



## Masterstudium **ADVANCED MATERIALS SCIENCE**

ab 01.10.2022 (Neu) – Plan nach ECTS

Matrikel-Nr.

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Familienname, Vorname(n)

Kennzeichnung des Studiums

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Auflagen/Additional mandatory Courses:	<input type="checkbox"/> JAYES, <input type="checkbox"/> NEIN/NO → Auflagen überprüft? <input type="checkbox"/>		
Vorstudium/ Bachelor's programme:	<input type="checkbox"/> Chemie/Chemistry	<input type="checkbox"/> Physik/Physics	<input type="checkbox"/> Maschinenbau/ Mechanical Engineering
	<input type="checkbox"/> Wirtschaftsingenieurw.- Maschinenbau/ Mechanical Engineering and Business Economics	<input type="checkbox"/> Verfahrenstechnik/ Chemical Engineering	<input type="checkbox"/> USW-NaWi/Technologie/ Environmental System Science – Natural Science and Technology
	<input type="checkbox"/> Biomedical Engineering	<input type="checkbox"/> Digital Engineering	<input type="checkbox"/> Elektrotechnik/ Electrical Engineering

Lehrveranstaltung/Course	Typ	SWS	Datum/Date	Note/ Grade	ECTS	
<b>Modul 1</b> Je nach Vorstudium ist das jeweilige Modul zu wählen. Depending on your bachelor's programme choose the corresponding module 1 A-G.						<b>(11 – 22)</b>
<b>Modul 1A: Introduction module for students with Bachelor's programme CHEMISTRY</b>					<b>13</b>	
Basic Laboratory for Advanced Materials Science	LU	2,67			02	1A.1
Introduction to Solid State Physics	VO	02			03	1A.2
Introduction to Materials Science	VO	02			03	1A.3
Introduction to Modelling and Simulation	VU	02			03	1A.4
Mathematics for Advanced Materials Science	VU	02			02	1A.5
<b>Modul 1B: Introduction module for students with Bachelor's programme PHYSICS</b>					<b>12</b>	
Basic Laboratory for Advanced Materials Science	LU	2,67			02	1B.1
Introduction to Materials Science	VO	02			03	1B.2
Applied Chemistry I	VO	1,33			02	1B.3
Applied Chemistry II	VO	1,33			02	1B.4
Analytical Chemistry	VO	02			03	1B.5

Lehrveranstaltung/Course	Typ	SWS	Datum/Date	Note/Grade	ECTS	
<b>Modul 1C: Introduction module for students with Bachelor's programme MECHANICAL ENGINEERING or MECHANICAL ENGINEERING AND BUSINESS ECONOMICS</b>					<b>14</b>	
Basic Laboratory for Advanced Materials Science	LU	2,67			02	1C.1
Introduction to Solid State Physics	VO	02			03	1C.2
Atom Physics – Quantum Mechanics	VO	1,33			02	1C.3
Applied Chemistry I	VO	1,33			02	1C.4
Applied Chemistry II	VO	1,33			02	1C.5
Analytical Chemistry	VO	02			03	1C.6
<b>Modul 1D: Introduction module for students with Bachelor's programme CHEMICAL ENGINEERING</b>					<b>12</b>	
Basic Laboratory for Advanced Materials Science	LU	2,67			02	1D.1
Introduction to Solid State Physics	VO	02			03	1D.2
Introduction to Materials Science	VO	02			03	1D.3
Atom Physics – Quantum Mechanics	VO	1,33			02	1D.4
Applied Chemistry II	VO	1,33			02	1D.5
<b>Modul 1E: Introduction module for students with Bachelor's programme ENVIRONMENTAL SYSTEM SCIENCE – NATURAL SCIENCE AND TECHNOLOGY or BIOMEDICAL ENGINEERING</b>					<b>11</b>	
Basic Laboratory for Advanced Materials Science	LU	2,67			02	1E.1
Introduction to Solid State Physics	VO	02			03	1E.2
Introduction to Materials Science	VO	02			03	1E.3
Introduction to Modelling and Simulation	VU	02			03	1E.4
<b>Modul 1F: Introduction module for students with Bachelor's programme DIGITAL ENGINEERING</b>					<b>17</b>	
Basic Laboratory for Advanced Materials Science	LU	2,67			02	1F.1
Introduction to Solid State Physics	VO	02			03	1F.2
Introduction to Materials Science	VO	02			03	1F.3
Atom Physics – Quantum Mechanics	VO	1,33			02	1F.4
Applied Chemistry I	VO	1,33			02	1F.5
Applied Chemistry II	VO	1,33			02	1F.6
Analytical Chemistry	VO	02			03	1F.7

