

Department Mechanical Engineering

Course Overview for the Degree Program

Master Mechanical Engineering with the specifications

Specializations

- VT III** Materials Engineering
- VT IV** Energy and Process Engineering
- VT V** Numerical Methods
- VT VI** Condition Monitoring – Digital Technologies

Content:

- i. Study Plan Mechanical Engineering
- ii. Catalog Required Courses
- ii. Catalog MA-TEC
- iii. Catalog MA-QES
- iv. Catalog MA-FL

The module descriptions are an appendix to the Examination Regulations (FPO-M).
The examination regulations are available for download on the Mechanical Engineering Examination Office's website.

Study Plan for the Master's Program in Mechanical Engineering with Specializations VT III to VT VI

Master Mechanical Engineering VT III to VT VI (2022)		HPW	ECTS-CP	Exam	HPW	ECTS-CP	Exam	HPW	ECTS-CP	Exam	HPW	ECTS-CP	Exam
Module	Module No.	1. Sem.			2. Sem.			3. Sem.			4. Sem.		
Deepening of Foundational Knowledge in Mathematics and Engineering													
Module Specialization 1													
Required module 1 from the selected specialization		4	6,0	O/W									
Module Specialization 2													
Required module 2 from the selected specialization		4	6,0	O/W									
Module Specialization 3													
Required module 3 from the selected specialization					4	6,0	O/W						
Total (12 HPW, 18 ECTS)													
Advanced Engineering Applications^{1,2}													
Modules Advanced Engineering Applications													
4–6 modules from the MA-TEC specialization track totaling 36 ECTS		8	12,0	O/W	8	12,0	O/W	8	12,0	O/W			
Interdisciplinary Applied Engineering Module Area													
3–4 modules from the full range of courses offered by MA-TEC and MA-QES totaling 24 ECTS		4	6,0	O/W	6	9,0	O/W	6	9,0	O/W			
Total (40 HPW, 60 ECTS)													
Advanced Practical Application^{1,2}													
Specialized Laboratory Module		4MBMA100											
2 specialized labs from the MA-FL catalog, including 1 from the chosen specialization					3	3,0	SL						
								3	3,0	SL			
ALTERNATIVELY:													
Module: Development Project		4MBMA097											
1 Development project in the selected specialization					1	3,0							
								1	3,0	SL			
Total (6 HPW, 6 ECTS)													
Internship and Thesis													
Internship (6 Weeks=6 ECTS-CP) or alternatively 1 special module	4MBMA198								6,0	SL			
Master's thesis with a final presentation ^{1, 2}	4MBMA199											30,0	
Total (0 HPW, 36 ECTS)													
Total HPW /Total ECTS-CP/ Number of exams		20	30,0		21	30,0		17	30,0		0	30,0	
Total HPW /Total ECTS-CP/ Number of exams		58 / 120,0 / 0											

SL – Exam without a grade

O/W - The exam format (oral or written) is specified in the respective module descriptions

¹ The study plan must be signed by a university professor.

² It is possible to distribute the hours differently across the semesters.

Specializations

VT III Materials Engineering

VT IV Energy and Process Engineering

VT V Numerical Methods

VT VI Condition Monitoring – Digital Technologies

Required courses for the specializations VT III to VT VI

Module No.	Module Title (Module Coordinator)					Course			
		VT III	VT IV	VT V	VT VI	Course titel	Lecturer	ECTS-CP	Date
4MBMA001/2	Höhere Festigkeitslehre/ Linear Theory of Elasticity (Weinberg)	s	-	s	-	Höhere Festigkeitslehre/ Linear Theory of Elasticity	Weinberg	6	ws
4MBMA002/2	Technische Schwingungslehre/ Vibration Theory (Kraemer)	-	-	s	s	Technische Schwingungslehre/ Vibration Theory	Kraemer	6	ss
4MBMA003/2	Höhere Thermodynamik/ Advanced Thermodynamics (Seeger)	s	s	-	-	Höhere Thermodynamik/ Advanced Thermodynamics	Seeger	6	ss
4MBMA004/2	Höhere Fluiddynamik/ Advanced Fluid Dynamics (Foyssi)	-	s	s	-	Höhere Fluiddynamik/ Advanced Fluid Dynamics	Foyssi	6	ws
4MBMA005	Signal Processing (Nelles)	-	s	-	s	Signal Processing	Nelles	6	ss
4ETMA160/2	Zuverlässigkeit technischer Systeme/ Reliability of Technical Systems (Gronwald)	o	-	-	o	Zuverlässigkeit technischer Systeme/ Reliability of Technical Systems	Gronwald	6	ss

m	= elective (oral exam)
s	= elective (written exam)
o	= elective (written or oral exam)
–	= ineligible
ws	= Winter Semester
ss	= Sommer Semester

Specializations

VT III	Materials Engineering
VT IV	Energy and Process Engineering
VT V	Numerical Methods
VT VI	Condition Monitoring – Digital Technologies

