

Module Catalogue for the Subject

Nanostructure Technology

as a Bachelor's with 1 major with the degree "Bachelor of Science" (180 ECTS credits)

Examination regulations version: 2007 Responsible: Faculty of Physics and Astronomy



Contents

The subject is divided into		3
Content and Objectives of th	ne Programme	4
•	tions, Notes, In accordance with	5
Compulsory Courses	,	6
Nanostructure Technology	<i>I</i>	7
Basics of NanostructureTechnol		8
Principles of Electronics (with P		9
Lab Course Engineering		10
Advanced Practical Course Bach	nelor	11
Advanced Undergraduate Labora	atory (Classical Mechanics, Thermodynamics, Basic Circuitry)	12
<u> </u>	atory (Optics, Basic Semiconductor Circuits)	13
Industrial Internship		14
Mathematics for Engineer		15
Mathematics 3 for students of P		16
Mathematics 1 for students in N	<u> </u>	18
Mathematics 2 for students in N	lanostructural Engineering	19
Chemistry		20
General Chemistry for Physics a	nd Engineers	21
Experimental Physics		23
	ics, Thermodynamics, Waves and Oscillations)	24
Experimental Physics 2 (Electric	s and Magnetism) Quantum Phenomena, Introduction Atomic Physics)	25 26
Experimental Physics 4 (Introdu-		27
Experimental Physics 5 (Physics		28
	ate Phenomena [Semiconductor, Superconductivity, Magnetism]	
Theoretical Physics		30
Theoretical Physics 1 (Theoretical	al Mechanics)	31
Theoretical Physics 3 (Theoretic	al Quantum Mechanics)	32
Theoretical Physics 3 FOKUS (Th		33
Module Comprehensive T		34
•	ical Physics / Nanostructure Technology	35
•	ical Physics / Nanostructure Technology	36
Compulsory Electives		37
Nanomatrix Inorganic Materials Ch		38
Nanoparticle Synthesis and Struct		39
Nanomatrix insulation systems an Nanomatrix semiconductor materi	•	40
Nanomatrix Semiconductor Proces		41 42
Principles Micro/Nano- and Optoe	-	43
Nanomatrix Biomedical Materials		44
Nanomatrix Biocompatible Structu	9	45
Nanomatrix Biophysical Analyzing	Systems and Processes	46
Thesis		47
Bachelor Thesis Nanostructure Tec	chnology	48
Subject-specific Key Skills		49
•	Electrostatics and Electrodynamics)	50
Theoretical Physics 4 (Theoretical		51
Mathematics 4 for Students of Phy	isics and Engineering	52
Measurements and Data Analysis Computational Physics		53 54
Laboratory and Measurement Tech	nnology	54 55
Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 11-Jan-2023 • exam. reg. da-	page 2 / 56
(2007)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2007	



The subject is divided into

section / sub-section	ECTS credits	starting page
Compulsory Courses	132	6
Nanostructure Technology	12	7
Lab Course Engineering	18	10
Mathematics for Engineers	26	15
Chemistry	10	20
Experimental Physics	42	23
Theoretical Physics	16	30
Module Comprehensive Tests	8	34
Compulsory Electives	18	37
Thesis	10	47
Subject-specific Key Skills	14	49



Content and Objectives of the Programme

The goal of the studies is it to mediate knowledge on the most important subsections of the Nanostructure Technology and to make the students familiar with the methods of engineering scientific and physical thinking and working. By training of analytic thinking abilities the students acquire the ability to deal later with the various fields of applications and to compile the basic knowledge in particular necessary for a consecutive Bachelor and Master course of studies. Therefore the main emphasis is put on the understanding of the fundamental physical and chemical terms and laws as well as on basic engineering-scientific knowledge and the development of the typical scientific thinking and working structures. During the Bachelor thesis the student should work on an thematic and temporally limited experimental or theoretical engineering-scientific task in the field of Nanostructure Technology using well-known procedures and scientific criteria under guidance to a large extent independently.



Abbreviations used

Course types: $\mathbf{E} = \text{field trip}$, $\mathbf{K} = \text{colloquium}$, $\mathbf{O} = \text{conversatorium}$, $\mathbf{P} = \text{placement/lab course}$, $\mathbf{R} = \text{project}$, $\mathbf{S} = \text{seminar}$, $\mathbf{T} = \text{tutorial}$, $\ddot{\mathbf{U}} = \text{exercise}$, $\mathbf{V} = \text{lecture}$

Term: **SS** = summer semester, **WS** = winter semester

Methods of grading: **NUM** = numerical grade, **B/NB** = (not) successfully completed

Regulations: **(L)ASPO** = general academic and examination regulations (for teaching-degree programmes), **FSB** = subject-specific provisions, **SFB** = list of modules

Other: **A** = thesis, **LV** = course(s), **PL** = assessment(s), **TN** = participants, **VL** = prerequisite(s)

Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

In accordance with

the general regulations governing the degree subject described in this module catalogue:

ASP02007

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

15-Apr-2008 (2008-7)

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.



Compulsory Courses

(132 ECTS credits)



Nanostructure Technology

(12 ECTS credits)



Module title				,	Abbreviation	
Basics	of Nan	ostructureTechnology		11-N1-072-m01		
Modul	e coord	linator		Module offered by		
Manag	ing Dir	ector of the Institute o	f Applied Physics	Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisite	S		
1 seme	ester	undergraduate				
Conter	nts					
Princip	les of p	oroducing, characteris	sing and applying nanos	structures.		
Intend	ed lear	ning outcomes				
		have knowledge of th ructures.	e fundamental properti	es, technologies, cha	racterising methods and functi-	
Course	S (type,	number of weekly contact ho	urs, language — if other than G	erman)		
V + S (1	no info	rmation on SWS (weel	kly contact hours) and c	ourse language avail	able)	
		sessment (type, scope, la	nguage — if other than German	, examination offered — if no	ot every semester, information on whether	
written	exami	nation (approx. 90 mi	nutes)			
Allocat	tion of	places				
Additional information						
						
Worklo	Workload					

Module appears in

Bachelor' degree (1 major) Physics (2008)

Bachelor' degree (1 major) Technology of Functional Materials (2009)

Referred to in LPO I (examination regulations for teaching-degree programmes)

Bachelor' degree (1 major) Technology of Functional Materials (2010)

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Bachelor' degree (1 major) Technology of Functional Materials (2006)



Module title					Abbreviation	
Princip	les of I	Electronics (with Practica		11-N2-072-m01		
Module	e coord	linator		Module offered by		
Manag	ing Dir	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	its					
Princip techno		passive and active electro	onic components and	their application in	analogous and digital circuit	
Intend	ed lear	ning outcomes				
The stu			actical setup of elect	ronic circuits from th	ne field of analogous and digital	
Course	S (type, 1	number of weekly contact hours, I	anguage — if other than Ger	rman)		
V + P (r	no info	rmation on SWS (weekly o	contact hours) and co	urse language avail	able)	
		sessment (type, scope, langua	ge — if other than German,	examination offered — if no	ot every semester, information on whether	
written	exami	nation (approx. 90 minut	es)			
Allocat	ion of	places				
Additio	nal inf	ormation				
Workload						
						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module	Module appears in					
	Bachelor' degree (1 major) Nanostructure Technology (2007) No final examination (2010)					



Lab Course Engineering

(18 ECTS credits)



Module title					Abbreviation
Advan	ced Pra	ctical Course Bachelor			11-PFB-072-m01
Module coordinator				Module offered by	
Manag	ging Dire	ector of the Institute of A	pplied Physics	Faculty of Physics and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
4	(not)	successfully completed	11-E1, 11-E2		
Duration Module level Other prerequisites			Other prerequisites	1	
1 semester undergraduate 11-A3					
<u> </u>					

Contents

Principles of Nuclear, Atomic and Molecular Physics, experiments on cryogenic temperatures and correlated systems, properties of solids, surfaces and interfaces.

