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Attachment 2: Module Descriptions						
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MatWiss-BP 01	Experimenta	l Physics I			1 <sup>st</sup> semester	9 CP					
		,,									
Module description	Experimental	Physics I - Mecha	nics and Therm	odynamics							
Module code	MatWiss-BP	01									
Faculty/Subject/Department	Faculty 07/Pl	hysics									
Associated degree	BSc Physics, E	3Sc Advanced Mat	erials, minor su	bject: Mathema	tics						
course(s)/Semester taken											
Module coordinator	Cf. German V	Cf. German Version									
Prerequisites	None	lone									
Learning outcomes	Students sha	tudents shall:									
	<ul> <li>have know</li> </ul>	nave knowledge of the fundamental phenomena and principles of the subject areas of mechanics and thermodynamics									
	mechanic	mechanics and thermodynamics									
	<ul> <li>master the</li> </ul>	e fundamental ter	minology and la	aws of conservation	lion Lidovalan salutions	to cimplo					
	De able te     problems	o describe the pi	lenomena mau	nematically and	develop solutions	to simple					
	<ul> <li>baye the</li> </ul>	ability to accerta	in the principle	as of simple as	neriments from th	o rolovant					
	literature	ability to ascerta		es of simple ex	periments nom th						
	<ul> <li>have know</li> </ul>	vledge of basic m	easurement inst	ruments							
	<ul> <li>be able to</li> </ul>	solve experiment	al exercises in a	team							
	be able to	appropriately illu	strate experime	ntal results							
Module content	Basic quant	ities, kinematics,	Newtonian a	axioms, forces	in nature, inerti	al forces,					
	momentum,	work and energy	, angular mome	entum, statics a	ind dynamics of fix	ed bodies,					
	relativistic m	echanics, mechan	ics of deformat	ole media, mech	anical oscillations a	and waves,					
	acoustics, kin	etic gas theory, la	iws of thermody	/namics, real ga	s and phase transiti	ons, forms					
	of heat trans	fer, physical meas	urement techno	ology							
Form(s) of instruction	Lecture (4	hours/week)									
	Tutorial (2	2 hours/week) in s	mall groups: cal	culation of exar	nples related to top	vics					
	covered in	n preceding lectur	es								
Total workland in hours	Block of la	abs following end	of lectures: 10 e	experiments (20	hours)						
Nodulo composition /	30 nours	A Course			points: 1 ECTS cred	Total					
Workload in hours		A COUISE		Autonomous	C Final module	TOtal					
				work	examination incl.						
					preparation						
		a Canata at having	<b>b</b>			<u> </u>					
		a contact nours	d 								
			Preparation/r								
			evision								
	Lecture	60	20	10	15	105					
	Tutorial	30	30	30	0	90					
	Laboratory	20	30	10	15	75					
	Total	110	80	50	30	270					
Examination requirements	Written exam	nination on lecture	e: 2/3 of tutorial	problems must	be solved successful	ully					
	Written exam	nination on labora	tory: all laborate	ory reports mus	t be accepted and t	he final					
	test complete	ed.									
Form(s) of examination and	<u>Form:</u>										
contribution to final mark	Written exam	nination on lectur	e (2 hours); min	imum pass mar	<: 50%						
	Written exam	nination or final co	olloquium on lat	poratory (1 hour	.)						
	Contribution	to final marks									
	Written even	nination on lecture	o· 75%								
	Written exam	nination or final co	olloguium on lak	oratory 25%							
Module retake examination	Written exam	nination or final co	olloquium								
Frequency, duration	Annually. wir	iter semester:	1								
	1 semester	···· ,									
Intake capacity	Calculated ac	cording to expect	ed number of st	udents							
Language of instruction	German										

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MatWice BAO6	Mathom	atics			1 <sup>st</sup> comostor	7.00				
	wathem	atics			1 semester	7 СР				
Module description	Mathema	atics								
Module code	MatWiss	-BA06								
Faculty/Subject/Department	Faculty 07/Physics, Faculty 08/Chemistry									
Associated degree	, BSc Che,	BSc Che, BSc Advanced Materials, BSc LmCh, L3 Che								
course(s)/Semester taken		, , , <del></del>								
Module coordinator	Cf. Germa	an Version								
Prerequisites	None									
Learning outcomes	Students chemical vector matrix differe	<ul> <li>Students shall have the ability to use the following mathematical methods to describe chemical and physical processes:</li> <li>vector arithmetic</li> <li>matrix calculus</li> <li>differential and integral calculus of one or multivariable functions</li> </ul>								
Module content	Analysis     Analysis     arcus)     calcul     equat     calcul     examp     Linear     eigenv	<ul> <li><u>Analysis:</u> numbers, sequences, series, functions (polynomials, e, ln, sin, cos, tan, cos, arcus), complex numbers, continuity, one-dimensional differential and integral calculus, Taylor series, solving of simple linear and inhomogeneous differential equations, differential calculus of multivariable functions (total differential), integral calculus with multiple variables, line integrals, partial differential equations using the example of the wave equation.</li> <li><u>Linear Algebra</u>: vectors, matrices, solving of linear equation systems, determinants, aigonvalues, aigonvalues.</li> </ul>								
Form(s) of instruction	Lectur	Lecture (4 hours/week)								
	Tutori	al (2 hours/wee	k)							
Total workload in hours	210 hour	s		Cred	it points: 7 ECTS cre	dits				
Module composition/Workload in hours		A Course		B Autonomous work	C Final module examination incl. preparation	Total				
		a Contact	b Prepara-							
		bours	tion /rovision							
		nours	tion/revision							
	Lecture	60	20	10	10	100				
	Tutorial	30	50	10	20	110				
	Total	90	70	20	30	210				
Examination requirements	50% of tu	itorial problems	must be success	fully solved.						
Form(s) of examination and	2 written	examinations (e	each 2 hours)							
contribution to final mark	Average	of both written e	examinations: 10	10%						
Module retake examination	Written e	examination								
Frequency, duration	Annually,	winter semeste	er;							
	1 semest	er								
Intake capacity	Calculate	d according to e	xpected number	r of students						
Language of instruction	German									

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MatWiss-BC 01	General	Chemistry			1 <sup>st</sup> semester	6 CP				
Module description	General O	Chemistry								
Module code	MatWiss	-BC 01								
Faculty/Subject/Department	Faculty 0	8/Chemistry/All	chemistry depar	tments						
Associated degree	BSc Chen	nistry, BSc Advan	iced Materials, B	Sc Food Science	e/1 <sup>st</sup> semester					
course(s)/Semester taken										
Module coordinator	Cf. Germ	an Version								
Prerequisites	None									
	<ul> <li>be far bond chemi</li> <li>have syster</li> </ul>	<ul> <li>be familiar with the fundamental physical-chemical properties, material states and bond forms as well as the fundamentals of thermodynamics, the principles of chemical equilibrium and of electrochemistry</li> <li>have knowledge of the periodic table and the interrelationships within the periodic system, the valence notation and chemical bonding models, the law of mass action.</li> </ul>								
	acid-b their r be far isome impor have relate	acid-base theories, redox reactions and simple inorganic-chemical compounds and their properties be familiar with the fundamentals of the organic-chemical nomenclature, forms of isomerism, organic-chemical material groups and their properties and the most important classes of natural substances have knowledge of everyday chemical phenomena, be able to explain these and								
Module content	<ul> <li>PC: St of atc ideal kinetii</li> <li>IC: Va impor produ electr</li> <li>OC: H isome</li> </ul>	<ul> <li>PC: Structure of matters, aggregate states, separation, the term "element", structure of atoms, isotopes, electron configurations, periodic system, definition of the mole, ideal gas law, energy and entropy, thermodynamic principles, fundamentals of kinetics, chemical compounds (metallic bonds, ionic bonds, covalent bonds).</li> <li>IC: Valence formulae and mesomerism, chemistry of the main groups, properties of important bonds, simple chemical calculations, law of mass action, solubility product, acid-base analysis, pH-value, pKs-value, buffers, redox reactions, electrochemistry, electrolysis, galvanic elements, Nernst-equation.</li> <li>OC: Hybridisation, bonds in organic chains, alkanes, alkenes, alkynes, aromatics, isomerism simple promoted articipal activity. CID conventions</li> </ul>								
Form(s) of instruction	Lecture     Tutori	re (4 hours/weel	groups, importa <) >ek)	nt organic mate	riai groups.					
Total workload in hours	180 hour	s		Cred	it points: 6 ECTS cre	dits				
Module composition/Workload in hours		A Course		B Autonomous work	C Final module examination incl. preparation	Total				
		a Contact hours	b Prepara- tion/revision							
	Lecture	60	60		24	144				
	Tutorial	12	24			36				
	Total	72	84		24	180				
Examination requirements	None									
Form(s) of examination and contribution to final mark Module retake examination	Written e Written e	examination (2 h examination	ours): 100%							
Frequency, duration	Annually, 1 semest	, winter semeste er	er;							
Intake capacity	250									
Language of instruction	German									

