

003366The following study plan is tentative: changes can happen each semester (last update: 2020.01.14)

### Semester 1: Adaptation Phase

Modules	UdS			
	Course	Responsible	Code	ECTS
<b>I. Structure &amp; Properties</b>	Microstructure Development	Busch		3
	Continuum Mechanics	Diebels	KonM	4
	Intermetallic Compounds	Busch	IPhas	3
	Experimental Mechanics	Diebels	ExMech	4
	Computer Simulation in Material Physics	Müser		8
	Fracture Mechanics	Motz	Bruch	4
<b>II. Materials Characterization</b>	3D Analysis of Micro and Nanostructures - Basics	Mücklich	3DMN1	3
	Methodology 2: Basics of Microscopy and Spectroscopy	Motz	TeG	5
	Methodology 4: High Resolution Microscopy II (TEM, SPM)	Motz	HMV2	3
	Diffraction Methods	Mücklich	BEUG	5
<b>III. Materials Engineering &amp; Processing Technologies</b>	Machining Technologies	Bähre	Spanf	3
	Surface Engineering	Busch	Otech	3
	Nonferrous Metals I	Busch	NEM1	3
	Lightweight Systems 1	Herrmann		3

Modules	UPC			
	Course	Responsible	Code	ECTS
<b>I. Structure &amp; Properties</b>	Physical Metallurgy	Prado	CEM01	5
	Physical Properties of Materials	Jiménez	CEM04	5
	Mechanical Behaviour of Materials	Alcala	24798	5
<b>II. Materials Characterization</b>	Microstructural Characterisation of Materials	Manero	CEM05	5
<b>III. Materials Engineering &amp; Processing Technologies</b>	Structure and Properties of Polymers		295em112	6

Modules	LTU			
	Course	Responsible	Code	ECTS
<b>I. Structure &amp; Properties</b>	Deformation and Fracture	Akthar	T7001T	7,5
	Material Science & Engineering I	Wallström	T0004T	7,5
<b>II. Materials Characterization</b>	<i>Advanced Materials Characterisation Techniques (Course given during the second semester at LTU)</i>	<i>Akthar</i>	<i>T7003T</i>	<i>7,5</i>
<b>III. Materials Engineering &amp; Processing Technologies</b>	Materials Technology and Materials Selection	Wallström	T0003T	7,5

*Comment: courses in italic might be chosen depending on the student backgrounds.*

Modules	UL			
	Course	Responsible	Code	ECTS
<b>I. Structure and Properties</b>	Properties and Selection of Materials (Mechanics of Materials I, Physical Properties of Materials, Materials Selection)	Ayadi, Czerwec, Bruyère		9
	Physics of Polymers (Physics of Polymers, Polymers Lab)	Royaud		6
<b>II. Materials Characterization</b>	Crystal Structures and Defects	Redjaimia		5
<b>III. Materials Engineering &amp; Processing Technologies</b>	Chemical Engineering (Chemical Reaction Engineering, Fluid and Transport Mechanic)	Simmonot, Acem		6

*Description:*

*Module I: Microstructure, nanostructure, materials physics, crystal structures, structural, mechanical and functional, properties*

*Module II: Diffraction, microscopy, spectroscopy, materials testing, micro/nano/atomic scale*

*Module III: Materials selection, deposition techniques, materials for special applications, chemical eng., processing technologies*

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**Track 1: Advanced Metallic Materials - Design, characterization and processing**