Catalog of MA-TEC elective modules for specializations VT III to VT VI

Module No. (Module Size)	Module Title (Module Coordinator)					Course			
		VT III	VT IV	VT V	VT VI				
						Course Title	Lecturer	ECTS-CP	Date
4MBMA036/2 (9 ECTS-CP)	Allgemeine Werkstofftechnik/ General Materials Engineering (von Hehl)	o	-	-	-	Aufbau technischer Werkstoffe/ Structure of Technical Materials	Butz	3	WS
		o	-	-	-	Verformungsverhalten technischer Werkstoffe/ Forming Behavior of Technical Materials	von Hehl	3	SS
		m	-	-	-	Tribologie und Bauteilverhalten/ Tribology and Component Behavior	Jiang	3	WS
		o	-	-	-	Materials and processes for resource- efficient transport applications	von Hehl	6	WS
4MBMA037/2 (9 ECTS-CP)	Werkstoffverhalten unter mechanischer Belastung/ Material Behavior Under Mechanical Stress (von Hehl)	o	-	o	o	Technische Bruchmechanik/ Fracture Mechanics	Weinberg	3	WS
		o	-	o	o	Materialermüdung/ Material Fatigue	Ohrndorf/ von Hehl	3	WS
		o	-	o	-	Verformungsverhalten technischer Werkstoffe/ Forming Behavior of Technical Materials	von Hehl	3	SS
		o	-	o	o	Fallstudien zu technischen Schadensfällen/ Case Studies in Technical Failure Analysis	Ohrndorf	3	WS+SS
4MBMA060/2 (9 ECTS-CP)	Angewandte Schadensdiagnostik in der Werkstofftechnik/ Applied Damage Diagnostics in Materials Engineering (von Hehl)	o	-	o	o	Automatische Schadensdiagnostik in der Werkstofftechnik/ Automated Damage Diagnostics in Materials Engineering	Bosse	6	WS+SS
		o	-	o	o	Fallstudien zu technischen Schadensfällen/ Case Studies in Technical Failure Analysis	Ohrndorf	3	WS+SS
4MBMA061/2 (6 ECTS-CP)	Automatische Schadensdiagnostik in der Werkstofftechnik/ Automated Damage Diagnostics in Materials Engineering (von Hehl)	-	-	-	o	Automatische Schadensdiagnostik in der Werkstofftechnik/ Automated Damage Diagnostics in Materials Engineering	Bosse	6	WS+SS
4MBMA038/2 (9 ECTS-CP)	Oberflächentechnik/ Surface Engineering (Jiang)	m	-	-	-	Tribologie und Bauteilverhalten/ Tribology and Component Behavior	Jiang	3	WS
		m	-	-	-	Physikalische Chemie funktioneller Dünnschichten/ Physical Chemistry of Functional Thin Films	Jiang	3	WS
		m	-	-	-	Materialwissenschaft dünner Schichten und Schichtsystemen/ Materials Science of Thin Films and Coating Systems	Jiang	3	WS
4MBMA039/2 (9 ECTS-CP)	Werkstoffe für den Fahrzeugleichtbau/ Materials for Automotive Lightweight Design (Brandt)	o	-	-	-	Werkstoffe für Automobile I/ Automotive Materials Part I	Brandt	3	WS
		o	-	-	-	Werkstoffe für Automobile II/ Automotive Materials Part II	Brandt	3	SS
		o	-	-	-	Werkstoffsysteme für den Fahrzeugleichtbau/ Materials for Automotive Lightweight Design	Brandt	3	WS
		o	-	-	-	Materialermüdung/ Material Fatigue	Ohrndorf/ von Hehl	3	WS
4MBMA040/2 (9 ECTS-CP)	Mikro- und Nanoanalytik in der Materialforschung/ Micro- and Nanoanalytics in Materials Research (Butz)	m	m	-	m	Rasterelektronen- und Ionenmikroskopie/ Scanning Electron and Ion Microscopy (SEM)	Butz	3	SS
		m	m	-	m	Abbildende TEM und Elektronenbeugung/ Imaging TEM and Electron Diffraction (TEM1)	Butz	3	SS
		m	m	-	m	Fortgeschrittene TEM und spektroskopische Methoden/ Advanced TEM and Spectroscopic Methods (TEM2)	Butz	3	WS
		m	m	-	m	Moderne Röntgenmethoden/ Modern X-Ray Methodology (RM)	Butz	3	WS
4MBMA041/2 (9 ECTS-CP)	Moderne Funktionswerkstoffe/ Modern Functional Materials (Butz)	o	o	-	o	Aufbau technischer Werkstoffe/ Structure of Technical Materials	Butz	3	WS
		o	o	-	o	Nanostrukturierte Werkstoffe für die Energie- und Sensortechnik/ Nanostructured Materials for Energy and Sensor Technology	Jiang	3	SS
		o	o	-	o	Keramik- und Hybridwerkstoffe/ Ceramic and Hybrid Materials	Butz	3	SS
4MBMA042/2 (9 ECTS-CP)	Angewandte Methoden der Strömungsmechanik/ Applied Methods of Fluid Mechanics (Foysi)	-	m	m	-	Numerische Fluiddynamik/ Computational Fluid Dynamics	Foysi	3	WS
		-	m	m	-	Einführung in die Aeroakustik und Strömungsbeeinflussung/ Introduction to Aeroacoustics and Flow Control	Foysi	3	WS
		-	m	m	-	Angewandte Fluidmechanik II/ Applied Fluid Mechanics II	Foysi	3	SS