MatWiss-BC 02	General Chemistry Laboratory	1 <sup>st</sup> semester	6 CP

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Module description	General Che	mistry Laborator	y Introduction					
Module code	MatWiss-BC	02						
Faculty/Subject/Department	Faculty 08/C	Faculty 08/Chemistry/All chemistry departments						
Associated degree	BSc Chemistry, BSc Advanced Materials, BSc Food Science/1 <sup>st</sup> semester							
course(s)/Semester taken								
Module coordinator	Cf. German	Version						
Prerequisites	None							
Learning outcomes	Students: • understa good lab • can reco • have a co analysis • understa • can plan experim	<ul> <li>Students:</li> <li>understand how fundamental practical laboratory work is undertaken in terms of good laboratory practice</li> <li>can record their laboratory results in the form of laboratory notebooks and reports</li> <li>have a command of the fundamental quantitative and qualitative methods for the analysis of matters</li> <li>understand and can apply basic separation processes</li> <li>can plan, set up, undertake and analyse simple chemical and physical-chemical experiments</li> </ul>						
Module content	<ul> <li>"Lab licence" (working safely in a laboratory)</li> <li>Acids and bases, pH-value, chemical equilibrium, titrations</li> <li>Redox reactions, galvanic elements, redox potentials</li> <li>Balancing constants, solubility product</li> <li>Complexation</li> <li>Filtration, crystallisation, distillation, chromatography</li> <li>Inorganic and organic detection reactions</li> <li>Organic-chemical laboratory techniques</li> <li>Simple organic-chemical experiments</li> <li>Fundamental experiments related to energy of chemical reactions (exothermic, endothermic, exergonic, endergonic), to chemical equilibrium and to electrochemictry</li> </ul>							
Form(s) of instruction	<ul><li>Laborato</li><li>Seminar</li></ul>	ory (3.7 hours (2.3 hours	s/week) s/week)					
Total workload in hours	180 hours	,	. ,	Credit p	oints: 6 ECTS credits	6		
Module composition/Workload in hours		A Course		B Autonomous work	C Final module examination incl. preparation	Total		
		a Contact hours	b Prepara- tion/revision					
	Laboratory	56	56			112		
	Seminar	34	34			68		
	Total	90	90			180		
Examination requirements	Regular atte	ndance at labora	tory and semina	r				
Form(s) of examination and contribution to final mark	Form: Labora Mark: No ma submission.	atory reports ark will be given;	students pass th	ne module if all	reports are accepte	d for		
Module retake examination								
Frequency, duration	Annually, wi	nter semester;						
	1 semester							
Intake capacity	250							
Language of instruction	German							

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MatWiss-BA 01	IT Basics					1 <sup>st</sup> semester	4 CP		
Module description	IT Basics								
Module code	MatWiss	-BA 01							
Faculty/Subject/Department	Faculty 0	Faculty 07/Physics. Faculty 08/Chemistry							
Associated degree	BSc Adva	BSc Advanced Materials							
course(s)/Semester taken									
Module coordinator	Cf. Germa	an Version							
Prerequisites	None								
Learning outcomes	Students	shall:							
	<ul> <li>unde collec in net</li> <li>autor</li> </ul>	<ul> <li>understand and recognise the versatile fields of application of the computer for data collection, calculations, data analysis, data visualisation and for the exchange of data in networked systems</li> <li>autonomously undertake and solve fundamental problems in this central area</li> </ul>							
Module content	<ul> <li>Text  </li> <li>Carry</li> <li>Data</li> <li>Excha</li> </ul>	<ul> <li>Text processing and presentation programmes (Word, PowerPoint)</li> <li>Carrying out calculations using a computer (e.g. Excel, Maple, Mathematica)</li> <li>Data analysis and visualisation (e.g. Origin/Excel)</li> <li>Exchange of data and data collection (Internet)</li> </ul>							
Form(s) of instruction	• Lectu	• Lecture (0.7 hours/week)							
	Tutori	• Tutorial (1.3 hours/week)							
Total workload in hours	120 hour	s ( <u></u>			Cred	t points: 4 ECTS cre	dits		
Module composition/Workload		A Course		В		C Final module	Total		
in hours				Autonor	nous				
				work		examination incl.			
						preparation			
		- Contract	h Durana						
		a Contact	b Prepara-						
		hours	tion/revision						
	Lecture	8	12	10	)	0	30		
	Tutorial	30	50	10	)	0	90		
	Total	38	62	20	)	0	120		
Examination requirements				•					
Form(s) of examination and	Tutorial r	problem sets							
contribution to final mark	Tutorial p	problem sets: 100	0%						
Module retake examination	Form: Tut	torial problem se	ets						
Frequency, duration	Annually,	winter semeste	r;						
	1 semest	er							
Intake capacity	Calculate	d according to ex	xpected number	r of studer	nts				
Language of instruction	German								

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MatWiss-BP 02	Experimenta	al Physics II		2	<sup>nd</sup> semester	9 CP			
	•	•		L. L					
Module description	Experimental Physics II - Electrical Science and Optics								
Module code	MatWiss-BP 02								
Faculty/Subject/Department	Faculty 07/P	hysics							
Associated degree	BSc Physics,	BSc Physics, BSc Advanced Materials, minor subject: Mathematics							
Module coordinator	Cf. German	Version							
Prerequisites	None								
Learning outcomes	Students sha	all:							
	<ul> <li>have known</li> </ul>	wledge of the fu	undamental phe	nomena and ph	vsical principles wi	thin the			
	sub-area	s of electricity a	nd optics	·	, , ,				
	• master t	, he fundamental	terms and conse	ervation laws of	physics, have the a	ability to			
	develop	experimental ex	ercises from the	literature, matl	nematically describ	e these			
	and solv	e them within a	team						
Module content	Electrostatio	s, electrical pow	er, magnetostat	ic energy, induc	tion, application fie	elds of			
	electromagn	etism, electrical	and magnetic p	roperties of mat	ter, Maxwell equa	tions,			
	electrical os	cillations and wa	ves, light as an e	lectromagnetic	wave, geometrical	optics,			
	wave optics,	fundamentals o	of quantum and v	wave mechanics	, simple examples,	physical			
	measureme	nt technology							
Form(s) of instruction	• Lecture (	4 hours/week)							
	Tutorial (	2 hours/week) ir	n small groups: c	alculation of ex	amples related to t	opics			
	covered i	n preceding lect	ures			00100			
	Block lab	<ul> <li>Block laboratory following end of lectures: 10 experiments (20 hours)</li> </ul>							
Total workload in hours	270 hours		0	Credit p	oints: 9 ECTS credit	S			
Module composition/Workload		A Course		В	C Final module	Total			
in hours				Autonomous	ovamination incl				
				work	examination inci.				
					preparation				
		a Contact	h Prenara-						
		bours	tion (revision						
		nours	tion/revision						
	Lecture	60	20	10	15	105			
	Tutorial	30	30	30	0	90			
	Laboratory	20	30	10	15	75			
	Total	110	80	50	30	270			
Examination requirements	Written exar	nination on lectu	ure: 2/3 of tutori	al problems mu	st be solved succes	sfully			
	Written exam	nination on labo	oratory: all labora	itory reports mu	ist be accepted and	the final			
Form(s) of overninetion and	Eorm:	eu							
contribution to final mark	Written exa	mination on lect	ure (2 hours): mi	nimum nass ma	rk: 50%				
	Whitehexa		are (2 nours), ni	innun puss nie	I				
	Written exa	mination or final	colloquium on la	aboratory (1 ho	ur)				
	<b>Contribution</b>	to final mark:							
	Written exa	mination on lect	ure: 75%						
	Written exa	mination or final	colloquium on l	aboratory: 25%					
	Written exar	nination or final	colloquium						
Frequency duration	Annually	mmor competer							
Frequency, utration	Annually, Su	inner semester;	,						
Intake canacity	Calculated a	ccording to ever	octed number of	students					
Language of instruction	German	containg to expe							
	Jerman								

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MatWiss-BC 03	Inorganio	Chemistry			2 <sup>nd</sup> semester	4 CP				
Module description	Inorganic	: Chemistry - Che	emistry of Transi	tion Metals						
Module code	MatWiss	-BC 03								
Faculty/Subject/Department	Faculty 0	8/Chemistry/Inc	organic Chemistry	y						
Associated degree	BSc Chen	nistry, BSc Advar	nced Materials, B	Sc Food Science	e/2 <sup>nd</sup> semester					
course(s)/Semester taken										
Module coordinator	Cf. Germa	Cf. German Version								
Prerequisites	General (	General Chemistry								
Learning outcomes	Students <ul> <li>learn</li> <li>trend</li> <li>becon</li> <li>analy</li> </ul>	<ul> <li>Students shall:</li> <li>learn the principles of the chemistry of the secondary group elements and recognise trends related to reactivity and structure</li> <li>become familiarised with bonding concepts of complex chemistry and be able to analyse these in relation to other bonding models</li> </ul>								
Module content	Productio in bonds (nomenc (blast fur	Production and chemistry of secondary group metals, trends in reactivity and structure in bonds between secondary group elements, complex chemical concepts (nomenclature, ligand fields, ligand exchanges), important macro-technical processes (blast furnace, copper refining, titanium oxide, precious metal extraction)								
Form(s) of instruction	Lectur     Tutori	re (3 hours/week	k/15 weeks)							
Total workload in hours	120 hour	s		Cred	it points: 4 FCTS cre	dits				
Module composition/Workload	1201104	A Course		В		Total				
in hours				Autonomous						
				work	examination incl.					
					preparation					
		a Contact	h Bronara							
		nours	tion/revision							
	Lecture	45	15	10	10	80				
	Tutorial	15	10	10	5	40				
	Total	60	25	20	15	120				
Examination requirements	Active pa	rticipation in tut	orial							
Form(s) of examination and	Written e	examination (2 h	ours)							
contribution to final mark	Written	examination: 100	)%							
Module retake examination	Written e	examination (2 h	ours)							
Frequency, duration	Annually,	, summer semes	ter;							
	1 semest	er								
Intake capacity	90									
Language of instruction	German									

