

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

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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 verabschiedet.

Ausnahmen:

- BSc. Bio- und Chemieingenieurwissenschaften (Stand WS 20/21): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MH_BSc_BCI.pdf (https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MH_BSc_BCI.pdf)
- BEd. Lehramt Metalltechnik (Stand WS 19/20): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Bachelor_Lehramt_Metalltechnik.pdf (https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Bachelor_Lehramt_Metalltechnik.pdf)
- MSc. Bio- und Chemieingenieurwissenschaften (Stand WS 20/21): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MH_Msc_BCI.pdf (https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MH_Msc_BCI.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 (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 (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 (https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Master_Lehramt_Metalltechnik_-_Verfahrenstechnik.pdf)

Module MV-MTS-M171-M-7

Analog and digital measuring signal processing (M, 4.0 LP)

Module Identification

Module Number	Module Name	CP (Effort)
MV-MTS-M171-M-7	<i>Analog and digital measuring signal processing</i>	4.0 CP (120 h)

Basedata

CP, Effort	4.0 CP = 120 h
Position of the semester	1 Sem. in WiSe
Level	[7] Master (Advanced)
Language	[DE] German
Module Manager	Seewig, Jörg, Prof. Dr.-Ing. (PROF DEPT: MV) (/staff/326/)
Lecturers	Eifler, Matthias, Dr.-Ing. habil. (WMA DEPT: MV) (/staff/287/)
Area of study	[MV-MTS] Measurement and Sensor Technology
Lifecycle-State	[NORM] Active

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V+1U	MV-MTS-86610-K-7 (/mhb/courses/MV-MTS-86610-K-7/)	P	-	PL1	4.0	WiSe

- About **[MV-MTS-86610-K-7]**: Title: "Analog and digital measuring signal processing"; Presence-Time: 42 h; Self-Study: 78 h

Examination achievement PL1

- Form of examination: **written or oral examination**
- Examination Frequency: each semester
- Examination number: 10324 ("Analogue and digital measuring signal treatment")

written (90-120 minutes) or oral (15-30 minutes) examination

Evaluation of grades

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

Contents

From **[MV-MTS-86610-K-7] Analog and digital measuring signal processing** (/mhb/courses/MV-MTS-86610-K-7/):

1. Introduction and terminology: signal terms, types and categories of signals, description of analog and digital measurement signals in the time range, signal description with basic functions, sequences
2. Description of analog signals in the frequency range: Fourier series, Fourier transformation, autocorrelation, power spectral density, Hilbert transformation
3. Measurement and processing of analog sensor signals: pure current and pure voltage circuits, analog measuring instruments, analog filters, carrier amplifiers, analog signal processing with operational amplifiers, AC measuring bridges, floating sensor, instrumentation amplifier, analog oscilloscope, analog function generator
4. Analog-digital converter and description of digital signals in the frequency range: A/D conversion, sample and hold element, quantification, discrete-time Fourier series, DTFT, scan theorem, over-sampling, down-sampling, DFT, Z transformation
5. Measurement and processing of digital signals: discrete-time estimation of energy spectra, structure function, digital filters, designing of digital filters, bus systems and integration into LabView, signal detection, statistical analysis and modeling of signals, ARMA models, prediction error, maximum likelihood estimation, digital multimeter, digital oscilloscope

6. Introduction to mathematical morphology: basic morphological operations - dilation, erosion, opening, closing, hough transformation, segmentation methods, Sobel filters, watershed transformation

The lecture will be supplemented with integrated exercises using practical examples in Matlab and LabView as well as with using instruments to generate and process signals.

Competencies / intended learning achievements

From [MV-MTS-86610-K-7] Analog and digital measuring signal processing (/mhb/courses/MV-MTS-86610-K-7/):

Students are able to

- Describe and explain basic signal processing terminology
- Analyze analog and digital signals in the time and frequency range
- Describe and apply analog signal processing methods
- Describe and apply digital signal processing methods
- Explain terms related to morphological signal processing and apply fundamental methods

Literature

From [MV-MTS-86610-K-7] Analog and digital measuring signal processing (/mhb/courses/MV-MTS-86610-K-7/):

To be announced once the course begins

Requirements for attendance (informal)

Modules:

- [MV-MTS-23-M-4] Measurement and control Theory (M, 8.0 LP) (/mhb/modules/MV-MTS-23-M-4/)
- [MV-MTS-B102-M-4] Electrical Engineering for Mechanical Engineering (M, 7.0 LP) (/mhb/modules/MV-MTS-B102-M-4/)

Requirements for attendance (formal)

None

References to Module / Module Number [MV-MTS-M171-M-7]

Module-Pool	Name
[MV-CE-MPOOL-6 (/mhb/modulepools/MV-CE-MPOOL-6/)]	Wahlpflichtmodule Computational Engineering
[MV-MBINFO-MPOOL-6 (/mhb/modulepools/MV-MBINFO-MPOOL-6/)]	Wahlpflichtmodule Maschinenbau mit angewandter Informatik
[MV-PT-MPOOL-6 (/mhb/modulepools/MV-PT-MPOOL-6/)]	Wahlpflichtmodule Produktionstechnik