

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: 2020 Responsible: Faculty of Physics and Astronomy

JMU Würzburg • generated 19-Apr-2025 • exam. reg. data record 82|224|-|-|H|2020

Julius-Maximilians-UNIVERSITÄT WÜRZBURG

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Advanced and Computational Data Analysis Thesis Bachelor Thesis Nanostructure Technology

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The subject is divided into

section / sub-section	ECTS credits	starting page
Compulsory Courses	118	9
Nanostructure Technology	27	10
Classical Physics	16	31
Optics and Quantum Physics I	6	38
Optics and Quantum Physics II	10	42
Solid State Physics	8	45
Theoretical Physics I	6	48
Theoretical Physics II	10	51
Mathematics	24	55
Laboratory Course Physics	11	60
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Materials Science		77
Life Sciences		101
Mathematics, Theory and Computer Aided Methods		116
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Learning Outcomes

German contents and learning outcome available but not translated yet.

Nach erfolgreichem Abschluss des Studiums verfügen die Absolventinnen und Absolventen über die folgenden Kompetenzen:

- Die Absolventinnen und Absolventen besitzen Abstraktionsvermögen, analytisches Denken, Problemlösungskompetenz und die Fähigkeit, komplexe Zusammenhänge zu strukturieren.
- Sie verstehen die Grundlagen und Zusammenhänge der Nanowissenschaften.
- Sie verfügen über Kenntnisse der physikalischen, chemischen und technischen Grundlagen der Nanostrukturtechnik in Theorie und Praxis sowie über die theoretischen und experimentellen Methoden zur Erlangung neuer Erkenntnisse.
- Sie verfügen über ein breites Grundlagenwissen aus den wichtigsten Teilgebieten der Nanowissenschaften sowie tiefergehende Kenntnisse in mindestens einem Teilgebiet.
- Sie sind in der Lage, sich mit Hilfe von Fachliteratur in neue Aufgabegebiete einzuarbeiten, physikalische und technische Methoden unter Anleitung auf konkrete Aufgabenstellungen anzuwenden, Lösungswege zu entwickeln und die Ergebnisse zu interpretieren und zu bewerten.
- Sie sind in der Lage, Probleme der Nanostrukturtechnik nach wissenschaftlichen Arbeitsweisen und unter Beachtung der Regeln guter wissenschaftlicher Praxis zu bearbeiten.
- Sie sind in der Lage, ihr Wissen und ihre Erkenntnisse einem Fachpublikum gegenüber darzustellen und zu vertreten.

Wissenschaftliche Befähigung

- Die Absolventinnen und Absolventen verstehen die mathematischen, theoretischen und experimentellen Grundlagen der Nanostrukturwissenschaften und können diese anwenden.
- Die Absolventinnen und Absolventen können unter Anleitung Experimente durchführen, analysieren und die erhaltenen Ergebnisse darstellen und bewerten.
- Die Absolventinnen und Absolventen setzen die erlernten die theoretischen und experimentellen Methoden unter Anleitung zur Erlangung neuer Erkenntnisse in den Nanostrukturwissenschaften um.
- Die Absolventinnen und Absolventen sind in der Lage, Probleme mit wissenschaftlicher Arbeitsweise und unter Beachtung der Regeln guter wissenschaftlicher Praxis (Dokumentation, Fehleranalyse) zu bearbeiten.
- Die Absolventinnen und Absolventen können ihr Wissen und ihre Erkenntnisse einem Fachpublikum gegenüber darstellen und vertreten.
- Die Absolventinnen und Absolventen können ein breites Grundlagenwissen aus den wichtigsten Teilgebieten der Nanostrukturwissenschaften sowie tiefergehende Kenntnisse in mindestens einem Teilgebiet abrufen.
- Die Absolventinnen und Absolventen verstehen die wesentlichen Zusammenhänge und Konzepte der einzelnen Teilgebiete der Nanostrukturwissenschaften.
- Die Absolventinnen und Absolventen sind in der Lage, sich mit Hilfe von Fachliteratur in neue Aufgabengebiete einzuarbeiten, sowie physikalische und technische Methoden weitgehend selbstständig auf konkrete Aufgabenstellungen anzuwenden, Lösungswege zu entwickeln und die Ergebnisse zu interpretieren und zu bewerten.
- Die Absolventinnen und Absolventen besitzen Abstraktionsvermögen, analytisches Denken, Problemlösungskompetenz und die Fähigkeit, komplexe Zusammenhänge zu strukturieren.