Lehrveranstaltung/Course	Typ	SWS	Datum/Date	Note/Grade	ECTS	
<b>Modul 1G: Introduction module for students with Bachelor's programme ELECTRICAL ENGINEERING</b>					<b>22</b>	
Basic Laboratory for Advanced Materials Science	LU	2,67			02	1G.1
Introduction to Solid State Physics	VO	02			03	1G.2
Introduction to Materials Science	VO	02			03	1G.3
Atom Physics – Quantum Mechanics	VO	1,33			02	1G.4
Applied Chemistry I	VO	1,33			02	1G.5
Applied Chemistry II	VO	1,33			02	1G.6
Analytical Chemistry	VO	02			03	1G.7
Thermodynamik für USW	VO	02			03	1G.8
Thermodynamik für USW	UE	01			02	1G.9
<b>Modul 2: Fundamentals of Material Science</b>					<b>10</b>	
Introduction to Solid State Chemistry for Advanced Materials Science	VO	1,33			02	2.1
Materials Production and Processing	VO	02			03	2.2
Modelling and Simulation for Advanced Materials Science	VU	02			02	2.3
Physical Properties of Materials	VO	02			03	2.4
<b>Modul 3: Materials Characterisation and Materials Laboratory</b>					<b>10</b>	
Materials Laboratory	LU	04			04	3.1
Materials Characterization I	VO	1,33			02	3.2
Materials Characterization II	VO	1,33			02	3.3
Materials Characterization III	VO	1,33			02	3.4
<b>Specialisation (Vertiefungsrichtung)</b>						
<p>A+B+C derselben Specialisation (Vertiefungsmoduls) sind zu wählen/Choose A+B+C of the same Specialisation.  Ist der Umfang der absolvierten LVen für das Wahlmodul der gewählten Specialisation (Vertiefungsrichtung) um 1 ECTS höher oder niedriger als 12, kann dies durch die General Electives and Soft Skills ausgeglichen werden.  If the completed courses for the Elective Subject (Wahlmodul) of the chosen Specialization (Vertiefungsrichtung) is one ECTS higher or lower than 12, it can be compensated by ECTS of General Electives and Soft Skills.</p>						
<b>Specialisation 4: Metals and Ceramics</b>					<b>33</b>	(15 + 6 + 12)
<b>Modul 4A: Theory and Application</b>			---	---	<b>15</b>	
Plasticity and Forming Processes	VO	2,67			04	4.A.1
Corrosion and Corrosion Protection of Metallic Materials	VO	02			03	4.A.2
Functional Materials I	VO	02			03	4.A.3

Lehrveranstaltung/Course	Typ	SWS	Datum/Date	Note/Grade	ECTS	
High-performance Metals and Alloys	VO	1,33			02	4.A.4
High-performance Ceramics	VO	02			03	4.A.5
<b>Modul 4B: Laboratory</b>			---	---	<b>06</b>	
Laboratory Course Metals and Ceramics	LU	06			06	4.B.1
<b>Wahlmodul 4C: Elective Subject</b> 12 ECTS aus nachfolgenden LVen sind zu wählen./Choose 12 ECTS of the following courses.					<b>12</b>	
Project Laboratory	PT	08			06	
Structural Transformation and Diffusion in Materials	VU	03			03	
Joining Technology	VO	02			03	
Werkstoffkunde Stahl für Advanced Materials Science	VO	1,33			02	
Failure Analysis	VU	02			02	
Structurally Complex Materials	VO	02			03	
Electrical Engineering Materials	VO	02			03	
Electro-chemical Surface Refinement	VO	02			03	
Advanced 2 D and 3 D Nanoanalysis	VU	02			03	
Fracture Mechanics for Advanced Materials Science	VO	1,33			02	
Surface Science	VO	02			03	
Laboratory Exercises in Computer Supported Measurement Techniques for Advanced Materials Science	LU	02			03	
Materials Selection	VU	02			02	
Materials and the Environment	VU	02			02	
Introduction to Solid State Physics, Exercise	UE	01			01	
Surface technology and wear	VO	02			03	
Raw Materials Science	VO	1,33			02	
Functional materials II	VO	0,66			01	
Additive Manufacturing and Joining Techniques in Aviation	VO	02			03	
Fatigue design principles	VU	02			02	
Topics in Metals and Ceramics	---	---			---	
Untertitel/Subtitle:						
Untertitel/Subtitle:						