<b>UdS</b>				
	<b>Course</b>	<b>Responsible</b>	<b>Code</b>	<b>ECTS</b>
Semester 2	Steel II	Busch	Stahl	3
	Kinetics of amorphous systems	Busch	Kin	3
	Powder Metallurgy	Busch	PuMet	3
	Amorphous Metals	Busch	AmoMet	3
	Machining Technologies	Bähre	Spanf	3
	Precision Machining Technologies	Bähre	FBTec	3
	3D Analysis of Micro and Nanostructures - Advanced Methods	Mücklich	3DMN2	3
	Methodology 7: Nano- and micromechanical testing methods	Motz	NMMMM	3
	Material Modelling	Diebels	MaMo	4
	Methodology 3: High Resolution Microscopy I (SEM, EDS)	Motz	HMV1	4
	Laser Treatment of Materials - Applications	Mücklich	Las2	4
	Physical Acoustics 1	Rabe		4
	Functional Materials II	Mücklich	FuWV	4
	Internship (Industry)	Motz, Marx	FPI	6
Seminar Material Engineering	All Professors	SMWS	<b>2 - 4</b>	
Semester 3	Nonferrous Metals I	Busch	NEM1	3
	Nonferrous Metals II	Busch	NEM2	3
	Intermetallic Compounds	Busch	IPhas	3
	Lightweight Systems 1	Herrmann		3
	Surface Engineering	Busch	OTech	3
	Heavy Plate Production and Processing	Kalla		3
	Non-Destructive Testing of Materials II	Boller	ZfP2	3
	Methodology 4: High Resolution Microscopy II (TEM, SPM)	Motz	HMV2	3
	3D Analysis of Micro and Nanostructures - Basics	Mücklich	3DMN1	3
	Structural Durability	Boller		3
	Corrosion and High Temperature Behavior	Busch	KorHT	3
	Laboratory Materials Science	Motz, Marx	PrMW	4
	Fracture Mechanics	Motz	Bruch	4
	Physical Acoustics 2	Rabe		4
	Diffraction Methods	Mücklich	BEUG	5
	Methodology 2: Basics of Microscopy and Spectroscopy	Motz	TeG	5
	Laser Treatment of Materials - Interaction with Matter	Mücklich	Las1	3
	Computer Simulation in Material Physics	Müser		8
Internship (Industry)	Motz, Marx	FPI	6	
Seminar Material Science	All Professors	SMWW	<b>2 - 4</b>	
<b>UPC</b>				
	<b>Course</b>	<b>Responsible</b>	<b>Code</b>	<b>ECTS</b>
Semester 2	Modern Manufacture of Metallic Materials (mandatory)		295em021	6
	Structural Integrity and Failure Analysis (mandatory)		295em022	6
	Materials Joining Technologies (mandatory)		240EM144	4,5
	Modelling of Plastic Deformation (mandatory)		240EM146	4,5
	Materials Selection in Mechanical design (mandatory)		240EM141	4,5
	Materials for Energy Applications (elective)		240EM142	4,5
	Materials for Transport Applications (elective)		240EM143	4,5
Internship (Industry)			5	
Semester 3	Structure and Properties of Metal Alloys		295em111	6
	Advanced Characterization of Materials		295em011	6
	Laboratory of materials science and technology		240em031	4,5
	Micromechanical Design, Nanomechanical and Coatings		240em131	4,5
	Functional materials		240em135	4,5
	Nanotechnology		240em134	4,5
	Internship (Industry)			5

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LTU				
	Course	Responsible	Code	ECTS
Semester 2	Phase Transformations (semester 1)	Akthar	T7008T	7,5
	Advanced Materials Characterization Techniques (Adapt. Phase MII)	Akthar	T7003T	7,5
	<b>Select 2 of the following (italic):</b>			
	<i>Materials Modelling</i>	Joffe	T7002T	7,5
	<i>Surface Engineering</i>	Vuorinen	T7004T	7,5
	<i>Nanomaterials</i>	Soldatov	T7006T	7,5
	<i>Materials Selection and Ecodesign</i>	Vuorinen	T0007T	7,5
	<i>Metal working</i>	Åkerfeldt	T7028T	7,5
Semester 3	Advanced Metallic Materials - Project Work	All Professors	T0009T	27
UL				
	Course	Responsible	Code	ECTS
Semester 2	Materials Mechanics II: Plasticity	Ayadi		5
	Materials Characterization	Zollinger		4
	Conferences and Industrial Visits	Zollinger		1
	Bibliographic Project	Horwat		6
	Solidification and phase transformation	Horwat, Zollinger		10
Semester 3	Ferrous and Non-Ferrous Alloys	Denis		6
	Stress-Phase Transformations	Denis		4
	Microstructural control	Mathieu		6
	Development processes (Extractive Metallurgy, Processing Routes)	Patisson		3
	Bibliographic Project	Horwat		7