Befähigung zur Aufnahme einer Erwerbstätigkeit

• Die Absolventinnen und Absolventen können ihr Wissen und ihre Erkenntnisse einem Fachpublikum gegenüber darstellen und vertreten.

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- Die Absolventinnen und Absolventen sind in der Lage, konstruktiv und zielorientiert in einem heterogenen Team zusammenzuarbeiten, unterschiedliche und abweichen-de Ansichten produktiv zur Zielerreichung zu nutzen und auftretende Konflikte zu lösen.
- Die Absolventinnen und Absolventen können ihre erworbenen Kompetenzen in unterschiedlichen interkulturellen Kontexten und in internationale zusammengesetzten Teams anwenden.
- Die Absolventinnen und Absolventen sind in der Lage, Probleme und deren Lösungen zielgruppengerecht und auch in einer Fremdsprache aufzubereiten und darzustellen.
- Die Absolventinnen und Absolventen können physikalische und technische Methoden weitgehend selbstständig auf konkrete Aufgabenstellungen der Nanostrukturwissenschaften anwenden, Lösungswege entwickeln und die Ergebnisse bewerten und interpretieren.
- Die Absolventinnen und Absolventen kennen die wichtigsten Anforderungen und Arbeitsweisen im industriellen Umfeld der Nanowissenschaften.
- Die Absolventinnen und Absolventen kennen die wichtigsten Anforderungen und Arbeitsweisen in Forschung und Entwicklung.
- Die Absolventinnen und Absolventen sind befähigt, komplexe Probleme zu analysieren und zu lösen und sich sehr schnell auch in weniger vertraute Themenkomplexe einzuarbeiten.

Persönlichkeitsentwicklung

UNIVERSITÄT

WÜRZBURG

- Die Absolventinnen und Absolventen kennen die Regeln guter wissenschaftlicher Praxis und beachten sie.
- Die Absolventinnen und Absolventen sind in der Lage, ihr Wissen und ihre Erkenntnisse einem Fachpublikum gegenüber darzustellen und zu vertreten.

Befähigung zum gesellschaftlichen Engagement

- Die Absolventinnen und Absolventen können naturwissenschaftliche Entwicklungen kritisch reflektieren und deren Auswirkungen auf die Wirtschaft, Gesellschaft und die Umwelt erfassen (Technikfolgenabschätzung).
- Die Absolventinnen und Absolventen haben ihr Wissen bezüglich wirtschaftlicher, gesellschaftlicher, naturwissenschaftlicher, kultureller etc. Fragestellungen erweitert und können begründet Position beziehen.
- Die Absolventinnen und Absolventen haben die Bereitschaft und Fähigkeit entwickelt, ihre Kompetenzen in partizipative Prozesse einzubringen und aktiv an Entscheidungen mitzuwirken.

Abbreviations used

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

ASPO2015

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

22-Jan-2020 (2020-8)

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

(118 ECTS credits)



Nanostructure Technology

(27 ECTS credits)

