

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-TD-M189-M-7

Applications of magnetic resonance in natural sciences and engineering (M, 3.0 LP)

Module Identification

Module Number	Module Name	CP (Effort)
MV-TD-M189-M-7	<i>Applications of magnetic resonance in natural sciences and engineering</i>	3.0 CP (90 h)

Basedata

CP, Effort	3.0 CP = 90 h
Position of the semester	1 Sem. in WiSe
Level	[7] Master (Advanced)
Language	[DE] German
Module Manager	Münnemann, Kerstin, Dr. (WMA DEPT: MV) (/staff/247/)
Lecturers	Münnemann, Kerstin, Dr. (WMA DEPT: MV) (/staff/247/)
Area of study	[MV-LTD] Engineering Thermodynamics
Reference course of study	[MV-88.B10-SG] M.Sc. Energy and Process Engineering (/mhb/FB-MV/cos-573/)
Lifecycle-State	[NORM] Active

Notice

Can also be taken by students from the Master Chemistry, Master TechnoPhysics, Master BCI, Master Physics, Master Biophysics.

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V	MV-TD-86071-K-7 (/mhb/courses/MV-TD-86071-K-7/)	WP	-	PL1	3.0	WiSe

- About [MV-TD-86071-K-7]: Title: "Applications of magnetic resonance in natural sciences and engineering"; Presence-Time: 28 h; Self-Study: 62 h

Examination achievement PL1

- Form of examination: **oral examination (30-45 Min.)**
- Examination Frequency: each semester
- Examination number: 11051 ("Applications of Magnetic Resonance in Natural Sciences and Engineering")

Evaluation of grades

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

Contents

From [MV-TD-86071-K-7] **Applications of magnetic resonance in natural sciences and engineering** (/mhb/courses/MV-TD-86071-K-7/):

- Physical principles of magnetic resonance (for nuclear spins and electron spins)
- One- and multidimensional spectroscopy
- Imaging
- Diffusion and velocity encoded measurements
- Modern hyperpolarization methods to increase the sensitivity of NMR
- Various application examples of the different magnetic resonance techniques

Competencies / intended learning achievements

From [MV-TD-86071-K-7] Applications of magnetic resonance in natural sciences and engineering
(/mhb/courses/MV-TD-86071-K-7/):

The students are able

- to describe the physical basics of magnetic resonance (for nuclear spins and electron spins)
- to name and explain various applications of magnetic resonance (spectroscopy, imaging, diffusion and velocity encoded measurements)
- to select specific measurement sequences for dedicated questions and analyze the measurement results
- to reproduce the physical principles and applications of hyperpolarization methods for sensitivity enhancement of NMR

Literature

From [MV-TD-86071-K-7] Applications of magnetic resonance in natural sciences and engineering
(/mhb/courses/MV-TD-86071-K-7/):

- Malcolm H. Levitt: Spin Dynamics, Wiley, ISBN 978-0-470-51117
- Harald Günther: NMR Spectroscopy, Wiley, ISBN 0 471 95199 4
- Paul T. Callaghan: Principles of Nuclear Magnetic Resonance Microscopy, Clarendon Press, Oxford, ISBN 978-0-19-853997-1
- L.T. Kuhn: Hyperpolarization Methods in NMR Spectroscopy, Topics in Current Chemistry, Vol. 338, Springer, ISBN: 978-3-642-39728-8

Requirements for attendance (informal)

None

Requirements for attendance (formal)

None

References to Module / Module Number [MV-TD-M189-M-7]

Course of Study	Section	Choice/Obligation
[MV-88.A29-SG] M.Sc. Biological and Chemical Engineering (/mhb/FB-MV/cos-567/)	Studienschwerpunkt II	[WP] Compulsory Elective
Module-Pool	Name	
[MV-ALL-MPOOL-6 (/mhb/modulepools/MV-ALL-MPOOL-6/)]	Wahlpflichtmodule allgemein	
[MV-BioVT-MPOOL-6 (/mhb/modulepools/MV-BioVT-MPOOL-6/)]	Wahlpflichtmodule Bioverfahrenstechnik	
[MV-EVT-MPOOL-6 (/mhb/modulepools/MV-EVT-MPOOL-6/)]	Wahlpflichtmodule Energie- und Verfahrenstechnik	