

## 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) ([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) ([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) ([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) ([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) ([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) ([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-IVW-M195-M-7

Physics of multifunctional materials (M, 3.0 LP)

### Module Identification

Module Number	Module Name	CP (Effort)
MV-IVW-M195-M-7	<i>Physics of multifunctional materials</i>	3.0 CP (90 h)

### Basedata

CP, Effort	3.0 CP = 90 h
Position of the semester	1 Sem. in SuSe
Level	[7] Master (Advanced)
Language	[DE/EN] German or English as required
Module Manager	Gurka, Martin, Dr. (EXT   DEPT: MV) (/staff/246/)
Lecturers	Gurka, Martin, Dr. (EXT   DEPT: MV) (/staff/246/)
Area of study	[MV-IVW] Composite Materials
Reference course of study	[MV-88.B78-SG] M.Sc. Production Engineering in Mechanical Engineering (/mhb/FB-MV/cos-578/)
Lifecycle-State	[NORM] Active

## Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V	<a href="/mhb/courses/MV-IVW-86982-K-7/">MV-IVW-86982-K-7</a>	P	-	PL1	3.0	SuSe

- About [\[MV-IVW-86982-K-7\]](#): Title: "Physics of multifunctional materials"; Presence-Time: 28 h; Self-Study: 62 h

## Examination achievement PL1

- Form of examination: **oral examination (20-30 Min.)**
- Examination Frequency: each semester
- Examination number: 10958 ("Physics of multifunctional materials")

## Evaluation of grades

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

## Contents

From [\[MV-IVW-86982-K-7\] Physics of multifunctional materials](#) (/mhb/courses/MV-IVW-86982-K-7/):

- What distinguishes functional materials (smart materials) from construction materials?
- Fundamental physics (mechanics, electrostatics, thermodynamics, mass and energy transport, viscoelasticity and damping).
- Fundamentals of materials science (crystalline solids, polymers, fluids).
- Definition of smart materials based on physical, application and economic aspects.
- Which material for which application? Differentiation and classification of multifunctional materials using performance indices.
- Comparison of material-based and integrated systems with discrete systems.
- Ferroelectrics: piezoelectric crystals, ceramics and polymers.
- Shape memory metals
- Non-Newtonian fluids
- Switchable fluids: electrorheology and magnetorheology.
- Electroactive polymers

- Typical applications: Sensors, actuators, energy converters.

## Competencies / intended learning achievements

From [MV-IVW-86982-K-7] Physics of multifunctional materials (/mhb/courses/MV-IVW-86982-K-7/):

Students will be able to

- understand the fundamental difference between functional materials and construction materials.
- describe the most important representatives of multifunctional materials on the basis of technical, materials and physical properties.
- set up a simple application using multifunctional materials (e.g. as sensor or actuator).
- assess new and initially unknown materials with regard to advantages and disadvantages and to estimate application limits on the basis of the underlying physical principle and fundamental technical data.
- assess the impact of the use of material-based functionalities in technical systems on their development and manufacturing process.

## Literature

From [MV-IVW-86982-K-7] Physics of multifunctional materials (/mhb/courses/MV-IVW-86982-K-7/):

- Gurka, Martin; The Physics of Multifunctional Materials - Concepts, Materials, Applications, DESTech Publications, ISBN: 978-1-60595-260-4, April 2018, 184 pages

## Requirements for attendance (informal)

Recommended: Completed bachelor's degree or completed undergraduate degree

## Requirements for attendance (formal)

None

## References to Module / Module Number [MV-IVW-M195-M-7]

Module-Pool	Name
[MV-ALL-MPOOL-6 (/mhb/modulepools/MV-ALL-MPOOL-6/)]	Wahlpflichtmodule allgemein