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MatWiss-BC 04	Organic (	Chemistry			2 <sup>nd</sup>	semester	4 CP					
	organie	enerniser y				semester						
Module description	Organic (	Chemistry										
Module code	MatWiss	-BC 04										
Faculty/Subject/Department	Faculty 0	8/Chemistry/In	organic Chemistry									
Associated degree	BSc Chen	BSc Chemistry/2 <sup>nd</sup> semester, BSc Advanced Materials /2 <sup>nd</sup> semester										
Module coordinator	Cf. Germ	an Version										
Prerequisites	Successfu	Successful completion of General Chemistry										
Learning outcomes	Students	Students shall:										
	<ul> <li>recog</li> <li>mastering</li> <li>unde</li> <li>recog</li> <li>stere</li> <li>have</li> </ul>	<ul> <li>recognise functional groups and be able to analyse their fundamental reactivity</li> <li>master the fundamental structures and properties of organic-chemical material groups including their nomenclature</li> <li>understand the bonding relationships within C-X single and multiple bonds</li> <li>recognise and understand all forms of isomerism in organic molecules, in particular stereo-isomerism</li> <li>have knowledge of the basis organic reaction mechanisms</li> </ul>										
	<ul> <li>be ab</li> </ul>	le to record an	d describe basic reaction	on mec	hanisms							
Form(s) of instruction	<ul> <li>Alkar funda</li> <li>Simpl</li> <li>Princ and k</li> <li>Simpl</li> <li>Radic</li> <li>S<sub>n</sub>-rea</li> <li>Stere</li> <li>Addit</li> <li>Conju</li> <li>Subst</li> <li>Perict</li> <li>Fund</li> <li>Classs</li> <li>Lecture</li> </ul>	<ul> <li>Alkanes, alkenes, alkynes, aromatics, alcohols, amines, carbonyl bonds and their fundamental reactions including fundamental mechanisms</li> <li>Simple molecular orbital theory, conformation analysis</li> <li>Principle of potential energy surface, reactivity-selectivity principle, thermodynamic and kinetic control</li> <li>Simple heterocycles</li> <li>Radical reactions, chain reactions</li> <li>Stereochemistry</li> <li>Addition and elimination</li> <li>Conjugation and hyper conjugation, resonance, aromaticity</li> <li>Substitution reactions of aromatics</li> <li>Pericyclic reactions</li> <li>Fundamental carbonyl chemistry</li> <li>Classes of natural substances</li> </ul>										
	Tutor	ial (0.5 hours/v	veek)									
Total workload in hours	120 hour	S		С	redit poi	nts: 4 ECTS credit	5					
Module composition/Workload in hours		A Course		B Autor work	nomous	C Final module examination incl. preparatior	Total					
		a Contact hours	b Preparation/revision									
	Lecture	45	45			9	99					
	Tutorial	7	14				21					
	Total	52	59			9	120					
Examination requirements	A mark o	f 50% or more	in tutorial.									
Form(s) of examination and	Written e	examination (2	hours)									
contribution to final mark	Written e	examination: 10	00%									
Module retake examination	Written o	or oral examina	tion									
Frequency, duration	Annually,	, summer seme	ester;									
	1 semest	er										
Intake capacity	150											
Language of instruction	German	or English (dep	ending on demand); lite	rature	: English							

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MatWiss-BC 05	Physical	Chemistry			2 <sup>nd</sup> semester	7 CP					
	Dhuataal	он									
Module description	Physical C	Lnemistry – The	ermodynamics and	d Electrochemis	try						
Module code	MatWiss-	-BC 05									
Faculty/Subject/Department	Faculty 0	Faculty 08/Chemistry/Physical Chemistry									
Associated degree	BSc Chem	3Sc Chemistry, BSc Advanced Materials, BSc Food Science/2 <sup>nd</sup> semester									
course(s)/Semester taken											
Module coordinator	Cf. Germa	f. German Version									
Prerequisites	General C	ieneral Chemistry or Mathematics									
Learning outcomes	Students	tudents shall:									
	<ul> <li>master</li> </ul>	master the basic laws in the fields of chemical thermodynamics, electrochemistry									
	and o	of chemical kine	tics								
	• be fai	miliar with the	physical-chemical	approaches to	these important fie	lds within					
	chem	istry and be ab	le to apply these	to neighbouring	disciplines						
Redula contout	1) I +										
Nodule content	1) Introd	1 <sup>st</sup> low, thermo	<u>odynamics</u> : Ideal	and real gases,	thermal and caloric	equations					
	nartial m	olar quantity fu	indamental equa	tions of thermo	dynamics chemical	notential					
	chemical	equilibrium nh	ase equilibria mi	iscible phase the	ermodynamics (nha	se diagram)					
	2) Electro	chemistry: fun	damental terms, i	onic migration.	weak and strong el	ectrolytes.					
	fixed elec	trolytes, revers	ible cell potential	l, electrical dipo	le coating, electroch	nemical					
	potential	, electrode pote	ential, half cells, h	alf-cell potentia	l, Stockholm conve	ntion,					
	diffusion	potential, diffe	rent types of galv	anic cells: chem	ical cells, concentra	tion cells					
	(e.g. lami	oda probe).									
	3) Fundai	mental terms of	f chemical kinetic	<u>s:</u> Arrhenius equ	uation, reaction of n	ith order,					
	dynamic	dynamic equilibrium, quasi steady-state									
Form(s) of instruction	<ul> <li>Lecture</li> </ul>	e (4 hours/wee	ek)								
	<ul> <li>Tutori</li> </ul>	al (2 hours/wee	ek)								
Total workload in hours	210 hour	S		Cred	t points: 7 ECTS cre	dits					
Module composition/Workload		A Course		В	C Final module	Total					
in hours				Autonomous	examination incl.						
				work	nrenaration						
					preparation						
		a Contact	b Prepara-								
		hours	tion/revision								
	Lecture	60	20	10	10	100					
	Tutorial	30	50	10	20	110					
		90	/U	20	30	210					
Examination requirements	A Mark O	1 50% of more i	or tutorial proble	msets							
		(42	· · · · ·								
Form(s) of examination and	Written e	examination (12	0 minutes)								
contribution to final mark	written e	examination: 10	0%								
Module retake examination	Written e	examination (12	0 minutes)								
Frequency, duration	Annually,	summer seme	ster;								
	1 semest	er	-								
Intake capacity	90										
Language of instruction	German										

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MatWiss-BC 06	Inorganic Ch	emistry Laborat	ory	2	<sup>nd</sup> semester	6 CP		
Module description	Inorganic Ch	emistry Laborat						
would description		norganie enemistry zaboratory						
Module code	MatWiss-BC	06						
Faculty/Subject/Department	Faculty 08/C	hemistry/Inorga	nic and Analytic	al Chemistry	a			
Associated degree	BSc Chemist	ry, BSc Advanced	Materials, BSc	Food Science/2	<sup>u</sup> semester			
course(s)/Semester taken								
Module coordinator	Ct. German	Version						
Prerequisites	General Che	mistry Laborator	y, General Chem	listry				
Learning outcomes	Students sha	III: Namontol in oraș	nic chamical pr	anaration math	odo			
	<ul> <li>learn fui</li> <li>prepare</li> </ul>	the fundamenta	types of iporga	eparation meth	ous			
	<ul> <li>prepare</li> <li>acquire</li> </ul>	knowledge of the	substance chei	nistry of the ch	emicals covered thr	ough lab		
	work					00001100		
	<ul> <li>gain exp</li> </ul>	erience in the ch	aracterisation o	f prepared subs	tances			
	become	familiar with the	different aspec	ts of safety in cl	nemical laboratorie	s		
Module content	1) Experime	nts on preparatio	on methods: we	chemistry (diss	olving, decomposir	ng,		
	precipitating	g), reactions with	gases, oxidation	ns and reduction	ns, fused-salt electr	olysis,		
	solid state re	eactions, melting	of sensitive pre	parations				
	2) Experime	nts on fundamer	ital types of inor	ganic bonds: ele	ement oxide-haloge	enide, -		
	nitride and -	sulfide, zeolite, g	ases, main grou	p molecules, co	ordination bonds, r	netal-		
	3) Character	Organic bonds						
Form(s) of instruction	Laborato	ry (4 hours/day/	15 days)					
	<ul> <li>Tutorial (</li> </ul>	1 hour x 15) acco	ompanying the l	əb				
	<ul> <li>Seminar</li> </ul>	(1 hour x 15)		~~				
Total workload in hours	180 hours	(		Credit p	oints: 6 ECTS credit	s		
Module composition/Workload		A Course		В	C Final module	Total		
in hours				Autonomous	examination incl			
				work				
					preparation			
		a Contact	b Prepara-					
		hours	tion/revision					
		110013	tionyrevision					
	Lecture	15	30			45		
	Tutorial	15	30			45		
	Laboratory	60	30			90		
Eventionation annuinean anta	l otal Descular and	90	90			180		
Examination requirements	Regular and	active participat	ion in the semin	ar and laborato	ry, active participat	onin		
Form(s) of examination and	Form: Lab re	ports	students pass t	a madula if all	lah ranarta ara asa	nted for		
contribution to final mark	submission	ark will be given;	students pass ti		lab reports are acce	epted for		
	300111331011.							
Module retake examination	Lab reports	Lab reports						
Frequency, duration	Annually, su	mmer semester;						
	1 semester							
Intake capacity	60							
Language of instruction	German							