Intended learning outcomes

The students have knowledge of conducting an experiment and of analysing and documenting the experimental results. They have basic knowledge of issuing a scientific publication and of using modern evaluation systems. They are able to work on a task based on publications and to acquire practical experimental methods.

 $\textbf{Courses} \ (\textbf{type}, \, \textbf{number of weekly contact hours, language} - \textbf{if other than German})$

Fortgeschrittenen-Praktikum Bachelor Theorie (Advanced Practical Course Bachelor Theory): S (1 weekly contact hour)

Fortgeschrittenen-Praktikum Bachelor Praxis (Advanced Practical Course Bachelor Practice): P (3 weekly contact hours)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

This module has the following assessment components

- 1. Seminar: talk (with discussion) demonstrating the students' understanding of the physics-related aspects of the experiments to be prepared (approx. 30 minutes)
- 2. Lab course: Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. Students must prepare an experiment log (8 to 10 pages).

Students must register for assessment components 1 and 2 online (details to be announced). To pass this module, students must pass both assessment component 1 and assessment component 2.

Allocation of places

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Additional information

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Workload

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 $\textbf{Referred to in LPO I} \ \ (\text{examination regulations for teaching-degree programmes})$

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Module appears in

Bachelor' degree (1 major) Physics (2007)

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Physics (2008)

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)



Module	e title		Abbreviation			
Advance Basic C		dergraduate Laboratory (y)	11-PGA-NN-072-m01			
Module	e coord	inator		Module offered by		
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics and Astronomy		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
4	(not)	successfully completed				
Duratio	n	Module level	Other prerequisites			
1 seme	ester undergraduate Recommended: 11-PFR					
Conten	Contents					

Physical laws of mechanics, thermodynamics, optics, science of electricity, vibrations and waves.

Intended learning outcomes

The students have knowledge and skills of physical measuring instruments and experimental techniques. They are able to independently plan and conduct experiments in cooperation with others, and to document the results in a measurement protocol.

Courses (type, number of weekly contact hours, language — if other than German)

Beispiele aus Mechanik, Wärmelehre und Elektrik (Examples from Mechanics, Thermodynamics and Electricity, BAM): P (2 weekly contact hours)

Klassische Physik (Classical Physics, KLP): P (2 weekly contact hours)

Elektrizitätslehre und Schaltungen (Electricity and Circuits, ELS): P (2 weekly contact hours)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

This module has the following assessment components

- 1. Lab course in part 1: a) Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. b) Talk (with discussion) to test the students' understanding of the physics-related contents of the course (approx. 30 minutes).
- 2. Lab course in part 2: a) Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. b) Talk (with discussion) to test the students' understanding of the physics-related contents of the course (approx. 30 minutes).

Students must register for assessment components 1 and 2 online (registration deadline to be announced). Students will be offered one opportunity to retake element a) and/or element b). To pass an assessment component, they must pass both elements a) and b).

To pass this module, students must successfully complete two out of the three courses.

To pass this module, students must pass both assessment component 1 and assessment component 2.

Allocation of places

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Additional information

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Workload

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)



Module title				Abbreviation	
Advan	Advanced Undergraduate Laboratory (Optics, Basic Semiconductor Circuits)				11-PGB-NRN-072-m01
Module coordinator Module offered by				Module offered by	
Managing Director of the Institute of Applied Physics			oplied Physics	Faculty of Physics and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
2	(not)	successfully completed			
Duration Module level Other prerequisites					
1 seme	ester	undergraduate			

Contents

Physical laws of atomic physics, nuclear physics and wave optics. Basic measuring methods using computers and storage oscilloscopes.

Intended learning outcomes

The students have knowledge and skills of physical measuring instruments and experimental techniques. They are able to independently plan and conduct experiments in cooperation with others, and to document the results in a measurement protocol.

Courses (type, number of weekly contact hours, language — if other than German)

Wellenoptik (Physical Optics, WOP): P (2 weekly contact hours)

Atom- und Kernphysik (Atomic and Nuclear Physics, AKP): P (2 weekly contact hours)

Computer und Messtechnik (Computers and Measurement Technology, CMT): P (2 weekly contact hours)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

This module has the following assessment components

• Lab course: a) Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. b) Talk (with discussion) to test the students' understanding of the physics-related contents of the course (approx. 30 minutes).

Students must register for assessment online (registration deadline to be announced).

Students will be offered one opportunity to retake element a) and/or element b). To pass an assessment, students must pass both elements a) and b).

To pass this module, students must successfully complete one out of the three courses.

To pass this module, students must pass the assessment components.

Allocation of places

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Additional information

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Workload

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)



Module title					Abbreviation
Industrial Internship					11-PFI-072-m01
Module	e coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
8	(not)	successfully completed			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	its		,		
		ndustrial methods, work report and an oral prese		production method	s. Summary of own experiences
Intend	ed learı	ning outcomes			
					ustrial technologies with relevan- report and an oral presentation.
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	rman)	
P + S (r	no infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)
		sessment (type, scope, langua le for bonus)	ge — if other than German, o	examination offered — if no	ot every semester, information on whether
•	•	oort / fieldwork report / re cal course (20 pages)	eport on practical trai	ning / report on prac	ctical course / project report / re-
Allocat	ion of p	olaces			
Additional information					
Workload					
Referred to in LPO I (examination regulations for teaching-degree programmes)					

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)



Mathematics for Engineers

(26 ECTS credits)