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### Track 2: Polymers and Composites - Modelling, processing & tailored properties

UdS				
	Course	Responsible	Code	ECTS
Semester 2	Experimental Characterization of Polymer Materials	Possart	ECPol	3
	Adhesives and Adhesive Bonding Technology	Possart	Kleb	3
	Organic Layers - Preparation and Characterization	Possart	OSHC	3
	Lightweight Systems 2	Herrmann		3
	3D Analysis of Micro and Nanostructures - Advanced Methods	Mücklich	3DMN2	3
	Numerical Mechanics	Diebels	NuMech	4
	Physical Acoustics 1	Rabe		4
	Material Modelling	Diebels	MaMo	4
	Empirical and Statistical Modelling	Bähre	EsMod	4
	Finite Elements in Continuum Mechanics	Diebels	FEMM	4
	Internship (Industry)	Motz, Marx	FPI	6
	Seminar Material Engineering	All Professors	SMWS	2 - 4
Semester 3	Synthesis of Polymers	Gallei	MC01	2
	Non-Destructive Testing of Materials II	Boller	ZFP2	3
	Functional Coatings	Kraus	GuKBe	3
	Methodology 4: High Resolution Microscopy II (TEM, SPM)	Motz	HMV2	3
	Lightweight Systems 1	Herrmann		3
	3D Analysis of Micro and Nanostructures - Basics	Mücklich	3DMN1	3
	NanoBioMaterials 1	Arzt	NBM-1	3
	Corrosion and High Temperature Behavior	Busch	KorHT	3
	Experimental Mechanics	Diebels	ExMech	4
	Continuum Mechanics	Diebels	KonM	4
	Physical Acoustics 2	Rabe		4
	Computer Simulation in Material Physics	Müser		8
	Laboratory Materials Science	Motz, Marx	PrMW	4
	Internship (Industry)	Motz, Marx	FPI	6
Seminar Material Science	All Professors	SMWW	2 - 4	
UPC				
	Course	Responsible	Code	ECTS
Semester 2	Composite Technology (mandatory)		295em121	6
	New Challenges in Additivation and Degradation of Plastic Materials (mandatory)		295em125	6
	Structural Integrity and Failure Analysis		295em022	6
	Materials for Energy Applications		240em142	4,5
	Materials for Transport Applications		240em143	4,5
	Materials Joining Technologies		240em144	4,5
	Selection of Materials in Mechanical Design		240em141	4,5
	Experimentation and Instrumentation		295eq221	6
Internship (Industry)			5	
Semester 3	Structure and Properties of Polymers		295em112	6
	Sustainability and Circular Economy		295ii024	6
	Laboratory of materials science and technology		240em031	4,5
	Biomedical Materials		240em033	4,5
	Micromechanical Design, nanomechanical and Coatings		240em131	4,5
	Polymer and biopolymer nanotechnology		240eq233	4,5
	Bioplastics and polymer biomaterials		240eq232	4,5
	Polymer Technology II		240eq331	4,5
	Biotech processes and polymer Industry		295eq011	6
Internship (Industry)			5	
LTU				
	Course	Responsible	Code	ECTS
Semester 2	Composites	Varna	T7012T	7,5
	Advanced Materials Characterization Techniques (Adapt. Phase MII)	Akthar	T7003T	7,5
	<b>Select 1 of the following (italic):</b>			
	<i>Phase Transformations (semester 1)</i>	Akthar	T7008T	7,5
	<i>Laser Material Processing (semester 1)</i>	Kaplan	T0018T	7,5
<i>Materials Mechanics (semester 1)</i>	Lindgren	T7016T	7,5	