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MatWiss-BP 03	Experime	ental Physics III			3 <sup>rd</sup> semester	7 CP		
	•							
Module description	Experime	Experimental Physics 3 – Structure of Matters						
Module code	MatWiss	MatWiss-BP 03						
Faculty/Subject/Department	Faculty 0	7/Physics						
Associated degree	BSc Adva	nced Materials, I	.3 Physics					
course(s)/Semester taken								
Module coordinator	Cf. Germa	an Version						
Prerequisites	Experime	ntal Physics I, Ex	perimental Phys	ics II				
Learning outcomes	Students <ul> <li>have</li> <li>under</li> </ul>	<ul> <li>Students shall:</li> <li>have knowledge of the structure and content of modern (non-classical) physics</li> <li>understand the interdisciplinary interrelationships with other disciplines</li> </ul>						
	<ul> <li>be ab</li> <li>be ab</li> <li>solve</li> </ul>	<ul> <li>be able to autonomously develop an understanding of new, current topics</li> <li>be able to appropriately formulate problems of modern physics and quantitatively solve simple examples</li> </ul>						
Module content	<ul> <li>Funda</li> <li>Atom</li> <li>Bond</li> <li>Struct</li> </ul>	<ul> <li>Fundamental effects of quantum physics</li> <li>Atomic structure, spectroscopy, hydrogen atom, laser</li> <li>Bond types, molecular physics, crystals</li> <li>Structure and stability of atomic nuclei, nuclear energy, elementary particles</li> </ul>						
Form(s) of instruction	<ul> <li>Lectur</li> <li>Tutori</li> </ul>	<ul> <li>Lecture (3 hours/week)</li> <li>Tutorial (2 hours/week)</li> </ul>						
Total workload in hours	210 hour	S	,	Credi	t points: 7 ECTS cre	dits		
Module composition/Workload		A Course		В	C Final module	Total		
in hours				Autonomous work	examination incl. preparation			
		a Contact	h Propara					
		a contact						
		nours	tion/revision					
	Lecture	45	50	10	15	120		
	Tutorial	30	40	10	10	90		
	Total	75	110	30	25	210		
Examination requirements	Written e	xamination: 50%	of tutorial prob	olems must be so	olved successfully.			
Form(s) of examination and	Written e	examination (2 h	ours)					
contribution to final mark	Written e	Written examination: 100%						
Module retake examination	Written e	examination or fi	nal colloquium					
Frequency, duration	Annually,	winter semeste	r;					
	1 semest	er						
Intake capacity	Calculate	d according to ex	pected number	r of students				
Language of instruction	German							

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Ineoretical Physics 3 <sup></sup> semes	ster 8 CP						
<b>Module description</b> Theoretical Physics – Mechanics and Quantum Mechanics	neoretical Physics – Mechanics and Quantum Mechanics						
Module code MatWiss-BP 04	AatWiss-BP 04						
Faculty/Subject/Department Faculty 07/Physics							
Associated degree BSc Advanced Materials, L3 Physics							
course(s)/Semester taken							
Module coordinator Cf. German Version							
Prerequisites Experimental Physics I, Experimental Physics II							
Learning outcomes Students shall:							
<ul> <li>understand the role of mathematics in the construction of mode</li> </ul>	els and theories						
within physics							
comprehend the mathematical description of the mechanics of	the mass point to						
the movement in the central field as well as the Lagrange and H	amilton equations						
understand the infitations of classical physics and thus the nece mochanics	ssity for quantum						
<ul> <li>be able to solve simple quantum mechanics problems</li> </ul>							
Module content   Mechanics of a mass point: oscillations, movement in the nuclei	is potential.						
movements in a rotating coordinate system, differentiation and	integration in						
simple coordinate systems, dynamics of point particles, extrema	l principle, Lagrange						
and Hamilton dynamics, symmetries and conservation laws, dyn	amics within						
Poisson brackets, fundamental Poisson brackets and dynamic in	variants.						
<ul> <li>Historical development of quantum mechanics: eigenvalues and</li> </ul>	eigen functions,						
commutator algebra, free Schrödinger equation and wave packe	ets, tunnel effect,						
single particle potentials and quantisation of harmonic oscillator	s, quantisation of						
angular momentum, electron spin, energy level of the hydrogen	atom, entangled						
states.							
Lecture (4 nours/week)     Tutorial (2 hours (week)							
Total workload in hours 240 hours Credit points: 8	FCTS credits						
7Module A Course B C Final m	Total						
composition/Workload in hours Autonomous	Jaule						
work	ion incl.						
preparati	on						
a Contact h Drenara							
a contact d Prepara-							
hours tion/revision							
Lecture 60 60 15 1!	5 150						
Tutorial 30 40 10 10	) 90						
Total 90 100 25 2	5 <b>240</b>						
Examination requirements							
Form(s) of examination and 2 written examinations (3 hours each)							
contribution to final mark Tutorial problem sets							
2 written examinations: 80%							
	Tutorial problem sets: 20%						
Tutorial problem sets: 20%							
Tutorial problem sets: 20%							
Module retake examination     Written examination       Frequency duration     Annually winter correctory							
Module retake examination     Written examination       Frequency, duration     Annually, winter semester;       1 semester							
Module retake examination       Tutorial problem sets: 20%         Module retake examination       Written examination         Frequency, duration       Annually, winter semester; 1 semester         Intake capacity       Calculated according to expected number of students							

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MatWiss-BC 07	Organic Che	mistry Laborato	rv	3	<sup>rd</sup> semester	6 CP		
Module description	Organic Che	Organic Chemistry Laboratory						
Module code	MatWiss-BC	07						
Faculty/Subject/Department	Faculty 08/C	hemistry/Organi	c Chemistry					
Associated degree	BSc Chemist	ry, BSc Advanced	Materials /3 <sup>rd</sup> s	emester				
course(s)/Semester taken								
Module coordinator	Cf. German	Version						
Prerequisites	Successful co	ompletion of Ger	eral Chemistry	Laboratory, Orga	anic Chemistry			
Learning outcomes	Students sha	all:						
	master t	he safe set-up of	chemical equip	ment				
	master a	<ul> <li>master aspects of operational safety and safe reaction control</li> </ul>						
	master t	master the safe use of dangerous chemicals and reactions						
	master c	master organic-chemical separation and extraction methods						
	<ul> <li>be able t</li> </ul>	o analyse simple	NMR, IR and U	V spectra				
	<ul> <li>be able t</li> </ul>	o autonomously	undertake singl	e step organic r	eactions			
Module content	<ul> <li>Organic-</li> </ul>	chemical unit op	erations					
	Preparat	ion of simple che	emical compoun	ids (e.g. from th	e Organikum)			
	Extraction	on and separation	n methods					
	Reaction	Reaction control						
Former(a) of instruction	<ul> <li>Simple n</li> </ul>	nethods for struc	ture analysis					
Total workload in hours	190 hours			Cradit n	ainta 6 FCTS aradit			
Nodulo composition (Workload	180 nours	A Course			oints: 6 ECTS credit	S Total		
in hours		A Course		Autonomous	C Final module	TOLAI		
in nours				work	examination incl.			
				WORK	preparation			
			1			<u> </u>		
		a Contact	b Prepara-					
		hours	tion/revision					
	Laboratoria		20		45	4.25		
	Laboratory	90	30		15	135		
	Tutoriai	15	30		15	45		
Examination requirements	TOLAI	105			15	180		
Examination requirements	Successiulico	Simpletion of labo	oratory and lab i	eports				
Form(s) of examination and	Form: Labor	atory reports and	l preparations					
contribution to final mark	Mark: No ma	ark will be given;	the students pa	ss the module r	f all lab reports are	accepted		
	for submission	on.						
Module retake examination	Preparation	and protocols						
	rieparations							
Frequency, duration	Annually wi	nter semester						
	1 semester							
Intake capacity	80							
	Gorman							

 Language of instruction
 German

 Module guidance and literature: see notice board / Date: see course catalogue

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MatWiss-BC 08	Physical Che	mistry Laborat	ory	3	<sup>rd</sup> semester	5 CP		
		•	•	L				
Module description	Physical Che	Physical Chemistry Laboratory						
Module code	MatWiss-BC	08						
Faculty/Subject/Department	Faculty 08/C	hemistry/Physi	cal Chemistry					
Associated degree	BSc Chemist	ry, BSc Advance	ed Materials, BSc	Food Science				
course(s)/Semester taken								
Module coordinator	Cf. German	Version						
Prerequisites	Successful co	ompletion of G	eneral Chemistry	Laboratory, Phy	sical Chemistry I			
Learning outcomes	Students sha	all:						
	<ul> <li>be famili</li> <li>experimentation</li> <li>develop</li> <li>physical</li> <li>develop</li> <li>uncertai</li> </ul>	<ul> <li>be familiarised with fundamental physical-chemical measurement methods</li> <li>experimentally determine fundamental physical-chemical properties of thermodynamics, electrochemistry and chemical kinetics</li> <li>develop skills in recording and reporting measurements and in the analysis of physical-chemical experiments</li> <li>develop fundamental skills in data presentation, uncertainty estimation and</li> </ul>						
Module content	1) Experiments on phenomenological thermodynamics: ideal and real gases, calorimetry, first law of thermodynamics, thermochemistry, Joule-Thompson effect, partial molar quantity, chemical equilibrium 2) Experiments on electrochemistry: conductivity of strong and weak electrolytes, Ostwald's law of dilution, ionic migration, current-voltage characteristics, electrochemical cells, reversible cell potential (EMF) and its temperature dependency, concentration chains 3) Experiments on chemical kinetics: reactions of the 1 <sup>st</sup> and 2 <sup>nd</sup> order, temperature dependency of reaction speeds							
Form(s) of instruction	Laboratory ( Seminar (2 h	12 experiments iours x 5; accor	s, each 5 hours) npanying the labo	ratory)				
Total workload in hours	150 hours			Credit p	oints: 5 ECTS credit	S		
Module composition/Workload in hours		A Course		B Autonomous work	C Final module examination incl. preparation	Total		
		a Contact	h Prenara-					
		a contact						
		nours	tion/revision					
	Seminar	10	10	5	5	30		
	Laboratory	60	40	10	10	120		
	Total	70	50	15	15	150		
Examination requirements	Successful co	ompletion of te	st and experimen	ts				
Form(s) of examination and	Form: Labor	atory reports						
contribution to final mark	Mark: No ma	ark will be give	n; the students pa	ss the module i	f all lab reports are	accepted		
	for submissi	on.						
Module retake examination	Lab reports							
Frequency, duration	Annually, wi	nter semester:						
	1 semester	,						
Intake capacity	60							
Language of instruction	German							