Module title					Abbreviation
Mathematics 3 for students of Physics and Engineering 11-MPI3-062-m					11-MPI3-062-m01
Module	e coord	inator		Module offered by	
Manag and As			of Theoretical Physics	Faculty of Physics a	and Astronomy
ECTS	1	od of grading	Only after succ. con	npl. of module(s)	
8	1	rical grade		ipti oi iiioudic(s)	
Duratio		Module level	Other prerequisites		
1 semester undergraduate Admission prere 50% of exercises sion to assessment ve details at the be considered a students have of over the course cours			50% of exercises. C sion to assessment ve details at the beg be considered a dec students have obtai over the course of the assessment into eff mitted to assessme	ertain prerequisites. The lecturer will infogrant of the course claration of will to see the qualification he semester, the lecture of the current or information the current or information of the current will er date, students will er date.	successful completion of approximust be met to qualify for admisorm students about the respective. Registration for the course will ek admission to assessment. If in for admission to assessment curer will put their registration for eet all prerequisites will be adnithed the subsequent semester. For I have to obtain the qualification
Conten	ntc		Tor damission to as:	jessment anew.	
		partial differential eq	uations in Physics		
			dations in rinysics.		
		ning outcomes			
		nave basic mathema ntial equations.	iicai knowledge of dynan	nic equations and so	lution methods for common and
Course	S (type, r	number of weekly contact ho	ours, language — if other than Ge	rman)	
V + Ü (r	no info	rmation on SWS (wee	kly contact hours) and co	ourse language avail	able)
		sessment (type, scope, la	anguage — if other than German,	examination offered — if no	ot every semester, information on whether
		nation (approx. 120 r	ninutes)		
Allocat					
	ion or j	Huces			
Δdditia	nal inf	 ormation			
	mat IIII	omativii			
 \\\ - -					
Worklo	pad				
 Def-		IDO I (
	ea to in	LPU I (examination regul	ations for teaching-degree progra	ammes)	
 M = dl.		!			
Module appears in					
Bachelor' degree (1 major) Physics (2007)					
Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008)					
Bachelor' degree (1 major) Technology of Functional Materials (2009)					
Bachelor' degree (1 major) Technology of Functional Materials (2009) Bachelor' degree (1 major) Technology of Functional Materials (2010)					
Bachelor' degree (1 major) Nanostructure Technology (2010)					
Bachelor' degree (1 major) Nanostructure Technology (2010) Bachelor' degree (1 major) Nanostructure Technology (2012)					
Bachelor' degree (1 major) Nanostructure Technology (2012) Bachelor' degree (1 major) Nanostructure Technology (2008)					
Bachelor' degree (1 major) Nanostructure Technology (2008) Bachelor' degree (1 major) Nanostructure Technology (2007)					



Bachelor' degree (1 major) Functional Materials (2012) Bachelor' degree (1 major) Technology of Functional Materials (2006)



Module title Abbreviation					Abbreviation	
Mathe	Mathematics 1 for students in Nanostructural Engineering 10-M-NST1-072-m01					
Modul	e coord	linator		Module offered by		
Dean c	of Studi	es Mathematik (Mathema	atics)	Institute of Mathen	natics	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	undergraduate				
Conter	nts					
		nbers and functions, seq le differential equations.	uences and series, d	ifferential and integr	ral calculus in one variable, vector	
Intend	ed lear	ning outcomes				
ple pro able to	blems interp	in natural and engineerir	ng sciences, in partic	ular in the field of na	ns to apply these methods to sim- nostructure technology, and is	
		number of weekly contact hours,				
V + Ü (no info	rmation on SWS (weekly	contact hours) and co	ourse language avail	lable)	
		sessment (type, scope, langua ble for bonus)	age — if other than German,	examination offered — if no	ot every semester, information on whether	
writter	exami	nation (90 minutes)				
Allocat	tion of	places				
			-			
Additio	onal inf	ormation				
Workload						
						
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)					
Modul	Module appears in					
	Bachelor' degree (1 major) Nanostructure Technology (2008)					
Bache	Bachelor' degree (1 major) Nanostructure Technology (2007)					



Module title					Abbreviation	
Mathematics 2 for students in Nanostructural Engineering					10-M-NST2-072-m01	
Module	e coord	inator		Module offered by		
Dean o	f Studi	es Mathematik (Mathema	atics)	Institute of Mathem	natics	
ECTS	Meth	od of grading	Only after succ. com	ipl. of module(s)		
8	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	its					
		and systems of linear equ variables, differential equ			y, differential and integral calcu-	
Intende	ed lear	ning outcomes				
se met	hods to		ıral and engineering :		tics. He/She learns to apply the- ar in the field of nanostructure	
Course	S (type, 1	number of weekly contact hours, l	anguage — if other than Ger	man)		
V + Ü (r	no info	rmation on SWS (weekly o	contact hours) and co	urse language avail	able)	
		sessment (type, scope, langua ole for bonus)	ge $-$ if other than German, ϵ	examination offered — if no	ot every semester, information on whether	
written	exami	nation (90 minutes)				
Allocat	ion of	places				
Additio	nal inf	ormation				
Workload						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module	Module appears in					
	Bachelor' degree (1 major) Nanostructure Technology (2008)					
Bachel	Bachelor' degree (1 major) Nanostructure Technology (2007)					



Chemistry

(10 ECTS credits)



Module title					Abbreviation
General Chemistry for Physics and Engineers					08-CP1-072-m01
Module coordinator				Module offered by	
lecturer of the course				Institute of Inorganic Chemistry	
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)	
10	nume	rical grade			
Duration Module level Other prerequisites		5			
1 semester undergraduate					

Contents

This module discusses the fundamental principles of both inorganic and organic chemistry. The lab course gives students the opportunity to learn essential methods and perform simple experiments.

Intended learning outcomes

Students are able to explain the principles of the periodic table and to extract information from it. They are able to explain basic models of the structure of matter. They have developed the ability to use the language of chemical formulas to describe chemical reactions and to interpret them by identifying the type of reaction. They are able to identify fundamental problems in chemistry and perform experiments to solve them.

Courses (type, number of weekly contact hours, language — if other than German)

This module comprises 3 module components. Information on courses will be listed separately for each module component.

- o8-IOC-1-072: V (no information on SWS (weekly contact hours) and course language available)
- 08-CP1-1-072: V (no information on SWS (weekly contact hours) and course language available)
- 08-CP1-3-072: P (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

Assessment in module component o8-IOC-1-072: Organic Chemistry for students of medicine, biomedicine, dental medicine, engineering and natural science

- 3 ECTS, Method of grading: numerical grade
- written examination (approx. 60 minutes)

Assessment in module component o8-CP1-1-072: Basics of General an Inorganic Chemistry

- 5 ECTS, Method of grading: numerical grade
- written examination (60 minutes)

Assessment in module component o8-CP1-3-072: General and Analytical Chemistry (lab)

- 2 ECTS, Method of grading: (not) successfully completed
- for each experiment: Vortestate (pre-experiment exams, approx. 10 minutes each), assessment of practical performance (log, 2 to 5 pages), Nachtestate (post-experiment exams, approx. 10 minutes each)
- Assessment offered: once a year, summer semester
- Only after successful completion of module components: Successful completion of module component o8-CP1-1 is a prerequisite for participation in module component o8-CP1-3.

ob-ci 1-1 is a prerequisite for participation in module component ob-ci 1-3.
Allocation of places
Additional information
Workload



Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Bachelor' degree (1 major) Physics (2007)

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Physics (2008)

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Master's degree (1 major) Physics (2010)

No final examination (2010)



Experimental Physics

(42 ECTS credits)