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	<b>Select 1 of the following (italic):</b>			
	<i>Aerospace Materials</i>	<i>Varna</i>	<i>T7005T</i>	<i>7,5</i>
	<i>Composites Manufacturing and Lightweight design</i>	<i>Fernberg</i>	<i>T7xxxT</i>	<i>7,5</i>
Semester 3	Polymers and composites - Project Work	All Professors	T7009T	27

UL				
	Course	Responsible	Code	ECTS
Semester 2	Materials Mechanics II: Plasticity	Ayadi		5
	Materials Characterization	Zollinger		4
	Conferences and Industrial Visits	Zollinger		1
	Bibliographic Project	Horwat		6
	Chemistry of Organic Materials (Macromolecular Chemistry, Polymers Lab II)	Six		10
Semester 3	Manufacturing of Polymeric Materials	Hu, Jonquières		6
	Functional Polymeric Materials	Six		4
	Natural and Biodegradable Materials	Jonquières		4
	Polymeric Matrix Composites	Ayadi		5
	Bibliographic Project	Horwat		7

*Comment: only one internship can be done during semester 2 or semester 3.*

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### Track 3: High Performing Surfaces - Coating, structuring & functionalization

UdS				
	Course	Responsible	Code	ECTS
Semester 2	Nonferrous Metals II	Busch	NEM2	3
	High-Performance Ceramics	Falk	HLKer	3
	Precision Machining Technologies	Bähre	FBTec	3
	Organic Layers - Preparation and Characterization	Possart	OSHC	3
	Adhesives and Adhesive Bonding Technology	Possart	Kleb	3
	NanoBioMaterials 2	Arzt	NBM-2	3
	Finite Elements in Continuum Mechanics	Diebels	FEMM	4
	Functional Materials II	Mücklich	FuWV	4
	Numerical Mechanics	Diebels	NuMech	4
	Methodology 3: High Resolution Microscopy I (SEM, EDS)	Motz	HMV1	4
	Material Modelling	Diebels	MaMo	4
	Internship (Industry)	Motz, Marx	FPI	6
	Seminar Material	All Professors	SMWS	2 - 4
Semester 3	Non-Destructive Testing of Materials II	Boller	ZFP2	3
	Intermetallic Compounds	Busch	IPhas	3
	Surface Engineering	Busch	OTech	3
	Microstructure Development	Busch		3
	Laser Treatment of Materials - Interaction with Matter	Mücklich	Las1	3
	3D Analysis of Micro and Nanostructures - Basics	Mücklich	3DMN1	3
	Functional Coatings	Kraus	GuKBe	3
	NanoBioMaterials 1	Arzt	NBM-1	3
	Methodology 4: High Resolution Microscopy II (TEM, SPM)	Motz	HMV2	3
	Computer Simulation in Material Physics	Müser		8
	Laboratory Materials Science	Motz, Marx	PrMW	4
	Internship (Industry)	Motz, Marx	FPI	6
	Seminar Material Science Seminar	All Professors	SMWW	2 - 4
UPC				
Semester 2	Course	Responsible	Code	ECTS
	<b>Not Available</b>			
Semester 3	<b>Not Available</b>			
LTU				
Semester 2	Course	Responsible	Code	ECTS
	Surface Engineering	Vuorinen	T7004T	7,5
	Advanced Materials Characterization Techniques (Adapt. Phase MII)	Akthar	T7003T	7,5
	<b>Select 1 of the following (italic):</b>			
	<i>Phase Transformations (semester 1)</i>	Akthar	T7008T	7,5
	<i>Materials Mechanics (semester 1)</i>	Lindgren	T7016T	7,5
	<b>Select 1 of the following (italic):</b>			
	<i>Nanostructured Materials and Nanotechnology</i>	Soldatov	T7006T	7,5
	<i>Materials Modeling</i>	Joffe	T7002T	7,5
<i>Metal Working</i>	Åkerfeldt	T7028T	7,5	
<i>Material Selection and Ecodesign</i>	Vuorinen	T0007T	7,5	
Semester 3	High performing Surfaces - Project Work	All Professors	T7009T	27
UL				
Semester 2	Course	Responsible	Code	ECTS
	Materials Mechanics II: Plasticity	Ayadi		5
	Materials Characterization	Zollinger		4
	Conferences and Industrial Visits	Zollinger		1
	Bibliographic Project	Horwat		6
	Solidification and phase transformation	Horwat, Zollinger		10
Semester 3	Surface Treatments	Horwat, Capon		6
	Materials and Surface Characterization	Horwat		5
	Formation of Microstructures	Denis		3
	Corrosion protection	Mathieu		5
	Bibliographic Project	Horwat		7

