781-SG#2010] M.Sc. Electrical and Computer Engineering [2010] (/mhb/FB-EIT/cos-556/)	Theoretical Part	[P] Compulsory
[EIT-88.781-SG#2010] M.Sc. Electrical and Computer Engineering [2010] (/mhb/FB-EIT/cos-556/)	Theoretical Part	[P] Compulsory
[EIT-88.?-SG#2021] M.Sc. Electrical and Computer Engineering [2021] (/mhb/FB-EIT/cos-686/)	Major Automation & Control (AUT)	[P] Compulsory
[EIT-88.?-SG#2021] M.Sc. Electrical and Computer Engineering [2021] (/mhb/FB-EIT/cos-686/)	Major Mechatronics (MET)	[P] Compulsory
[EIT-88.A20-SG#2021] M.Sc. European Master in Embedded Computing Systems (EMECS) [2021] (/mhb/FB-EIT/cos-566/)	Elective Subjects	[W] Elective Module
[EIT-88.?-SG#2021] M.Sc. Automation and Control (A&C) [2021] (/mhb/FB-EIT/cos-676/)	A&C Core Courses	[P] Compulsory
[EIT-88.?-SG#2021] M.Sc. Embedded Computing Systems (ESY) [2021] (/mhb/FB-EIT/cos-677/)	Elective Subjects	[W] Elective Module