Module	e title		Abbreviation			
Experir ons)	mental	Physics 1 (Mechanics, Th	11-E1-072-m01			
Module	e coord	linator		Module offered by		
Manag	ing Dir	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	its					
Physica	al laws	of mechanics, vibrations	and waves, thermod	ynamics		
Intende	ed lear	ning outcomes				
The stu	dents	understand the basic cor	texts and principles	of mechanics, vibrat	ion, waves and thermodynamics.	
Course	S (type, i	number of weekly contact hours, l	anguage — if other than Ger	rman)	·	
V + Ü (r	no info	rmation on SWS (weekly	contact hours) and co	ourse language avail	able)	
		sessment (type, scope, langua	ge — if other than German, o	examination offered — if no	et every semester, information on whether	
		nation (approx. 120 minu	tes)			
Allocat			(63)			
	1011 01	- Piuces				
Δdditio	nal inf	ormation				
	mat iiii	ormation				
Worklo	ad					
Referre	ed to in	LPO I (examination regulation:	s for teaching-degree progra	mmes)		
			<u> </u>			
Module appears in						
Bachelor' degree (1 major) Physics (2007)						
Bachelor' degree (1 major) Physics (2009)						
Bachelor' degree (1 major) Physics (2008)						
	Bachelor' degree (1 major) Nanostructure Technology (2008)					
	_	ree (1 major) Nanostructu)		
Bachel	Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)					



Module title					Abbreviation	
Experimental Physics 2 (Electrics and Magnetism)					11-E2-072-m01	
Module	e coord	inator		Module offered by		
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. com	ıpl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	its					
Physica	al laws	of the science of electric	ity, magnetism, electi	romagnetic vibration	s and waves	
Intend	ed learı	ning outcomes	<u> </u>			
		understand the basic cor	itexts and principles	of science of electric	ity, magnetism, electromagnetic	
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	man)		
V + Ü (ı	no infor	rmation on SWS (weekly	contact hours) and co	ourse language avail	able)	
		sessment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether	
written	examiı	nation (approx. 120 minu	tes)			
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)					
Module appears in						
Bachelor' degree (1 major) Physics (2007)						
Bachel	Bachelor' degree (1 major) Physics (2009)					
Bachelor' degree (1 major) Physics (2008)						
	_	ree (1 major) Nanostructu	•, .			
Bachel	Bachelor' degree (1 major) Nanostructure Technology (2007)					

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)



Modul	Module title Abbreviation						
Experimental Physics 3 (Optics, Quantum Phenomena, Introduction Atomic Physics) 11-E3-072-m01							
Modul	e coord	linator		Module offered by			
Manag	ging Dir	ector of the Institute of A	Applied Physics	Faculty of Physics a	and Astronomy		
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)			
8	nume	rical grade					
Durati	on	Module level	Other prerequisites	i			
1 seme	ester	undergraduate					
Conte	nts						
Physic	al laws	of optics, quantum phe	nomena, introduction	to Atomic Physics.			
Intend	led lear	ning outcomes					
The st		have knowledge of the	pasic contexts and pri	nciples of optics, qu	antum phenomena and Atomic		
Course	es (type,	number of weekly contact hours	, language — if other than Ge	rman)			
V + Ü (no info	rmation on SWS (weekly	contact hours) and co	ourse language avail	able)		
module writter	is credital	ole for bonus) nation (approx. 120 min		examination offered — if no	ot every semester, information on whether		
Alloca	tion of	places					
Additi	onal inf	ormation					
Workl	oad						
Referr	ed to in	LPO I (examination regulation	ons for teaching-degree progra	ummes)			
Modul	le appe	ars in					
	_	ree (1 major) Mathemat					
	Bachelor' degree (1 major) Mathematics (2007)						
Bachelor' degree (1 major) Physics (2007) Bachelor' degree (1 major) Physics (2009)							
Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008)							
	Bachelor' degree (1 major) Nanostructure Technology (2008)						
	Bachelor' degree (1 major) Nanostructure Technology (2007)						
	_	ree (1 major) Computati		09)			
Bache	Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)						



Module title					Abbreviation		
Experimental Physics 4 (Introduction to Solid State Physics) 11-E4-072-mo1							
Modul	e coord	inator		Module offered by			
Manag	ing Dire	ector of the Institute of A _l	oplied Physics	Faculty of Physics a	and Astronomy		
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)			
8	nume	rical grade					
Duratio	on	Module level	Other prerequisites				
1 seme	ster	undergraduate					
Conten	its						
		of solids: Bonding and solectron gas).	tructure, lattice dyna	mics, thermal proper	rties, principles of electronic pro-		
Intend	ed lear	ning outcomes					
		have knowledge of the ba properties, principles of	-	•	nding and structure, lattice dyna-		
Course	S (type, r	number of weekly contact hours,	anguage — if other than Ge	rman)			
V + Ü (no info	rmation on SWS (weekly	contact hours) and co	ourse language avail	able)		
		sessment (type, scope, langua ble for bonus)	ge — if other than German,	examination offered — if no	ot every semester, information on whether		
written examination (approx. 120 minutes)							
Allocation of places							
Additional information							
	-						

Workload

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 $\textbf{Referred to in LPO I} \ \ (\text{examination regulations for teaching-degree programmes})$

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Module appears in

Bachelor' degree (1 major) Mathematics (2008)

Bachelor' degree (1 major) Mathematics (2007)

Bachelor' degree (1 major) Physics (2007)

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Nanostructure Technology (2007)



Modul	Module title Abbreviation						
Experi	Experimental Physics 5 (Physics of Atoms and Molecules) 11-E5-072-m01						
Modul	e coord	linator		Module offered by			
Manag	ing Dir	ector of the Institute of A	pplied Physics	Faculty of Physics a	and Astronomy		
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)			
6	nume	rical grade					
Duratio	on	Module level	Other prerequisites				
1 seme	ster	undergraduate					
Conter	ıts		•				
Physic	al laws	of Atomic and Molecular	Physics.				
Intend	ed lear	ning outcomes					
Quantı	um med	chanical atom model, one	e/multi-electron atom	is, electronic dipole	d Molecular Physics (atoms: transitions, atoms in B field as itions, electronic excitations)		
Course	S (type,	number of weekly contact hours,	language — if other than Ge	rman)			
V + Ü (no info	rmation on SWS (weekly	contact hours) and co	ourse language avail	lable)		
		sessment (type, scope, langua ole for bonus)	age — if other than German,	examination offered — if no	ot every semester, information on whether		
written	exami	nation (approx. 120 minu	ites)				
Allocat	tion of	places					
-							
Additio	onal inf	ormation					
Worklo	ad						
Referred to in LPO I (examination regulations for teaching-degree programmes)							
Module appears in							
	Bachelor' degree (1 major) Physics (2007)						
	_	ree (1 major) Physics (20	•	`			
Bachel	Bachelor' degree (1 major) Nanostructure Technology (2007)						