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MatWiss-BM 01	Advance	d Materials I			3 <sup>rd</sup> semester	4 CP		
Module description	Advanced	Advanced Materials I – Introduction						
Module code	MatWiss-	-BM 01						
Faculty/Subject/Department	Faculty 0	7/Physics, Facult	y 08/Chemistry					
Associated degree	BSc Adva	BSc Advanced Materials /3 <sup>rd</sup> semester						
Modulo coordinator	Cf Corm	an Varsian						
Prorequisites	None							
Learning outcomes	Students	shall						
Module content	<ul> <li>acquire a fundamental factual knowledge of advanced materials: substance classes, important material properties</li> <li>be familiarised with methods for the classification of matters according to their properties</li> <li>acquire fundamental knowledge regarding the interrelationships between material states (solid, fluid, gas, plasma) and properties</li> <li>acquire fundamental knowledge regarding the interrelationships between material classes and functions</li> <li>gain an overview of the fundamental process for the production and machining of materials</li> <li>have a strong command of the relevant scientific vocabulary and terminology</li> <li>gain an overview of the themes, content and methodology of the lectures Advanced Materials I to IV</li> <li>Structure of matter (fundamentals)</li> <li>preparation of matter (solid-solid reactions, gas phase reactions, synthesis from the melt, solution, sol-gel, CVD, PLD, MBE, VLS, liquid-phase epitaxy, etc.)</li> <li>Differentiation of matter according to their basic properties and applications, structure-quantity relationships</li> <li>Structure of matter with multiple phases and alloys</li> </ul>							
	<ul> <li>Fundamentals of representations in phase diagrams</li> <li>Mechanical material properties (elasticity, plasticity, cracks and breakage)</li> <li>Heat treatment</li> <li>Chemical and tribological properties</li> </ul>							
Form(s) of instruction	Lect	ure (2 hours/we	ek)					
	Tuto	orial (1 hour/wee	ek)					
Total workload in hours	120 hour	s		Credi	it points: 4 ECTS cre	dits		
Module composition/Workload in hours		A Course		B Autonomous work	C Final module examination incl. preparation	Total		
		a Contact	b Prepara-					
		hours	tion/revision					
	Locture	30	15	15	0	60		
	Tutorial	15	20	10	15	60		
	Total	45	35	25	15	120		
Examination requirements	None							
Form(s) of examination and contribution to final mark	Written e Written e	Written examination Written examination: 100%						
Module retake examination	Written e	examination						
Frequency, duration	Annually,	winter semeste	r; 1 semester					
Intake capacity	Calculate	d according to e	xpected number	r of students				
Language of instruction	German	German						

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MatWiss-BA 02	Toxicology a	nd Law		5 <sup>tt</sup>	semester	2 CP		
Module description	Toxicology ar	Toxicology and Law						
Module code	MatWiss-BA	02						
Faculty/Subject/Department	Faculty 01/La	w, Faculty 11/Me	edicine					
Associated degree	BSc Chemistr	BSc Chemistry/5 <sup>th</sup> semester, BSc Advanced Materials /5 <sup>th</sup> semester, BSc Food Science/3 <sup>rd</sup>						
course(s)/Semester taken	semester							
Module coordinator	Dean, Faculty	/ 08						
Prerequisites	None							
Learning outcomes	Module com	ponent: Legal stu	dies_					
	Students sha	II:						
	• be aware	of the fundamer	ntal legal require	ements when de	ealing with dange	rous		
	substanc	es	0 1		0 0			
	• be able t	o deal with dange	erous substance	s in an adequate	e manner from a l	egal		
	point of v	view and participa	ate in the legal r	isk discourse		•		
	acquire t	he attestation of	competence acc	cording to § 5 of	f the restriction o	rdinance		
	on chemi	cals						
	• be in a po	osition to adapt to	o the relevant le	gal requiremen	ts through the ex	perience		
	gained in	practical work						
	Module com	ponent: Toxicolog	<u>zy</u>					
	Students sha	ll:						
	learn the	fundamentals ar	id fields of work	of toxicology				
	be inform	ned about the sou	urces and forms	of possible exp	osures			
	<ul> <li>understa</li> </ul>	nd toxicodynamic	c and toxicokine	tic processes ar	id mechanisms of			
	toxicolog	ical effects						
	<ul> <li>gain func</li> <li>substance</li> </ul>	lamental knowled	age of the functi	oning modes of	selected substan	ces or		
		e classes a apply the funda	montals of rick	accoccmont				
Modulo contont	De able to	s apply the funda		assessment				
Woddle content	The legal	ly mandatory cor	tent for the att	estation of com	netence according	a to the		
	restrictio	n ordinance on cl	hemicals in nar	icular:		5 10 110		
	Regulatic	ins regarding the	registration of c	langerous subst	ances			
	Regulatio	ons regarding the	classification. la	belling, and page	kaging of danger	ous		
	substanc	es	, ,	0, 11, 11, 11, 11, 11, 11, 11, 11, 11, 1				
	Regulation	ons regarding the	dispensing and	use of dangerou	us substances			
	Fundame	entals of dangero	us substances la	w in a wider co	ntext			
	Fundame	ntal knowledge o	of relevant quest	tions related to	constitutional, civ	/il and		
	Europear	n law						
	<ul> <li>Fundame</li> </ul>	ntal skills in the u	understanding o	f legal texts				
	Fundame	ental skills in the a	acquisition of leg	gal information				
	Toxicology							
	Definition	h and field of wor	k of toxicology					
	<ul> <li>Incorpora</li> <li>and colls</li> </ul>	ation possibilities	as well as comp	osition, structu	re and functions of	or organs		
		d chronic toxicity	dose-effect rel	ationshin				
	Resorption	on distribution s	torage metabol	ism and expulsi	on of foreign sub	stances		
	Toxic effe	ect mechanisms a	nd chemical car	cinogenesis (dif	ference in the	Junees		
	concentr	ation and summa	tion toxins)	(-				
	Effect cha	aracteristics of se	lected matters/	matter groups s	such as solvents,			
	environm	nental contamina	nts, metals or p	esticides .	,			
	Combina	tion effects						
	Risk asse	ssment through s	pecified limit va	lues such as MA	AK, BLW and BAT	values		
Form(s) of instruction	Lecture							
Total workload in hours	60 hours			Credit po	oints: 2 ECTS credi	ts		
Module composition/Workload		A Course		В	C Final module	Total		
in hours				Autonomous	examination inc	1		
				work				
					preparation			
		a Contact	b Prepara-					
	L	a contact						

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		hours	tion/revision				
	Lecture: Legal studies	11	10		9	30	
	Lecture: Toxicology	11	10		9	30	
	Total	22	20		18	60	
Examination requirements	None						
Form(s) of examination and contribution to final mark	Written exan Written exan	Written examination (120 minutes) Written examination: 100%					
Module retake examination	Written or or	al examination					
Frequency, duration	Winter seme 1 semester	ster;					
Intake capacity	120						
Language of instruction	German						