Catalog of MA-QES elective modules for specializations VT III to VT VI

Module No. (Module Size)	Module Title (Module Coordinator)					Course			
		VT III	VT IV	VT V	VT VI				
						Course Title	Lecturer	ECTS-CP	Date
4MBMA001/2 (6 ECTS-CP)	Höhere Festigkeitslehre/ Linear Theory of Elasticity (Weinberg)		s		s	Höhere Festigkeitslehre/ Linear Theory of Elasticity	Weinberg	6	ws
4MBMA002/2 (6 ECTS-CP)	Technische Schwingungslehre/ Vibration Theory (Kraemer)	s	s			Technische Schwingungslehre/ Vibration Theory	Kraemer	6	ss
4MBMA003/3 (6 ECTS-CP)	Höhere Thermodynamik/ Advanced Thermodynamics (Seeger)			s	s	Höhere Thermodynamik/ Advanced Thermodynamics	Seeger	6	ss
4MBMA004/2 (6 ECTS-CP)	Höhere Fluiddynamik/ Advanced Fluid Dynamics (Foysi)	s			s	Höhere Fluiddynamik/ Advanced Fluid Dynamics	Foysi	6	ws
4MBMA005 (6 ECTS-CP)	Signal Processing (Nelles)	s		s		Signal Processing	Nelles	6	ss
4INFBA013 (6 ECTS-CP)	Introduction to Machine Learning (Beel)	s	s	s	s	Introduction to Machine Learning	Beel	6	ws
4ETMA160/2 (6 ECTS-CP)	Zuverlässigkeit technischer Systeme/ Reliability of Technical Systems (Gronwald))		o	o		Zuverlässigkeit technischer Systeme/ Reliability of Technical Systems	Gronwald	6	ss
4ETMA167/2 (6 ECTS-CP)	Data Science for Dynamical Systems (Wallscheid)	-	-	-	o	Data Science for Dynamical Systems	Wallscheid	6	ws
4MBMA120 (6 ECTS-CP)	Technisches Englisch/ Technical English (N.N.)	o	o	o	o	Technical English for Mechanical Engineering Students, Part 1 The Global Engineer's English Toolkit: Technical, Academic, Digital, Intercultural, Part 1" (999F00186V)	N.N.	3	ss
		o	o	o	o	Technical English for Mechanical Engineering Students, Part 2 The Global Engineer's English Toolkit: Technical, Academic, Digital, Intercultural, Part 2" (999F00187V)	N.N.	3	ss

m	= elective (oral exam)
s	= elective (written exam)
o	= elective (written or oral exam)
	= Restricted. It is a required course in the specialization
–	= ineligible
ws	= Winter Semester
ss	= Sommer Semester

Specializations	
VT III	Materials Engineering
VT IV	Energy and Process Engineering
VT V	Numerical Methods
VT VI	Condition Monitoring – Digital Technologies

Catalog of MA-FL elective laboratories for specializations VT III to VT VI

Modul No.	Laboratory No.									
		Course Title	Lecturer	E/R	ECTS-CP	Date	VT III	VT IV	VT V	VT VI
4MBMA100	MA-FL-1	Experimentelle Mechanik/ Experimental Mechanics	Kraemer	E	3	WS	o	-	-	o
	MA-FL-2	Systemdynamik und Regelungstechnik/ System Dynamics and Control Engineering	Nelles	E	3	WS as needed: ss	-	-	-	o
	MA-FL-4	Wärme- und Strömungstechnik/ Thermal Engineering and Fluid Mechanics	Foysi	E	3	SS	-	o	-	-
	MA-FL-5	Numerische Fluidodynamik/ Numerical Fluid Dynamics	Foysi	R	3	WS	-	o	o	-
	MA-FL-6	Werkstofftechnik/ Materials Engineering	Jiang	E	3	WS	o	-	-	-
	MA-FL-7	Energieverfahrenstechnik/ Energy Process Engineering	Beine	E	3	SS	-	o	-	-
	MA-FL-8	Finite Elemente Methode/ Finite Element Method	Hesch	R	3	SS	o	-	o	o

m	= elective (oral exam)
s	= elective (written exam)
o	= elective (written or oral exam)
–	= ineligible
E	= experimental
R	= Computer-based
ws	= Winter Semester
ss	= Summer Semester

Specializations	
VT III	Materials Engineering
VT IV	Energy and Process Engineering
VT V	Numerical Methods
VT VI	Condition Monitoring – Digital Technologies