Module title					Abbreviation	
	Experimental Physics 7 (Solid State Phenomena [Semiconductor, Superconductivity, Magnetism])					
Modul	e coord	inator		Module offered by		
Manag	ging Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. com	ıpl. of module(s)		
4	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	undergraduate				
Conte	nts	,				
Physic	al laws	of solid-state phenomen	a (semiconductors, s	uperconductivity, m	agnetism)	
•	_	ning outcomes		,	<u> </u>	
menol tic ord	ogical n er)	nodels, BCS model; magr	netism: Dia-, para- an	d ferromagnetism, r	erfaces; superconductivity: pheno- mean field description of magne-	
	_	number of weekly contact hours, l				
		rmation on SWS (weekly	•		·	
		sessment (type, scope, langua ble for bonus)	ge — if other than German, o	examination offered — if no	ot every semester, information on whether	
writter	n exami	nation (approx. 120 minu	tes)			
Alloca	tion of _I	olaces				
Additi	onal inf	ormation				
Workle	oad		•			
			,			
Referr	ed to in	LPO I (examination regulation	s for teaching-degree progra	mmes)		
Module appears in						
Bache	Bachelor' degree (1 major) Physics (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008)					
Bachelor' degree (1 major) Nanostructure Technology (2008)						
	Bachelor' degree (1 major) Nanostructure Technology (2007)					
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)						



Theoretical Physics

(16 ECTS credits)



Module title					Abbreviation	
Theoretical Physics 1 (Theoretical Mechanics)					11-T1-072-m01	
Modul	le coord	linator		Module offered by	<u>'</u>	
	ging Dir strophy		of Theoretical Physics	Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)		
8	nume	erical grade				
Durati	on	Module level	Other prerequisites	3		
1 seme	ester	undergraduate				
Conte	nts	•				
Newto	nian m	echanics, Lagrangian	mechanics, Hamiltoniar	equation of motion	, conservation laws.	
Intend	led lear	ning outcomes				
The st metho		have knowledge of th	ne principles of classical	theoretical mechani	cs and the required calculation	
Course	es (type,	number of weekly contact ho	ours, language — if other than Ge	rman)		
V + Ü ((no info	rmation on SWS (wee	ekly contact hours) and c	ourse language avai	lable)	
		sessment (type, scope, label for bonus)	anguage — if other than German,	examination offered — if no	ot every semester, information on whether	
writter	n exami	nation (approx. 120 r	minutes)			
Alloca	tion of	places				
Additi	onal inf	formation				
Workl	oad					
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Bache	lor' deg	ree (1 major) Mathem	natics (2008)			
n 1	Dealth aland also area (consists) Markey and the constitution (consists)					

Bachelor' degree (1 major) Mathematics (2007)

Bachelor' degree (1 major) Physics (2007)

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Physics (2008)

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Bachelor' degree (1 major) Computational Mathematics (2009)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)



Modul	e title			Abbreviation	
Theore	etical Pl	nysics 3 (Theoretical (Quantum Mechanics)		11-T3-072-m01
Modul	e coord	inator		Module offered by	
_	ing Dire	ector of the Institute o	f Theoretical Physics	Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)	
8	nume	rical grade			
Duratio	on	Module level	Other prerequisites	;	
1 seme	ester	undergraduate			
Conter	nts		,		
			nger equation, mathema spin, hydrogen atom, m		quantum mechanics, harmonic
Intend	ed lear	ning outcomes			
The stu	udents	have knowledge of th	e principles of quantum	mechanics and the	required calculation methods.
Course	es (type, r	number of weekly contact ho	urs, language — if other than Ge	rman)	
V + Ü (no info	rmation on SWS (weel	kly contact hours) and c	ourse language avai	lable)
		sessment (type, scope, landle for bonus)	nguage — if other than German,	examination offered — if n	ot every semester, information on whether
writter	exami	nation (approx. 120 m	inutes)		
Alloca	tion of	places			
Additio	onal inf	ormation			
Worklo	oad				
Referred to in LPO I (examination regulations for teaching-degree programmes)					
Modul	e appea	ars in			
Bachelor' degree (1 major) Mathematics (2008) Bachelor' degree (1 major) Mathematics (2007) Bachelor' degree (1 major) Physics (2007) Bachelor' degree (1 major) Physics (2000)					

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Physics (2008)

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Bachelor' degree (1 major) Computational Mathematics (2009)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)



Module	e title			,	Abbreviation	
Theoretical Physics 3 FOKUS (Theoretical Quantum Mechani				nics)	11-T3F-072-m01	
Module	e coord	inator		Module offered by		
_	ing Dire	ector of the Institute of Th	eoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	undergraduate				
Conten	nts					
		sical physics, Schrödinge gular momentum and spir	•		quantum mechanics, harmonic	
Intend	ed lear	ning outcomes				
The stu	udents	have knowledge of the pr	inciples of quantum	mechanics and the r	equired calculation methods	
Course	es (type, r	number of weekly contact hours, l	anguage — if other than Ger	rman)		
V + Ü (no info	rmation on SWS (weekly o	contact hours) and co	ourse language avail	able)	
		sessment (type, scope, langua ele for bonus)	ge — if other than German,	examination offered — if no	t every semester, information on whether	
written	exami	nation (approx. 120 minu	tes)			
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	oad					
-						
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)					
Module appears in						
	Bachelor' degree (1 major) Physics (2007)					
		ree (1 major) Physics (200				
	_	ree (1 major) Physics (200)		
Bacnel	Bachelor' degree (1 major) Nanostructure Technology (2008)					

Bachelor' degree (1 major) Nanostructure Technology (2007)



Module Comprehensive Tests

(8 ECTS credits)



Module title					Abbreviation	
Compr	ehensi	ve Exam in Theoretical Ph	re Technology	11-PREN-072-m01		
Modul	e coord	inator		Module offered by		
chairpe	erson o	f examination committee		Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. com	pl. of module(s)		
4	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conter	ıts					
					ands the connections between uired scientific methods.	
Intend	ed lear	ning outcomes				
		know the connections be the acquired scientific m		hysical and chemica	al terminology and laws and are	
Course	S (type, i	number of weekly contact hours, l	anguage — if other than Ger	man)		
A (no i	nforma	tion on SWS (weekly cont	act hours) and cours	e language available	e)	
		sessment (type, scope, langua ble for bonus)	ge $-$ if other than German, ϵ	examination offered — if no	ot every semester, information on whether	
oral ex	aminat	ion of one candidate eac	h (approx. 30 minute	s)		
Allocat	ion of	places				
-						
Additio	nal inf	ormation				
-						
Worklo	ad					
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
	Bachelor' degree (1 major) Nanostructure Technology (2008)					
Bachel	Bachelor' degree (1 major) Nanostructure Technology (2007)					