Lehrveranstaltung/Course	Typ	SWS	Datum/Date	Note/Grade	ECTS	
<b>Specialisation 5: Semiconductor Processing and Nanotechnology</b>					<b>33</b>	(15 + 6 + 12)
<b>Modul 5A: Theory and Application</b>			---	---	<b>15</b>	
Microelectronics and Micromechanics	VO	02			03	5.A.1
Organic Semiconductors	VO	02			03	5.A.2
Modelling and Simulation of Semiconductors	VU	02			03	5.A.3
Surface Science	VO	02			03	5.A.4
Nanostructures and Nanotechnology	VO	02			03	5.A.5
<b>Modul 5B: Laboratory</b>			---	---	<b>06</b>	
Laboratory Course Semiconductor Processing and Nanotechnology	LU	06			06	5.B.1
<b>Wahlmodul 5C: Elective Subject</b> 12 ECTS aus nachfolgenden LVen sind zu wählen./Choose 12 ECTS of the following courses.					<b>12</b>	
Project Laboratory	PT	08			06	
Electron Transport in Mesoscopic Systems	VO	02			03	
Structuring of Material Surface and Functional Nanofabrication	VO	02			03	
Physics of Semiconductor Devices	VO	02			03	
Solid State Spectroscopy	VO	02			03	
Thin Film Science and Processing	VO	02			03	
2 D Materials	VO	02			03	
Surface Chemistry	VO	02			03	
IC Design Project Management and Quality	VO	01			1,5	
HREM in Materials Science	VO	02			03	
Vacuum Technology	VO	02			03	
Introduction to Solid State Physics, Exercise	UE	01			01	
Nano Optics	VO	02			03	
Structured Light and Nanoscale Wave Phenomena	VO	02			03	
Scanning Probe Techniques	VO	02			03	
Synchrotron Radiation Techniques	VO	02			03	
X-ray and Neutron Scattering	VO	02			03	

Lehrveranstaltung/Course	Typ	SWS	Datum/Date	Note/Grade	ECTS	
Topics in Semiconductor Processing and Nanotechnology	---	---			---	
Untertitel/Subtitle:						
Untertitel/Subtitle:						
Untertitel/Subtitle:						
<b>Specialisation 6: Biobased Materials</b>					<b>33</b>	(15 + 6 + 12)
<b>Modul 6A: Theory and Application</b>			----	----	<b>15</b>	
Bionanomaterials and Biomimetics	VO	02			03	6.A.1
Polymeric Biomaterials	VO	02			03	6.A.2
Soft Matter Physics	VO	02			03	6.A.3
Physical and Chemical Characterization of Biopolymers	VO	02			03	6.A.4
Biological and Biobased Materials	VO	02			03	6.A.5
<b>Modul 6B: Laboratory</b>			----	----	<b>06</b>	
Laboratory Course Biobased Materials	LU	06			06	6.A.6
<b>Wahlmodul 6C: Elective Subject</b> 12 ECTS aus nachfolgenden LVen sind zu wählen./Choose 12 ECTS of the following courses.					<b>12</b>	
Project Laboratory	PT	08			06	
Intermolecular Forces in Hybrid Materials	VO	1,33			02	
Renewable Resources – Chemistry and Technology I	VO	1,33			02	
Environmental Chemistry and Technology	VO	2,66			04	
Molecular Biophysics 2	VO	02			03	
Structure and Matter	VO	1,33			02	
Tissue Engineering	VO	02			03	
Biophotonics	VO	02			03	
Computational Biomechanics	VU	04			5,5	
Characterization of Condensed Mater	VO	1,33			02	
Elemental Mass Spectrometry	VO	1,33			02	
Introduction into Simulation of Polymeric Materials	VO	0,66			01	
Soft Matter Microscopy	VO	02			03	