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MatWiss-BP 06	Experimenta	al Physics IV: Sol	id State Physics	4	<sup>th</sup> semester	6 CP	
Module description	Experimenta	Experimental Physics IV: Solid State Physics					
Module code	MatWiss-BP	06					
Faculty/Subject/Department	Faculty 07/P	hvsics					
Associated degree	BSc Physics.	BSc Advanced M	aterials				
course(s)/Semester taken	,						
Module coordinator	Cf. German	Version					
Prerequisites	Experimenta	al Physics I, Exper	imental Physics	II, Experimenta	l Physics III		
Learning outcomes	Students sha	all:					
	• be famil	iar with the conc	epts of solid stat	te physics			
	master t	ypical calculation	n methods for pr	operties of soli	ds		
	<ul> <li>have exp</li> </ul>	perience in the ca	alculation of cha	racteristic prop	erties through prac	tical	
	example	S					
Module content	Crystal struc	tures, diffractom	etry with x-rays	, neutrons, elec	trons, bond types,	phonons,	
	elastic prope	erties, sound pro	pagation, phone	onic density of s	tate, Boltzmann sta	itistics,	
	free electron	y, Debye-weiler	density of state	Eormi statistice	zmann transport ed	juation,	
	conductor/ii	sulator hole co	ncent Boltzman	n transport equ	iation for electrons		
	measureme	nt of relaxation t	imes. Fermi sph	ere, de Haas va	n Alphen effect, cvc	lotron	
	resonance, e	electricity transp	ort, ferroelectric	ity, diamagneti	sm and paramagne	tism,	
	ferromagnet	tism, semi-condu	ctors, doping, co	onductivity, Sch	ottky contact, pn-ti	ransition,	
	transistors	transistors					
Form(s) of instruction	Lecture	e (2 hours/week)					
	<ul> <li>Tutoria</li> </ul>	l (1 hour/week)					
	Labora	tory (2 hours/we	ek)	<u> </u>			
Total workload in hours	180 hours			Credit p	oints: 6 ECTS credit	S	
Module composition/Workload		A Course		В	C Final module	Total	
in hours				Autonomous	examination incl.		
				work	preparation		
					preparation		
		a Contact	b Prepara-				
		hours	tion/revision				
	Lecture	30	20			50	
	lutorial	15	45		5	65	
	Laboratory	30	25		10	190	
Examination requirements	50% of tuto	rial problems mu	50 st be successfull	l v solved all lah	oratory protocols a	ccented	
Examination requirements	for submissi	nn	st be successiun	y solveu, all lau		lepteu	
contribution to final mark	Tutorial ovo	rai examination	on topics covere	d in lecture and	alaboratory		
	Laboratory	arotocols					
	Laboratory						
	Written or o	ral examination	on topics covere	d in lecture an	d laboratory: 50%		
	Tutorial exercises: 25%						
	Laboratory p	protocols: 25%					
Module retake examination	Written or o	ral examination					
Frequency, duration	Annually, su	mmer semester;					
	1 semester						
Intake capacity	Calculated a	ccording to expe	cted number of	students			
Language of instruction	German						

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MatWiss-BP 05	Data Acquis	ition and Proces	sing	4	<sup>th</sup> semester	7 CP		
Module description	Data Acquisi	tion and Process	ing					
Module code	Matwiss-BP	05						
Faculty/Subject/Department	Faculty 07/P	nysics	ataviala					
Associated degree	BSC Physics,	BSC Advanced IVI	aterials					
Course(s)/ semester taken	Cf. Cormon V	larcian						
Niodule coordinator	Cr. German	Version	imantal Dhusics					
	Experimenta Studopto cha	ii Pilysics I, Exper		11				
Learning outcomes	Students sha	311. 						
	<ul> <li>have fun</li> </ul>	idamental knowl	edge of analogu	e and digital me	easurement technol	logy		
	<ul> <li>master t</li> </ul>	ne measuremen	t chain (with sen	isor equipment)	from signal acquisi	ition to		
	signal pr	be use of compu	visualisation	d coffuera for a	nacific manaurama	t		
	<ul> <li>Inaster t tochnologic</li> </ul>	ne use of compu	ter naruware an	u soltware for s	specific measureme	ent		
	<ul> <li>learn the</li> </ul>	by functions	t databases for	matter research	and he able to util	lico tho		
	data evo	hange in networ	k systems in the	context of new	types of problem	iise the		
Module content	Fundamenta	al measurement t	technology	context of new	types of problem			
module content	Analogo	us measurement	technology (me	asurement brid	ges measurement			
	amplifie	rs)			Bes) measurement			
	<ul> <li>Fundame</li> </ul>	entals of sensor t	technology with	different physic	cal mechanisms			
	Basic cire	cuitry of measure	ement and contr	ol technology fo	or the acquisition o	f		
	different	, t physical proper	ties (transmitter	s, measuremen	t of frequency and i	impulse		
	width, cl	losed loops)	•			·		
	Methods	s for reduction of	f noise (filter and	d correlation me	ethods, lock-in			
	measure	ement technology	y)					
	Set-up o	f measurement t	echnology (AD/	DA converter, in	iterfaces, data conv	version		
	and stor	age systems)						
	Measureme	nt technology for	r matter researc	<u>h</u>				
	<ul> <li>e.g. imperiod</li> </ul>	edance spectroso	сору					
	High res	olution scanning	probe microsco	py methods for	the characterisatio	n of		
	matter (	e.g. atomic force	microscopy for	surface analysis	s, use of image proc	essing		
	with digi	ital filter techniq	ues)					
	Computer sk	<u>(IIIS</u>			·····			
	<ul> <li>Program</li> <li>technological</li> </ul>	iming of a measu	rement problem	i (control of equ	upment) and meas	urement		
	Data and	by in an experim	n and modelling	ale (e.g. Lauviev	w) athematic/Manle)			
	<ul> <li>Data and</li> <li>Data evo</li> </ul>	hange and acqui	sition (database	s (e.g. Origin/ivia s Internet)	athematic/wapie/			
Form(s) of instruction	Lecture	(2 hours/week)		s, memery				
	Semina	r (1 hour/week)						
	<ul> <li>Laborat</li> </ul>	tory (3.2 hours/w	veek)					
Total workload in hours	210 hours	, (,	/	Credit p	oints: 7 ECTS credit	S		
Module composition/Workload		A Course		В	C Final modulo	Total		
in hours				Autonomous				
				work	examination incl.			
					preparation			
		a Contact	b Prepara-					
		hours	tion/revision					
	Lecture	30	30			60		
	Seminar	12	12		1	24		
	Laboratory	48	62		16	126		
	Total	90	104	1	16	210		
Examination requirements	Successful n	articipation in se	minar. all labora	tory reports acc	epted for submission	 on.		
	e accession p							
Form(c) of overvice the and	Mritton /2 h	ours) or oral ave	mination (1 have	r)				
contribution to final mark	Writton or o	ours) or oral exa-	100% (1 1100)	)				
	written of 0		10070					
Module retake examination	Written examination							

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Attachment 2: Module Descriptions	

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Annually, summer semester;
1 semester
Calculated according to expected number of students
German

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MatWiss-BM 04	Advanced N	laterials Laborat	ory I	4	<sup>th</sup> semester	6 CP		
	-							
Module description	Advanced M	Advanced Materials Laboratory I – Preparation of Solids						
Module code	MatWiss-BN	MatWiss-BM 04						
Faculty/Subject/Department	Faculty 08/C	Faculty 08/Chemistry, Faculty 07/Physics						
Associated degree	BSc Advance	3Sc Advanced Materials /4 <sup>th</sup> semester						
course(s)/Semester taken								
Module coordinator	Cf. German	Cf. German Version						
Prerequisites	None							
Learning outcomes	Students sha	all:						
	<ul> <li>gain exp for the p</li> <li>master t</li> <li>be able t</li> <li>interpret</li> </ul>	<ul> <li>gain experience in the fundamental chemical and physical preparation techniques for the preparation of solids</li> <li>master the fundamental methods of material synthesis</li> <li>be able to characterise the synthesised preparations or model substances and interpret the results</li> </ul>						
Module content	Synthesis of	solids						
	<ul><li>Solid sta</li><li>Synthesi</li></ul>	te reactions, trai s from solutions	nsport reactions					
	Gas phase	se methods						
Form(s) of instruction	Seminar (1 hour/week)							
	Laboratory (	Laboratory (5 hours/week)						
Total workload in hours	180 hours	-		Credit p	oints: 6 ECTS credit	S		
Module composition/Workload in hours		A Course		B Autonomous work	C Final module examination incl. preparation	Total		
		a Contact	b Prepara-					
		hours	tion/revision					
	Seminar	15	15	0	0	30		
	Laboratory	75	10	65	0	150		
	Total	90	25	65	0	180		
Examination requirements	Successful co	ompletion of test	t and practical ex	xperiments				
Form(s) of examination and	Form: Labor	atory reports						
contribution to final mark	Mark: No ma	ark will be given	(pass/fail).					
Module retake examination	Reports							
Frequency, duration	Annually, su	mmer semester;						
Intaka canacity	I semester	coording to over	ctad number of	studonts				
	Carman	ccording to expe	cted number of	students				
Language of instruction	German							

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MatWiss-BM 02	Advance	d Materials II			4 <sup>th</sup> semester	6 CP			
Module description	Advanced	d Materials II							
Module code	MatWiss	-BM 02							
Faculty/Subject/Department	Faculty 0	7/Physics, Facult	y 08/Chemistry						
Associated degree	BSc Adva	nced Materials /	4 <sup>th</sup> semester						
Module coordinator	Cf Germ	an Version							
Prerequisites	None								
	Students								
	<ul> <li>unde</li> <li>gain a</li> <li>devel</li> <li>devel</li> <li>learn</li> </ul>	<ul> <li>understand the fundamental importance of defects, impurities etc.</li> <li>gain an overview of the targeted manipulation of material properties</li> <li>develop an understanding of the thermodynamic treatment of defects</li> <li>develop fundamental knowledge regarding the failure mechanisms of matter</li> <li>learn concepts for the description of material combinations</li> </ul>							
Module content	<ul> <li>Physi defect</li> <li>Stres:</li> <li>Stres:</li> <li>Descrition</li> <li>Misci</li> <li>Corror</li> <li>Grain</li> <li>Nucle</li> <li>Fatign</li> <li>Defect</li> <li>Ionic</li> <li>Funct</li> </ul>	<ul> <li>Physical description of 0-dimensional, 1-dimensionsal and 2-dimensional structural defects (Burgers vector, etc.)</li> <li>Stresses in epitaxial matter</li> <li>Stresses caused by doping</li> <li>Description of relaxation phenomena</li> <li>Miscible phase TD</li> <li>Corrosion/oxidation (e.g. Si/SiO2) in the wider sense</li> <li>Grain boundaries, influence on mechanical properties</li> <li>Nucleation</li> <li>Fatigue/wear</li> <li>Defects/irregularities/dynamics of defect formation</li> <li>Ionic conduction</li> </ul>							
Form(s) of instruction	Lect     Tuto	cure (3 hours/we prial (2 hours/we	ek) ek)			, ,			
Total workload in hours	150 hour	s		Credi	t points: 5 ECTS cre	dits			
Module composition/Workload in hours		A Course		B Autonomous work	C Final module examination incl. preparation	Total			
		a Contact	b Prepara-						
		hours	tion/revision						
		nours	tionyrevision						
	Lecture	45	25	0	0	70			
	Tutorial	30	30	0	20	80			
	Total	75	55	0	20	150			
Examination requirements	None								
Form(s) of examination and contribution to final mark	Written e Written e	examination examination: 100	%						
Module retake examination	Written e	examination							
Frequency, duration	Annually, 1 semest	. summer semest er	er;						
Intake capacity	Calculate	d according to e	pected number	of students					
Language of instruction	German	-							