Module title Abbreviation						
Comprehensive Exam in Theoretical Physics / Nanostructure Technology 11-PRN-072-m01						
Modul	e coord	inator		Module offered by	y	
chairp	erson o	f examination committee		Faculty of Physics	and Astronomy	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
4	nume	rical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ester	undergraduate				
Conter	ıts					
	•	of the examination is to d g and is able to apply the		•	ofound methodological knowledge	
Intend	ed lear	ning outcomes				
The stu		have founded methodolo	gical knowledge in e	ngineering and are	able to apply the acquired scienti-	
Course	es (type, i	number of weekly contact hours, l	anguage — if other than Ger	rman)		
A (no i	nforma	tion on SWS (weekly cont	act hours) and cours	e language availab	ole)	
		sessment (type, scope, langua ble for bonus)	ge — if other than German,	examination offered — if	not every semester, information on whether	
oral ex	aminat	ion of one candidate eac	h (approx. 30 minute	s)		
Allocat	tion of	places				
Additio	onal inf	ormation				
Worklo	oad					
						
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)					
						
Modul	Module appears in					
	Bachelor' degree (1 major) Nanostructure Technology (2008) Bachelor' degree (1 major) Nanostructure Technology (2007)					



Compulsory Electives

(18 ECTS credits)



Module	Module title Abbreviation				
Nanomatrix Inorganic Materials Chemistry 08-NM-AW-072-m01					
Module coordinator Module offered by					
Dean o Pharma		es Chemie and Pharmazio	e (Chemistry and	Chair of Chemical T	echnology of Material Synthesis
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
engine science	ering, e e, nano	electronics and photonics	and biophysical app	olications and the te	he application directions power chnology fields of materials ent, in particular in the area of in-
Intende	ed lear	ning outcomes			
		e developed advanced kn eering work, in particular			ation directions or technology stry.
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	rman)	
R + V (r	o infor	mation on SWS (weekly o	ontact hours) and co	urse language avail	able)
		sessment (type, scope, langua le for bonus)	ge — if other than German, (examination offered — if no	ot every semester, information on whether
		mination (approx. 90 min			oral examination of one candition (approx. 10 pages)
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)				
Module	appea	ars in			
	Bachelor' degree (1 major) Nanostructure Technology (2008)				
Bachelor' degree (1 major) Nanostructure Technology (2007)					



Module title Abbreviation					
Nanoparticle Synthesis and Structuring Technologies					08-NM-NS-072-m01
Modul	e coord	inator		Module offered by	L
Dean o		es Chemie and Pharmazi	e (Chemistry and	Chair of Chemical T	echnology of Material Synthesis
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	undergraduate			
Conte	nts				
engine scienc	ering, e e, nano	electronics and photonics	and biophysical app and components an	olications and the te	the application directions power chnology fields of materials ent, in particular in the area of na-
Intend	ed lear	ning outcomes			
		•	_		ation directions or technology d structuring technologies.
Course	es (type, r	number of weekly contact hours, l	anguage — if other than Ger	rman)	
V + R (no infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)
		sessment (type, scope, langua le for bonus)	ge — if other than German,	examination offered — if no	ot every semester, information on whether
		mination (approx. 90 min oral examination in group) oral examination of one candi- rt (approx. 10 pages)
Alloca	tion of p	olaces			
Additio	onal inf	ormation			
Workle	oad				
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)				
Modul	e appea	ars in			
	_	ree (1 major) Nanostructu	•, .	•	
Bachelor' degree (1 major) Nanostructure Technology (2007)					



Module title					Abbreviation	
Nanom	natrix ir	isulation systems and p	11-NM-WP-072-m01			
Module coordinator				Module offered by		
Managing Director of the Institute of Applied Phys			pplied Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. co	ompl. of module(s)		
6	nume	rical grade				
Duration Module level		Other prerequisites				
1 semester undergraduate -						
Conter	ıts					

Principles and specific knowledge of engineering work in the application fields of energy engineering, electronics, photonics and biophysics as well as in the technology-oriented materials sciences, technologies of nanostructuring, components and system development, especially in the field of thermal insulation systems and photovoltaics.

Intended learning outcomes

The students have advanced knowledge of one or more application or technology areas of engineering work, especially in the field of thermal insulation systems and photovoltaics.

Courses (type, number of weekly contact hours, language — if other than German)

V + R (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 10 pages)

Allocation of places

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Additional information

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Workload

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Master's degree (1 major) Technology of Functional Materials (2010)



Module title					Abbreviation
Nanomatrix semiconductor materials					11-NM-HM-072-m01
Module coordinator				Module offered by	
Managing Director of the Institute of Applied Phys			oplied Physics	Faculty of Physics and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duration Module level		Other prerequisites			
1 semester undergraduate -					
Conter	Contents				

Principles and specific knowledge of engineering work in the application fields of energy engineering, electronics, photonics and biophysics as well as in the technology-oriented materials sciences, technologies of nanostructuring, components and system development, especially in the field of semiconductor materials.

Intended learning outcomes

The students have advanced knowledge of one or more application or technology areas of engineering work, especially in the field of semiconductor materials.

 $\textbf{Courses} \ (\textbf{type, number of weekly contact hours, language} - \textbf{if other than German})$

V + R (no information on SWS (weekly contact hours) and course language available)

 $\textbf{Method of assessment} \ (\textbf{type}, \textbf{scope}, \textbf{language} - \textbf{if other than German, examination offered} - \textbf{if not every semester, information on whether} \ (\textbf{type}, \textbf{scope}, \textbf{language} - \textbf{if other than German, examination offered} - \textbf{if not every semester, information on whether} \ (\textbf{type}, \textbf{scope}, \textbf{language}) \ (\textbf{type}, \textbf{language}) \$ module is creditable for bonus)

a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 10 pages)

Allocation of places

Additional information

Workload

Referred to in LPO I (examination regulations for teaching-degree programmes)

Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Master's degree (1 major) Technology of Functional Materials (2010)



Module title Abbreviation					
Nanomatrix Semiconductor Processing					11-NM-HP-072-m01
Module coordinator				Module offered by	
Managing Director of the Institute of Applied Physic			oplied Physics	ed Physics Faculty of Physics and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duration Module level		Other prerequisites			
1 semester undergraduate					
Contents					

Principles and specific knowledge of engineering work in the application fields of energy engineering, electronics, photonics and biophysics as well as in the technology-oriented materials sciences, technologies of nanostructuring, components and system development, especially in the field of semiconductor processes.

Intended learning outcomes

The students have advanced knowledge of one or more application or technology areas of engineering work, especially in the field of semiconductor processes.

