

Module Handbook

TUK MODHB Homepage

Notes on the module handbook of the department Mechanical and Process Engineering

Die hier dargestellten veröffentlichten Studiengang-, Modul- und Kursdaten des Fachbereichs Maschinenbau und Verfahrenstechnik ersetzen die Modulbeschreibungen im KIS und wurden mit Ausnahme folgender Studiengänge am 28.10.2020, bzw. am 13.01.2021 verabschiedet.

Ausnahmen:

- BEd. Lehramt Metalltechnik (Stand WS 19/20): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Bachelor_Lehramt_Metalltechnik.pdf
- MEd. Lehramt Metalltechnik Werkstoffe und Fertigung (Stand WS 19/20): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Master_Lehramt_Metalltechnik_-_Werkstoffe_und_Fertigung.pdf
- MEd. Lehramt Metalltechnik Maschinen- und Fahrzeugtechnik (Stand WS 19/20): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Master_Lehramt_Metalltechnik_-_Fahrzeugtechnik.pdf
- MEd. Lehramt Metalltechnik Verfahrenstechnik (Stand WS 19/20): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Master_Lehramt_Metalltechnik_-_Verfahrenstechnik.pdf

Module MV-MEC-M169-M-4

Hybrid and discrete-event dynamical systems (M, 5.0 LP)

Module Identification

Module Number	Module Name	CP (Effort)
MV-MEC-M169-M-4	<i>Hybrid and discrete-event dynamical systems</i>	5.0 CP (150 h)

Basedata

CP, Effort	5.0 CP = 150 h
Position of the semester	1 Sem. in WiSe
Level	[4] Bachelor (Specialization)
Language	[EN] English
Module Manager	Bajcinca, Naim, Prof. Dr.-Ing. (PROF DEPT: MV)
Lecturers	Bajcinca, Naim, Prof. Dr.-Ing. (PROF DEPT: MV)
Area of study	[MV-MEC] Mechatronics in Mechanical and Automotive Engineering
Reference course of study	[MV-88.235-SG] M.Sc. Vehicle Engineering
Lifecycle-State	[NORM] Active

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V+1U	MV-MEC-86691-K-4	P	-	PL1	5.0	WiSe

- About **[MV-MEC-86691-K-4]**: Title: "Hybrid and discrete-event dynamical systems"; Presence-Time: 42 h; Self-Study: 108 h

Examination achievement PL1

- Form of examination: **oral examination (30-45 Min.)**
- Examination Frequency: each semester
- Examination number: 10175 ("Hybrid and discrete-event dynamical systems")

Evaluation of grades

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

Contents

From **[MV-MEC-86691-K-4] Hybrid and discrete-event dynamical systems:**

- Systems and realizations;
- Finite systems, Discrete automata and Petri nets;
- Supervisory control;
- Infinite systems, Hybrid automata and Petrinets;
- Reachability;
- (Bi-)Simulation, Control and verification;
- Algebraic and Symbolic approaches;
- Special system classes: Timed automata, Max-Plus Algebra, Mixed logic dynamics;
- Switching systems.

Competencies / intended learning achievements

From **[MV-MEC-86691-K-4] Hybrid and discrete-event dynamical systems:**

1. Lecture:

Hybrid systems form the frontier between continuous and discrete-event dynamical systems. Most processes in systems biology, information and communication technology, as well as industrial automation technology, process engineering, manufacturing, logistics, etc., exhibit a hybrid nature. The description of complex technical systems and decision processes underlies hybrid control theory, which is characterized by a coupling of time- and event-driven mechanisms or continuous and discrete state spaces. The resulting dynamic behaviour patterns are conceivably rich. The lecture teaches basic concepts and mathematical tools for the analysis and synthesis of such dynamical effects and systems, which still form a research focus of control theory after more than three decades of research.

2. Exercise:

Students will be able to understand the concepts of modelling and design methodology using simple examples.

Literature

From [MV-MEC-86691-K-4] Hybrid and discrete-event dynamical systems:

- Lunze, J.: "Ereignisdiskrete Systeme: Modellierung und Analyse dynamischer Systeme mit Automaten, Markovketten und Petrinetzen". Oldenburg Wissenschaftsverlag, 2006.
- John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman: "Introduction to Automata Theory, Languages, and Computation". Addison Wesley Pub Co Inc, 2006.
- Tabuada, P.: "Verification and Control of Hybrid Systems". Springer, 2009.
- Cassandras, C.; Lafortune, S.: "Introduction to Discrete Event Systems". Springer, 2008.
- Goebel, R.; Sanfelice, R.G.; Teel, A.R.: "Hybrid Dynamical Systems". Princeton University Press, 2012.
- Lunze, J.; Lamnabhi-Lagarrigue, F. (Eds.): "Handbook of Hybrid Systems Control: Theory, Tools, Applications". 2009.

Requirements for attendance of the module (informal)

Advanced mathematics lectures

Requirements for attendance of the module (formal)

None

References to Module / Module Number [MV-MEC-M169-M-4]

Module-Pool	Name
[EIT-AC-MSC-TW-MPOOL-7]	General Elective Modules Master A&C
[MV-ALLG-2022-MPOOL-6]	Wahlpflichtmodule Master allgemein 2022
[MV-ALL-MPOOL-6]	Wahlpflichtmodule allgemein
[MV-BioVT-MPOOL-6]	Wahlpflichtmodule Bioverfahrenstechnik
[MV-EVT-2022-MPOOL-6]	Wahlpflichtmodule M.Sc. EVT 2022
[MV-EVT-MPOOL-6]	Wahlpflichtmodule Energie- und Verfahrenstechnik
[MV-FT-2022-MPOOL-6]	Wahlpflichtmodule M.Sc. Fahrzeugtechnik 2022
[MV-FT-MPOOL-6]	Wahlpflichtmodule Fahrzeugtechnik
[MV-MB-INF-2022-MPOOL-6]	Wahlpflichtmodule M.Sc. Maschinenbau mit angewandter Informatik 2022
[MV-MBINFO-MPOOL-6]	Wahlpflichtmodule Maschinenbau mit angewandter Informatik
[MV-MV-SIAK-DT-CSIT-MPOOL-6]	SIAK Zertifikat "Digitale Transformation" - Module MV "Computer Science & IT"