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**Track 4: Materials Engineering and Manufacturing Technologies**

<b>UdS</b>				
	<b>Course</b>	<b>Responsible</b>	<b>Code</b>	<b>ECTS</b>
Semester 2	Powder Metallurgy	Busch	PuMet	3
	Lightweight Systems 2	Herrmann	?	3
	Production Engineering	Bähre	ProdSys	3
	Amorphous Metals	Busch	AmoMet	3
	Precision Machining Technologies	Bähre	FBTec	3
	Structural Health Monitoring	Boller		3
	Nonferrous Metals II	Busch	NEM2	3
	Steel II	Busch	Stahl	3
	3D Analysis of Micro and Nanostructures - Basics	Mücklich	3DMN1	3
	Physical Acoustics 1	Rabe		4
	Methodology 3: High Resolution Microscopy I (SEM, EDS)	Motz	HMV1	4
	Machine Dynamics	Diebels		4
	Fluid Mechanics	Roland	Ström	4
	Laser Treatment of Materials - Applications	Mücklich	Las2	4
	Finite Elements in Continuum Mechanics	Diebels	FEMM	4
	Internship (Industry)	Motz, Marx	FPI	6
Seminar Material Engineering	All Professors	SMWS	<b>2 - 4</b>	
Semester 3	Functional Coatings	Kraus	GuKBe	3
	Joining Technology	Kalla	?	3
	Non-Destructive Testing of Materials II	Boller	ZfP2	3
	Surface Engineering	Busch	OTech	3
	Machining Technologies	Bähre	Spanf	3
	Shaping Processes	Bähre	URUmV	3
	Heavy Plate Production and Processing	Kalla		3
	Lightweight Systems 1	Herrmann		3
	Laser Treatment of Materials - Interaction with Matter	Mücklich	Las1	3
	Structural Durability	Boller		3
	Corrosion and High Temperature Behavior	Busch	KorHT	3
	Computer Simulation in Material Physics	Müser		8
	Laboratory Materials Science	Motz, Marx	PrMW	4
	Internship (Industry)	Motz, Marx	FPI	6
Seminar Material Science	All Professors	SMWW	<b>2 - 4</b>	
<b>UPC</b>				
Semester 2	Course	Responsible	Code	ECTS
	<b>Not Available</b>			
Semester 3	<b>Not Available</b>			
<b>LTU</b>				
Semester 2	Course	Responsible	Code	ECTS
	Laser Material Processing (semester 1)	Kaplan	T0018T	7,5
	Advanced Materials Characterization Techniques	Antti	T7003T	7,5
	Advanced Processing and Cyberlab	Kaplan	T7015T	7,5
	<b>Select 1 of the following (italic):</b>			
	<i>Surface Engineering</i>	Vuorinen	T7004T	7,5
	<i>Nanostructured Materials and Nanotechnology</i>	Soldatov	T7006T	7,5
	<i>Materials Modeling</i>	Joffe	T7002T	7,5
	<i>Metal working</i>	Åkerfeldt	T7028T	7,5
<i>Composites Manufacturing and Lightweight design</i>	Fernberg	T7xxxT	7,5	
<i>Biocomposites</i>	OKsman	T7017T	7,5	
Semester 3	Materials Engineering and Manufacturing Technologies - Project Work	All Professors	T7009T	27
<b>UL</b>				
Semester 2	Course	Responsible	Code	ECTS
	<b>Not Available</b>			
Semester 3	<b>Not Available</b>			