 $\textbf{Courses} \ (\textbf{type, number of weekly contact hours, language} - \textbf{if other than German})$

V + R (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 10 pages)

Allocation of places

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Additional information

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Workload

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Master's degree (1 major) Technology of Functional Materials (2010)



Module title Abbreviation					
Principles Micro/Nano- and Optoelectronic Devices 11-NM-MB-072-m01					
Module	e coord	linator		Module offered by	-
Manag	ing Dir	ector of the Institute of A	oplied Physics	Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	its				
structu compo	ring, connents.	omponents and system d			sciences, technologies of nano- cro-/nano- and optoelectronic
		ning outcomes	,		
		have advanced knowleds the field of micro-, nano-			gy areas of engineering work,
Course	S (type, i	number of weekly contact hours,	anguage — if other than Ge	rman)	
V + R (r	no info	rmation on SWS (weekly	contact hours) and co	urse language avail	able)
		sessment (type, scope, langua ble for bonus)	ge — if other than German,	examination offered — if no	ot every semester, information on whether
		mination (approx. 90 minoral examination in group) oral examination of one candi- rt (approx. 10 pages)
Allocat	ion of	places			
Additio	nal inf	ormation			
	_				
Worklo	ad				
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
Module	e appea	ars in			
	_	ree (1 major) Nanostructi			
Bachelor' degree (1 major) Nanostructure Technology (2007)					



Module title					Abbreviation
Nanomatrix Biomedical Materials					03-NM-BW-072-m01
Module coordinator				Module offered by	, I
•		f examination committee ne Human-Computer Int		Faculty of Medicine	2
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	its				
nics an	d phot	onics and biophysical ap	oplications as well as	the technology focu	reas power engineering, electro- ises materials science, nanostruc- e area of biomedical materials.
Intend	ed learı	ning outcomes			
		e developed an advanced with a particular focus o			rea or technology focus of engi-
Course	S (type, r	number of weekly contact hours,	language — if other than Ge	rman)	
V + R (r	no infor	mation on SWS (weekly	contact hours) and co	ourse language avai	lable)
		sessment (type, scope, langua le for bonus)	age — if other than German,	examination offered $-$ if n	ot every semester, information on whether
		mination (approx. 90 mination in group			c) oral examination of one candi- rt (approx. 10 pages)
Allocat	ion of p	olaces			
-					
Additio	nal inf	ormation			
Worklo	ad				
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)				
Module	e appea	ars in			
	Bachelor' degree (1 major) Nanostructure Technology (2008)				
Bachelor' degree (1 major) Nanostructure Technology (2007)					



Module title					Abbreviation
Nanomatrix Biocompatible Structuring Technologies					07-NM-BS-072-m01
Module	e coord	linator		Module offered by	1
Dean o	f Studi	es Biologie (Biology)		Faculty of Biology	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	its		,		
science biocom	e, nanc patibl	e structuring technolog e structuring technolog	gies and components an		echnology fields of materials ent, in particular in the area of
		ning outcomes			
			knowledge and skills in ular in the area of bioco		ition directions or technology g technologies.
Course	S (type, i	number of weekly contact hou	urs, language — if other than Ge	rman)	
V + R (r	no info	rmation on SWS (week	dy contact hours) and co	ourse language avai	lable)
		sessment (type, scope, lar ble for bonus)	nguage — if other than German,	examination offered — if n	not every semester, information on whether
			minutes) or b) talk (approus oups (approx. 30 minute		c) oral examination of one candiort (approx. 10 pages)
Allocat	ion of	places			
Additio	nal inf	ormation			
Worklo	ad				
Referre	d to in	LPO I (examination regula	tions for teaching-degree progra	ammes)	
Module	e appe	ars in			
Bachel	or' deg	ree (1 major) Nanostru	acture Technology (2008	B)	

Bachelor' degree (1 major) Nanostructure Technology (2007)



Module title					Abbreviation	
Nanom	natrix B	iophysical Analyzing Sys	.	11-NM-BV-072-m01		
Modul	e coord	inator		Module offered by		
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	undergraduate				
Conter	ıts		•			
nics, p	hotonic Iring, co	s and biophysics as well	as in the technology	/-oriented materials s	of energy engineering, electro- sciences, technologies of nano physical analysis systems and	
Intend	ed lear	ning outcomes				
		have advanced knowledg he field of biophysical ar			gy areas of engineering work,	
Course	C (tuno r	number of weekly contact hours. I	anguago if other than Co	rman)		

 $\textbf{Courses} \ (\text{type, number of weekly contact hours, language} - \text{if other than German})$

V + R (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 10 pages)

Allocation of places

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Additional information

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Workload

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Master's degree (1 major) Technology of Functional Materials (2010)



Thesis

(10 ECTS credits)



Module title Abbreviation					Abbreviation
Bachelor Thesis Nanostructure Technology					11-BA-N-072-m01
Module coordinator				Module offered by	
chairpe	erson o	f examination committee		Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	ipl. of module(s)	
10	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
					ask in the field of nanostructure riting of the Bachelor's thesis.
Intend	ed lear	ning outcomes			
structu	re tech		ce of a supervisor, es	pecially in accordan	d engineering task from nano- ce with known methods and
Course	S (type, r	umber of weekly contact hours, l	anguage — if other than Ger	man)	
no cou	rses as	signed			
		sessment (type, scope, langua le for bonus)	ge — if other than German, o	examination offered — if no	ot every semester, information on whether
written	thesis	(approx. 25 pages)			
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
Module	e appea	rs in			
		ree (1 major) Nanostructu	ıre Technology (2010))	
	_	ree (1 major) Nanostructı			
	_	ree (1 major) Nanostructu			
Bachel	Bachelor' degree (1 major) Nanostructure Technology (2007)				



Subject-specific Key Skills

(14 ECTS credits)



Modul	e title				Abbreviation
Theoretical Physics 2 (Theoretical Electrostatics and Electrodynamics)					11-T2-072-m01
Modul	e coord	linator		Module offered	by
	ging Dir strophy	ector of the Institute o	of Theoretical Physics	Faculty of Physi	cs and Astronomy
ECTS		od of grading	Only after succ. cor	npl. of module(s)	
8		erical grade			
Duratio		Module level	Other prerequisites	.	
1 seme	ester	undergraduate			
Conter	_		Į.		
	_	. magnetostatics. Max	well equations, covaria	nt formulation, el	ectrodynamics and matter.
		ning outcomes			
			e principles of classical	electrodynamics	and the required calculation me-
Course	es (type,	number of weekly contact ho	urs, language — if other than Ge	rman)	
V + Ü (no info	rmation on SWS (wee	kly contact hours) and c	ourse language a	vailable)
Metho	d of as	sessment (type, scope, la	nguage — if other than German,	examination offered —	if not every semester, information on whether
		ole for bonus)			
written	ı exami	nation (approx. 120 m	ninutes)		
Allocat	tion of	places			
Additio	onal inf	formation			
Worklo	oad				
Referre	ed to in	LPO I (examination regula	ations for teaching-degree progra	ammes)	
		- I (examination regation	actions for todaming degree progre		
Modul	e appe	ars in			
		gree (1 major) Mathem	atics (2008)		
	_	gree (1 major) Mathem			
	_	ree (1 major) Physics			
	_	gree (1 major) Physics			
Bachel	lor' deg	ree (1 major) Physics	(2008)		
	_	•	ucture Technology (2008	3)	
	_	•	ucture Technology (2007		
	_	•	ational Mathematics (20		
D11		,) Disersia - (Missau 0)		

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)