Lehrveranstaltung/Course	Typ	SWS	Datum/Date	Note/Grade	ECTS	
Milli and Micro Fluid Mechanics	VU	02			02	
Molecular Biophysics 1	VO	02			03	
Biocompatible Materials	VU	02			03	
Physics of Sustainable Energy	VO	02			03	
High-performance Polymers	VO	1,33			02	
AI / machine learning for data analysis	VO	02			03	
Topics in Biobased Materials	---	---			---	
Untertitel/Subtitle:						
Untertitel/Subtitle:						
Untertitel/Subtitle:						
<b>Wahlmodul: General Electives and Soft Skills</b>					<b>07-12</b>	
<ul style="list-style-type: none"> <li>• <u>3-4 ECTS müssen an Soft Skills gewählt werden!</u></li> <li>• LVen der Wahlmodule (Elective Subjects: 4C, 5C, 6C), wenn nicht in der Specialisation (Vertiefungsrichtung) gewählt.</li> <li>• LVen aus Theory and Application (4A, 4B, 4C) der nicht gewählten Specialisation (Vertiefungsrichtung).</li> <li>• <u>Max. 1 „Project Laboratory“</u> darf im gesamten Masterstudium verwendet werden.</li> <li>• <u>Max. 3 ECTS an Fremdsprachen-LVen</u> (Englisch oder Deutsch) dürfen gewählt werden.</li> <li>• Ist der Umfang der absolvierten LVen für das Wahlmodul der gewählten Specialisation (Vertiefungsrichtung) um 1 ECTS höher oder niedriger als 12, kann dies durch die General Electives and Soft Skills ausgeglichen werden.</li> </ul>						
<ul style="list-style-type: none"> <li>• <u>3-4 ECTS must be chosen in the area of soft skills!</u></li> <li>• Courses of the Elective Subjects (4C, 5C, 6C) if not taken in the Specialisation.</li> <li>• Courses from Theory and Application (4A, 4B, 4C) of the non-chosen specialization.</li> <li>• <u>Max. 1 'Project Laboratory' course</u> can be used throughout the entire master's programme.</li> <li>• <u>Max. 3 ECTS of foreign languages</u> (German or English) can be chosen.</li> <li>• If the completed courses for the Elective Subject (Wahlmodul) of the chosen Specialisation (Vertiefungsrichtung) is 1 ECTS higher or lower than 12, it can be compensated by ECTS of General Electives and Soft Skills.</li> </ul>						

Lehrveranstaltung/Course	Typ	SWS	Datum/Date	Note/Grade	ECTS	
<b>Master Seminar</b>					<b>01</b>	
Master Seminar	SE	01			01	
<b>Freie Wahlfächer – Free-choice subject</b> Max. 1 „Project Laboratory“ darf im gesamten Masterstudium verwendet werden./ Max. 1 'Project Laboratory' course can be used throughout the entire master's programme.				<b>E</b>	<b>06-12</b>	NFWF: 1:1 VO = 1:1,5
Modul 1 + Wahlmodul (General Electives and Soft Skills) + Freie Wahlfächer (Free-choice subject) = 35 ECTS!						
<b>Master's Thesis</b>					<b>30</b>	
<b>Master's Examination</b>					<b>01</b>	

Das viersemestrige Masterstudium umfasst einen Arbeitsaufwand von 120 ECTS-Anrechnungspunkten.

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ECTS-Zusammenfassung vom Prüfungsreferat der Naturwissenschaftlichen Fakultät auszufüllen.			
Module	Soll-ECTS	Tatsächliche ECTS	
Modulgruppe 1: Introduction (1A-1G)	11-22		<b>Modulgruppe 1 (Introduction) + Wahlmodul (General Electives and Soft Skills) + Freie Wahlfächer = 35 ECTS</b>
Modul 2: Fundamentals of Material Science	10	10	
Modul 3: Materials Characterisation and Materials Laboratory	10	10	
Specialisation (Vertiefungsrichtung)	33	33	
Wahlmodul (General Electives and Soft Skills)	07-12		
Master's Thesis Seminar	01	01	
Freie Wahlfächer (Free-choice subject)	06-12		
Master's Thesis	30	30	
Master's Examination	01	01	
Summe		120	