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### Track 5: Bio/Nanomaterials (including special applications)

UdS				
	Course	Responsible	Code	ECTS
Semester 2	Organic Layers - Preparation and Characterization	Possart	OSHC	3
	Methodology 6: Microstructural Mechanics and DamageMechanisms	Motz, Marx	MSMSM	3
	Nanostructural Physics 2	Hartmann		3
	3D Analysis of Micro and Nanostructures - Advanced Methods	Mücklich	3DMN2	3
	NanoBioMaterials 2	Arzt	NBM-2	3
	Methodology 7: Nano- and micromechanical testing methods	Motz	NMMMM	3
	High-Performance Ceramics	Falk	HLKer	3
	Material Modelling	Diebels	MaMo	4
	Methodology 3: High Resolution Microscopy I (SEM, EDS)	Motz	HMV1	4
	Laser Treatment of Materials - Applications	Mücklich	Las2	4
	Functional Materials II	Mücklich	FuWV	4
	Internship (Industry)	Motz, Marx	FPI	6
	Seminar Material Engineering	All Professors	SMWS	2 - 4
Semester 3	Functional Coatings	Kraus	GuKBe	3
	3D Analysis of Micro and Nanostructures - Basics	Mücklich	3DMN1	3
	NanoBioMaterials 1	Arzt	NBM-1	3
	Non-Destructive Testing of Materials II	Boller	ZfP2	3
	Laser Treatment of Materials - Interaction with Matter	Mücklich	Las1	3
	Methodology 4: High Resolution Microscopy II (TEM, SPM)	Motz	HMV2	3
	Surface Engineering	Busch	OTech	3
	Laboratory NanoBioMaterials	Arzt	NBM-P	4
	Continuum Mechanics	Diebels	KonM	4
	Methodology 2: Basics of Microscopy and Spectroscopy	Motz	TeG	5
	Computer Simulation in Material Physics	Müser		8
	Laboratory Materials Science	Motz, Marx	PrMW	4
	Internship (Industry)	Motz, Marx	FPI	6
Seminar Material Science	All Professors	SMWW	2 - 4	
UPC				
Semester 2	<b>Not Available</b>			
Semester 3	Biomedical Materials (mandatory)		240em033	4,5
	Living Tissues and Biointerface (mandatory)		240em132	4,5
	Bioceramics (mandatory)		240em133	4,5
	Micromechanical Design, Nanomechanical and Coatings		240em131	4,5
	Nanotechnology		240em134	4,5
	Laboratory of Materials Science and Technology		240em031	4,5
	Advanced Characterization of Materials		295em011	6
	Internship (Industry)			5
LTU				
	Course	Responsible	Code	ECTS
	Biocomposites	Oksman	T7017T	7,5
	Nanomaterials	Soldatov	T7006T	7,5
	Advanced Materials Characterization Techniques	Akthar	T7003T	7,5
	<b>Select 1 of the following (italic):</b>			
	<i>Phase Transformations (semester 1)</i>	Akthar	T7008T	7,5
	<i>Laser Material Processing (semester 1)</i>	Kaplan	T0018T	7,5
	<i>Materials Mechanics (semester 1)</i>	Lindgren	T7016T	7,5
Semester 3	Bio/Nanomaterials (including Special Applications) - Project Work	All Professors	T7009T	27
UL				
Semester 2	<b>Not Available</b>			
Semester 3	<b>Not Available</b>			

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