Module	e title		Abbreviation		
Theoretical Physics 4 (Theoretical Thermodynamics and St				atistics)	11-T4-072-m01
Modul	e coord	inator		Module offer	ed by
Manag and As		ector of the Institute of	f Theoretical Physics	Faculty of Phy	ysics and Astronomy
ECTS	Meth	od of grading	Only after succ. cor	npl. of module	(s)
8	nume	rical grade			
Duratio	on	Module level	Other prerequisites	}	
1 seme	ster	undergraduate			
Conten	ıts	, <u> </u>	· · ·		
Princip chanic		hermodynamics, fund	amental theorems, ther	modynamic po	tentials, principles of statistical me-
Intend	ed lear	ning outcomes			
		have knowledge of the ethods.	e principles of thermody	namics and st	atistical mechanics and the required
Course	S (type, i	number of weekly contact hou	ırs, language — if other than Ge	rman)	
V + Ü (ı	no info	rmation on SWS (week	kly contact hours) and c	ourse language	e available)
		sessment (type, scope, lan ble for bonus)	nguage — if other than German,	examination offere	d-if not every semester, information on whether
written	exami	nation (approx. 120 m	inutes)		
Allocat	ion of	places			
Additio	nal inf	ormation			
Worklo	ad				
	-		,		
Referre	ed to in	LPO I (examination regular	tions for teaching-degree progra	ammes)	
Module	e appe	ars in			
		ree (1 major) Mathema	atics (2008)		
	_	ree (1 major) Mathema			
	_	ree (1 major) Physics (
Bachel	or' deg	ree (1 major) Physics ((2009)		
	_	ree (1 major) Physics (
Bachel	or' deg	ree (1 major) Nanostru	(2008) Icture Technology (2008 Icture Technology (2007	-	

Bachelor' degree (1 major) Computational Mathematics (2009) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)



Module title Abbreviation						
Mather	Mathematics 4 for Students of Physics and Engineering 11-MPI4-062-mo1					
Module coordinator				Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics			eoretical Physics	Faculty of Physics and Astronomy		
ECTS						
8						
Duratio	Duration Module level		Other prerequisites			
1 semester		undergraduate				
Conten	ts					
Functio	nal an	alysis and complex analy	sis.			
Intende	ed lear	ning outcomes				
The students have basic knowledge of mathematics of Hilbert space and the theory of functions of a complex variable as well as the required calculation methods.						
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	man)		
V + Ü (r	no info	rmation on SWS (weekly o	contact hours) and co	ourse language avail	able)	
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)						
written	exami	nation (approx. 120 minu	tes)			
Allocat	ion of _I	olaces				
Additio	nal inf	ormation				
Worklo	ad					
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Bachelor' degree (1 major) Physics (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008) Bachelor' degree (1 major) Nanostructure Technology (2010) Bachelor' degree (1 major) Nanostructure Technology (2012)						
	Bachelor' degree (1 major) Nanostructure Technology (2008)					

Bachelor' degree (1 major) Nanostructure Technology (2007)



Module title				Abbreviation	
Measurements and Data Analysis					11-PFR-072-m01
Module coordinator				Module offered by	
Managing Director of the Institute of Applied Physics			oplied Physics	Faculty of Physics and Astronomy	
ECTS	Metho	od of grading	Only after succ. compl. of module(s)		
2	nume	erical grade			
Duration Module level		Other prerequisites			
1 semester		undergraduate			
Contents					

Types of error, error approximation and propagation, graphs, linear regression, average values and standard deviation, distribution functions, significance tests, writing of lab reports and publications.

Intended learning outcomes

In this module, the students acquire subject-specific transferable skills. They have knowledge of practical experimental work, error propagation and the principles of statistics.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Bachelor' degree (1 major) Mathematics (2008)

Bachelor' degree (1 major) Mathematics (2007)

Bachelor' degree (1 major) Physics (2007)

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Physics (2008)

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Bachelor' degree (1 major) Computational Mathematics (2009)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)



Module title					Abbreviation
Computational Physics					11-A1-072-m01
Module coordinator				Module offered by	
Managing Director of the Institute of Theoretical Physics and Astrophysics				Faculty of Physics and Astronomy	
ECTS	Method of grading Only after succ. o		Only after succ. cor	mpl. of module(s)	
6	numerical grade				
Duratio	Duration Module level		Other prerequisites		
1 semester unde		undergraduate			
Contents					
Introduction to two of the programming languages relevant for students of Physics and Engineering, solving physical problems with computer programmes.					
Intended learning outcomes					
The students have acquired the following transferable skills: Basic knowledge of two programming languages, skills in working with computers, knowledge of algorithms to solve numeric physical problems.					
Courses (type, number of weekly contact hours, language — if other than German)					
V + Ü (no information on SWS (weekly contact hours) and course language available)					

 $\textbf{Method of assessment} \ (\textbf{type}, \textbf{scope}, \textbf{language} - \textbf{if other than German, examination of fered} - \textbf{if not every semester, information on whether} \ (\textbf{type}, \textbf{scope}, \textbf{language} - \textbf{if other than German, examination of fered} - \textbf{if not every semester, information on whether} \ (\textbf{type}, \textbf{scope}, \textbf{language}) \ (\textbf{type}, \textbf{language})$

Allocation of places

module is creditable for bonus)

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Additional information

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Workload

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Bachelor' degree (1 major) Physics (2007)

written examination (approx. 120 minutes)

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Physics (2008)

Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)



Module title					Abbreviation
Laboratory and Measurement Technology					11-A3-072-m01
Module coordinator				Module offered by	
Managing Director of the Institute of Applied Physics				Faculty of Physics and Astronomy	
ECTS	Method of grading		Only after succ. compl. of module(s)		
6	numerical grade				
Duratio	Duration Module level		Other prerequisites		
1 semester		undergraduate	Admission prerequisite to assessment: successful completion of approx. 50% of exercises. Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.		

Contents

Introduction to electronic and optical measuring methods of physical metrology, vacuum technology and cryogenics, cryogenics, light sources, spectroscopic methods and measured value acquisition.

Intended learning outcomes

The students have acquired the following transferable skills: Electronic and optical measuring methods in physical metrology, cryogenics and vacuum technology, cryogenics, light sources, spectroscopic methods and measured value acquisition.

 $\textbf{Courses} \ (\textbf{type}, \, \textbf{number of weekly contact hours, language} - \textbf{if other than German})$

V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 120 minutes)

Allocation of places

Only as part of pool of general key skills (ASQ): 15 places. Places will be allocated by lot.

Additional information

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Workload

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Bachelor' degree (1 major) Physics (2007)

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Physics (2008)

Bachelor' degree (1 major) Nanostructure Technology (2010)

Bachelor' degree (1 major) Nanostructure Technology (2012)

Bachelor' degree (1 major) Nanostructure Technology (2008)



Bachelor' degree (1 major) Nanostructure Technology (2007)

Master's degree (1 major) Technology of Functional Materials (2010)

Master's degree (1 major) Technology of Functional Materials (2009)

Master's degree (1 major) Functional Materials (2012)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2010)