

Modul Flatness-Based Control					Abk. FS
Studiensem. 1,3	Regelstudiensem. 1	Turnus Every year	Dauer 1 Semester	SWS 2+1	ECTS-Punkte 4

Modulverantwortliche/r	Prof. Dr.-Ing. habil. Joachim Rudolph		
Dozent/inn/en	Prof. Dr.-Ing. habil. Joachim Rudolph		
Zuordnung zum Curriculum	Master Systems Engineering		
Zulassungsvoraussetzungen	No formal requirements		
Leistungskontrollen / Prüfungen	Oral or written exam		
Lehrveranstaltungen / SWS	2 SWS lecture, 1 SWS tutorial		
Arbeitsaufwand	Lecture + Tutorial for 15 weeks	45 h	
	Personal studies	60 h	
	Preparation for the exam	15 h	
		= 120 h	
Modulnote	Result of the exam		

Lernziele/Kompetenzen

Students are able to analyze and to control technological processes modeled as either linear or nonlinear finite-dimensional systems using flatness-based approaches.

Inhalt

A detailed introduction to flatness-based trajectory-tracking control with nonlinear finite-dimensional systems is given. Numerous technological examples illustrate the methods discussed. Specifically, these comprise a nonholonomic car, a gantry crane, electric motors, chemical reactors, a planar vtol aircraft, and several more.

- Why should we use flatness-based trajectory tracking control?
- Flat systems definition, inputs, states, flatness in linear systems
- Flatness-based open-loop control: equilibria, trajectory planning, feedforward control
- Feedback control: state feedback, exact feedback linearization, stabilization
- Observers for state estimation
- Conditions for flatness, defect, and orbital flatness

Weitere Informationen:	For current information, see homepage of Prof. Rudolph
Unterrichtssprache:	English (German if all students agree)
Literaturhinweise:	J. Rudolph, Flatness-Based Control, Shaker Verlag, Düren, 2021.

Exercises and detailed solutions, partly comprising digital simulations, are provided in the tutorial.
This course is equivalent to the former „Systemtheorie und Regelungstechnik 3“, which it replaces.