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MatWiss-BM 06	Material	Categories			5 <sup>th</sup> semester	4 CP		
	Wateria	categories			J Semester	<b>+</b> CI		
Module description	Material (	Categories						
Module code	MatWiss-	BM 06						
Faculty/Subject/Department	Faculty 07	7/Physics, Faculty	y 08/Chemistry					
Associated degree	BSc Advar	nced Materials /	5 <sup>th</sup> semester					
course(s)/Semester taken								
Module coordinator	Cf. Germa	Cf. German Version						
Prerequisites	None							
Learning outcomes	Students	shall:						
	• under differ	<ul> <li>understand the interrelationships between function, structure and properties of different material classes</li> </ul>						
	<ul> <li>be far classe</li> </ul>	miliar with the ch es	naracteristics and	d resulting appli	cation of the differe	nt material		
	• gain a	in overview of na	atural occurrenc	es and "markets	<i>."</i>			
	be far	niliarised with th	ne technological	aspects of matt	er machining			
	<ul> <li>be ab</li> </ul>	le to describe an	id categorise diff	ferent matter in	relation to specific	advanced		
Madula contant	matte	er problems						
widdule content	<ul> <li>Const</li> <li>Electr</li> </ul>	ruction matter						
	<ul> <li>Liecti</li> <li>Magn</li> </ul>	etic matter						
	<ul> <li>Flectr</li> </ul>	ochemically rele	want matters					
	<ul> <li>Semi-</li> </ul>	conductors						
	<ul> <li>Soft n</li> </ul>	natters (Polymer	s, LCs)					
Form(s) of instruction	Lecture (2 hours/week)							
	• Sem	Seminar (1 hour/week)						
Total workload in hours	120 hours	5		Credi	t points: 4 ECTS crea	lits		
Module composition/Workload		A Course		В	C Final module	Total		
in hours				Autonomous	evamination incl			
				work				
					preparation			
		a Contact	b Prepara-					
		hours	tion/revision					
	Lecture	30	10	10	10	60		
	Seminar	15	15	20	10	60		
	Total	45	25	30	20	120		
Examination requirements	None	•	•	•				
Form(s) of examination and	Seminar p	presentation or o	oral final examin	ation				
contribution to final mark	Seminar p	presentation or o	oral final examin	ation: 100%				
	'							
Module retake examination	Seminar p	presentation or o	oral final examin	ation				
Frequency, duration	Annually,	winter semester	r;					
	1 semeste	er						
Intake capacity	Calculate	d according to ex	xpected number	of students				
Language of instruction	German							

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MatWiss-BM 07	Modern (	Concepts in Adv	anced Materials		5 <sup>th</sup> semester	5 CP			
		•							
Module description	Modern C	Nodern Concepts in Advanced Materials							
Module code	MatWiss-	1atWiss-BM 07							
Faculty/Subject/Department	Faculty 07	aculty 07/Physics, Faculty 08/Chemistry							
Associated degree	BSc Advar	Sc Advanced Materials /5 <sup>th</sup> semester							
course(s)/Semester taken									
Module coordinator	Cf. Germa	Cf. German Version							
Prerequisites	None								
Learning outcomes	Students	shall:							
	<ul> <li>be far advan</li> <li>gain in this to</li> </ul>	<ul> <li>be familiarised with current research topics (within JLU and externally) in the field of advanced materials</li> <li>gain in-depth knowledge of a specific topic through a literature review and present this topic in a seminar presentation</li> </ul>							
Module content	<ul> <li>Nanoi</li> <li>Curre</li> <li>Soft n</li> <li>Surfac</li> <li>Solar</li> <li>Thin f</li> <li>Epitax</li> </ul>	<ul> <li>Nanomaterials</li> <li>Current topics in electrochemistry</li> <li>Soft matter</li> <li>Surface catalysis</li> <li>Solar cells</li> <li>Thin films with special magnetic properties</li> <li>Enitavial thin films</li> </ul>							
Form(s) of instruction	• Sem	Seminar (2 hours/week)							
Total workload in hours	150 hours	5	·	Cre	dit points: 5 ECTS cre	dits			
Module composition/Workload in hours		A Course		B Autonomou work	C Final module examination incl. preparation	Total			
		a Contact	h Prenara-						
		h a contact							
		nours	tion/revision						
	Seminar	30	40	50	30	150			
	Total	30	40	50	30	150			
Examination requirements	None								
Form(s) of examination and	Seminar p	presentation (1	hour)						
contribution to final mark	Seminar p	presentation: 10	00%						
Module retake examination	Seminar p	presentation							
Frequency, duration	Annually,	winter semeste	er;						
	1 semeste	er							
Intake capacity	Calculated	d according to e	expected number	of students					
Language of instruction	German								

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MatWiss-BM 05	Advanced M	laterials Labor	atory II	5	th semester	6 CP			
	•								
Module description	Advanced M	Advanced Materials Laboratory II - Properties of Materials and their Characterisation							
Module code	MatWiss-BN	1 05							
Faculty/Subject/Department	Faculty 08/C	hemistry, Facu	Ity 07/Physics						
Associated degree	BSc Advance	d Materials /5	<sup>th</sup> semester						
course(s)/Semester taken									
Module coordinator	Cf. German	Version							
Prerequisites	None								
Learning outcomes	Students sha	all have the ski	lls to characterise	standard mater	ials within a team:				
	different	tiation betwee	n bulk and surface	properties					
	<ul> <li>determine</li> </ul>	nation of struct	tural, electrical an	d optical prope	rties				
	<ul> <li>correlati</li> </ul>	on of material	properties with m	aterial and stru	ctural characteristic	CS			
Module content	Experiments	on:							
	Magneti	c properties (H	lall effect)						
	Determin	nation of the s	structure (scanning	g tunnelling mid	croscopy, SEM, x-ray	/			
	reflector	netry, physisol	ption)	neo cootroco		-+			
	Electroci	lenical charac	tensation (impeda	ance spectrosco	ppy, cyclic voltamme	etry,			
	Character	risation of sen	ni-conductors (cur	rent-voltage ch	aracteristics				
	nhotolur	minescence on	semi-conductors (cur	quantum wave	s")				
	<ul> <li>Material</li> </ul>	analysis (Auge	er effect Rutherfo	rd backscatterii	ag simultaneous mi	ulti-			
	element	analysis), mas	s spectrometry. IR	/Raman spectre	ometry				
	Chemica	Chemical analysis (FPS, FSCA: FDX)							
Form(s) of instruction	Seminar (0.7 hours/week)								
	Laboratory (4 hours/week)								
Total workload in hours	180 hours	/(	- /	Credit p	oints: 6 ECTS credit	s			
Module composition/Workload		A Course		В	C Final module	Total			
in hours				Autonomous					
				work	examination incl.				
					preparation				
		- Cantast	h Dava and						
		a Contact	b Prepara-						
		hours	tion/revision						
	Seminar	20	10	10	10	50			
	Laboratory	60	30	30	10	130			
	Total	80	40	40	20	180			
Examination requirements	All laborator	y reports must	be accepted for s	ubmission.	-				
		, ,	·						
Form(s) of examination and	Final collogu	ium (45 minut	مد)						
contribution to final mark	Final collogu	ium: 100%	(3)						
	i indi conoqu	100/0							
Module retake examination	Final collogu	iium							
Frequency, duration	Annually, wi	nter semester:							
	1 semester	,							
Intake capacity	Calculated a	ccording to exp	pected number of	students					
Language of instruction	German	0 1	-						

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MatWiss-BM 03	Advanced M	aterials III		5 <sup>ti</sup>	semester	5 CP		
Module description	Advanced Ma	atorials III - Stru	ctural Characteria	ation of Materi	alc			
Module code	MatWiss_BM				a15			
Faculty/Subject/Department	Faculty 07/P	US Dysics Faculty ()	8/Chamistry					
Associated degree		d Matorials /4 <sup>th</sup>	comostor					
course(s)/Semester taken	BSC Auvanced	u Wateriais /4	Semester					
Module coordinator	Cf German V	/ersion						
Prerequisites	None	Nono						
Learning outcomes	Students sha	II•						
	master se	n. Signtific method	ls for the analysis	of atomic near	field and long-ran	a order		
	of matter	r in theory and a	annlication	of atomic near		se order		
	<ul> <li>gain fund</li> </ul>	lamental knowl	edge of the interr	elationship bet	ween structure and	4		
	diffractio	n data of inorga	anic bonds	elationenip set				
	• be able to	• be able to determine the important atomic structural parameters of mainly						
	inorganic	compounds/m	atters from diffra	ction data (pha	se analysis, lattice			
	constants	s, lattice defects	s, particle size) wi	th computer-aid	ded analysis metho	ds		
	gain fund	lamental knowl	edge of the atom	ic structure of r	elevant matters in			
	advanced	materials						
	<ul> <li>master the methods</li> </ul>	ne scientific lang	guage and termin	ology of crystall	ography and diffra	ction		
Module content	Introduct	ion into crystall	ography and diffi	action theory (	elastic and inelastic	:		
	scattering	g, reciprocal lat	tice, structure fac	tores, atomic fo	orm factors)			
	Influence	of structural ar	nd measurement	parameters on	diffraction data (pe	eak		
	widening	, absorption, et	c.)					
	Experime	ental acquisition	of powder diffra	ction data				
	Iutorials	on crystallogra	ohy: analysis of da	ata with suitable	e analysis program	mes		
	(X Pert, C	Drigin, Powaceli	), determination	of lattice type a	nd constants, latti	ce		
	<ul> <li>Introduct</li> </ul>	ion into the cha	racterisation me	thods for nanos	tructures			
	<ul> <li>Introduct</li> </ul>	ion into comple	mentary method	s (FXAES/XANE	S. NMR. electron			
	microsco	pv)	,		,, e.eeu en			
Form(s) of instruction	Lecture	(2 hours/week)						
	Seminar	r (0.8 hours/wee	ek)					
	Practica	l tutorial (2 hou	rs/week)					
Total workload in hours	150 hours			Credit po	oints: 5 ECTS credit	S		
Module composition/Workload		A Course		В	C Final module	Total		
in hours				Autonomous	examination incl			
				work				
					preparation	<u> </u>		
		a Contact	b Prepara-					
		hours	tion/revision					
	Lecture	30	15	0	10	55		
	Seminar	12	6	0	17	35		
	Practical	30	10	0	20	60		
	tutorial							
	Total	72	31	0	47	150		
Examination requirements	Successful co	mpletion of pra	ctical tutorials					
Form(s) of examination and	Written exan	nination						
contribution to final mark	Written exan	nination: 100%						
Module retake examination	Written exan	nination						
Frequency, duration	Annually, wir	nter semester; 1	semester					
Intake capacity	Calculated ac	cording to expe	ected number of s	tudents				
Language of instruction	German	- ·						

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MatWiss-BM 09	Research Pr	oject I		e	<sup>th</sup> semester	9 CP			
Module description	Research Pr								
Module code	MatWiss-BN	MatWiss-BM 09							
Faculty/Subject/Department	Faculty 07/F	hysics, Faculty	08/Chemistry						
Associated degree	BSc Advance	ed Materials							
course(s)/Semester taken									
Module coordinator	Cf. German	Version							
Prerequisites	None								
Learning outcomes	Students sh	itudents shall complete a project and thereby:							
	<ul> <li>gain exp</li> <li>knowloc</li> </ul>	gain experience in the methods within one specific discipline and deepen their							
	<ul> <li>broader</li> </ul>	hooden their skills in reviewing literature and in scientific discussion							
	<ul> <li>deepen</li> </ul>	their skills in th	e use of multime	dia presentation	ntechniques includ	ing			
	didactic	aspects			r teeningues, meruu				
Module content	Literatu	re review							
	Experier	nce with moder	n equipment for t	he synthesis ar	d characterisation of	of matter			
	Impleme	enting a project	plan						
	<ul> <li>Discussi</li> </ul>	on and presenta	ation of results						
	Draft we	eekly progress r	eports and a final	report					
Form(s) of instruction	Participation	n in a current re	search and devel	opment project	for a duration of 5	weeks in			
	an external	institution (indu	istry or research (	centre); alterna	tively, in consultatio	n with			
		coordinator, pa	lty mombor moni	tors the progress	arch with which the	ough			
	weekly prog	ress reports	ity member mom	tors the progres	ss of the project this	ougn			
		sion of work pro	gramme (0 5 hou	irs/week)					
	Discuss	sion of weekly r	eports (0.5 hours	/week)					
	<ul> <li>Final d</li> </ul>	iscussion (0.5 h	ours/week)	,					
Total workload in hours	30 hours	,	, ,	Credit p	oints: 9 ECTS credit				
Module composition/Workload		A Course		В	C Final module	Total			
in hours				Autonomous	ovamination incl				
				work	examination inci.				
					preparation				
		a Contact	b Prepara-						
		hours	tion/revision						
		nours	tionyrevision						
	Placement	190	40	20	20	270			
	Total	190	40	20	20	270			
Examination requirements	None								
Form(s) of examination and	Written fina	l report							
contribution to final mark	Oral present	tation (30 minut	tes)						
		(	,						
	Written fina	l report: 70%							
	Oral present	tation: 30%							
Module retake examination	Written fina	l report							
	Oral present	tation (30 minut	tes)						
Frequency, duration	Annually, su	immer semester	r;						
Intako canacitu	L semester	coording to cur	acted number of	students					
	Calculated a	iccording to exp	ected number of	students					
Language of Instruction	German								

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MatWiss-BM 08	Advanced M	aterials IV		6 <sup>th</sup>	semester	3 CP	
Module description	Advanced M	atorials IV - Adv	anced Materials i	n Practice			
would description	Advanced Mi						
Module code	MatWiss-BM	08					
Faculty/Subject/Department	Faculty 07/Pl	nysics, Faculty 0	8/Chemistry				
Associated degree	BSc Advance	d Materials /6 <sup>th</sup>	semester				
course(s)/Semester taken							
Module coordinator	Cf. German V	'ersion					
Prerequisites	MatWiss BM	01-03					
Learning outcomes	Students sha	ll:					
	master th	ne fundamental	concepts and me	thods of technie	cal physics		
	be familia	arised with mat	erial production,	machining and p	processing technol	ogies	
	be able to	o assess advant	ages and disadva	ntages as well as	s costs of individua	11	
	be able to	s a access the ani	alication possibilit	ies of technolog	ties and processes	in an	
	industria	environment			gies and processes	man	
Module content	Macrosco	opic material pr	operties				
	Vacuum	technology					
	<ul> <li>Heating a</li> </ul>	ind refrigeratio	n technology				
	Material	processing met	hods				
Form(s) of instruction	Seminar	r (2 hours/week	:)				
Total workload in hours	90 hours			Credit po	ints: 3 ECTS credit	S	
Module composition/Workload		A Course		В	C Final module	Total	
in hours				Autonomous	examination incl		
				work			
					preparation		
		a Contact	b Prepara-				
		hours	tion/revision				
		110013					
	Seminar	15	15	0	5	35	
	Practical	30	0	0	25	55	
	tutorial						
	Total	45	15	0	30	90	
Examination requirements	None						
Form(s) of examination and	Written exan	nination					
contribution to final mark	Presentation						
	Written examination: 50%						
	Presentation	: 50%					
Module retake examination	Written exan	nination and pr	esentation				
Frequency, duration	Annually, sur	nmer semester	;				
	1 semester		-				
Intake capacity	Calculated ac	cording to expe	ected number of s	students			
Language of instruction	German	·					

Version 4 of February 8, 2012 and February 15, 2012

Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

MatWiss-BM 10	Bachelor's Thesis			6	<sup>th</sup> semester	12 CP	
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Module description	Bachelor's Thesis						
Module code	MatWiss-BM 10						
Faculty/Subject/Department	Faculty 07/Physics, Faculty 08/Chemistry						
Associated degree	BSc Advanced Materials /6 <sup>th</sup> semester						
course(s)/Semester taken							
Module coordinator	Cf. German Version						
Prerequisites	Successful completion of the compulsory modules in the 1 <sup>st</sup> – 5 <sup>th</sup> semesters						
Learning outcomes	Students should possess the skills to apply scientific methods to the development and						
	characterisa	characterisation of novel materials within the framework of a scientific experiment.					
	Students should be able to present their results in a scientific paper and defend their						
	findings. The dissertation can be an extension of the study project and come out of						
	experiments conducted while working at a commercial lab.						
Madula contant	Drafting of a work plan						
Wodule content	Familiarisation with relevant literature						
	Familiarisation with measurement and analysis methods undertaking and analysis						
	of experiments, discussion of results						
	Writing the dissertation						
Form(s) of instruction	All-day instruction on scientific work within a research team						
Total workload in hours	360 hours Credit points: 12 ECTS credits						
Module composition/Workload	A Course			В	C Final module	Total	
in hours				Autonomous			
				work	examination incl.		
					preparation		
		a Contact	h Prenara-				
		have	tion (novision				
		nours	tion/revision				
	Laboratory	280			80	260	
	Total	280			80	360	
Examination requirements	None	200			80	300	
2. Automation requirements	Home						
Form(s) of examination and	Written final report (discortation)						
contribution to final mark	Oral presentation (30 minutes)						
	oral presentation (so minutes)						
	Written final report (dissertation): 70%						
	Oral presentation (30 minutes): 30%						
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Module retake examination	If the dissertation is not passed, a new dissertation must be submitted according to § 34						
	para. 2 sentence 2 of the General Regulations.						
Frequency, duration	Annually, summer semester;						
Intoko conocitu	1 semester						
Language of instruction	German						