Module	title				Abbreviation
Introduction to Nanoscience			11-N-EIN-152-m01		
Module coordinator		Module offered by			
Managi	ng Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
7	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
2 seme	ster	undergraduate	Admission prerequis 85% of sessions).	site to assessment: ı	regular attendance (minimum
Conten	ts				
Introdu	ction to	the principles of produc	ing, characterising a	nd applying nanostr	uctures.
Intende	ed learr	ning outcomes			
		nave knowledge of the fu ructures.	ndamental properties	s, technologies, chai	racterising methods and functi-
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)	
V (2) + S Module		t in: German or English			
		essment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether
	-	5 minutes) with discussi ssessment: German and/		mination (approx. 12	20 minutes)
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
this wil 3 Sente find tha gistratio ly regist sessme	l be con ence 4 A at the s on for a ter for a ent was	nsidered a declaration of ASPO (general academic tudent has obtained the assessment into effect. O an assessment. Students not put into effect will no	will to seek admission and examination regu qualification for adm nly those students th who did not register ot be admitted to the	on to assessment pu ulations). If the mod ission to assessmen at meet the respecti for an assessment o respective assessm	n for admission to assessment, irsuant to Section 20 Subsection ule coordinators subsequently it, they will put the student's re- ve prerequisites can successful- or whose registration for an as- ent. If a student takes an as- sessment will not be considered.
Worklo	ad				
210 h					
Teachir	ng cycl	9			
Referre	d to in	LPO I (examination regulations	s for teaching-degree progra	mmes)	
Module	e appea	rs in			
Bachelo Bachelo Bachelo Bachelo	or's deg or's deg or's deg or's deg	gree (1 major) Nanostruct gree (1 major) Functional gree (1 major, 1 minor) Ph gree (1 major) Nanostruct gree (1 major, 1 minor) Ph	Materials (2015) hysics (Minor, 2015) ture Technology (2020 hysics (Minor, 2020)		
Bachelo	or's deg	gree (1 major) Functional	Materials (2021)		

Module	title				Abbreviation
Industrial Internship				11-N-IP-152-m01	
Module	coord	inator		Module offered by	
Managi	ng Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
10	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semes	ster	undergraduate			
Conten	ts				
		ndustrial methods, work report and an oral prese		production method	s. Summary of own experiences
Intende	ed learr	ning outcomes			
					strial technologies with relevan- report and an oral presentation.
Courses	5 (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)	
P (o) + 9	S (1)				
module is	creditab	le for bonus)			t every semester, information on whether
		actical course (approx. 1) ssessment: German and		entation/talk (approx	x. 45 minutes), weighted 1:4
Allocati	ion of p	olaces			
Additio	nal info	ormation			
this will 3 Sente find tha gistratio ly regist sessme	l be con ince 4 A at the si on for a ter for a ent was	nsidered a declaration of ASPO (general academic tudent has obtained the assessment into effect. O an assessment. Students not put into effect will no	will to seek admission and examination reg qualification for adm nly those students th who did not register ot be admitted to the	on to assessment pu ulations). If the modu ission to assessmen at meet the respecti for an assessment o respective assessm	n for admission to assessment, rsuant to Section 20 Subsection ule coordinators subsequently t, they will put the student's re- ve prerequisites can successful- or whose registration for an as- ent. If a student takes an as- sessment will not be considered.
Worklo	ad				
300 h					
Teachir	ng cycl	9			
Referre	d to in	LPO I (examination regulations	s for teaching-degree progra	mmes)	
		•			
Module			ure Technology (com	-)	
		gree (1 major) Nanostruct gree (1 major) Nanostruct	•, •		
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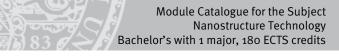
Module	e title				Abbreviation	
Experi	mental	Chemistry			08-AC-ExChem-152	-m01
Module	Module coordinator			Module offered by	l	
	r of lec	ture "Experimentalchemi	e" (Experimental	Institute of Inorgan	ic Chemistry	
ECTS	1	od of grading	Only after succ. co	mpl. of module(s)		
5		rical grade				
Duratio		Module level	Other prerequisite	s		
1 seme		undergraduate				
		undergraduate]			
	dule p	rovides an overview of the level, metals, acid-base				
Intend	ed lear	ning outcomes				
cient ir actions	n basic s using	nderstands the principle models of the structure typical chemical formula number of weekly contact hours,	of matter and can de language and interp	scribe them properly. pret them by identifyi	. He/she can depict o	chemical re-
V (4)	(t)pe,					
	d of as	Sessment (type, scope, langua	age — if other than German	examination offered - if no	t every semester informat	ion on whether
		le for bonus)			se every semester, infondidt	ion on whether
written	exami	nation (approx. 90 minut	es)			
		ssessment: German and				
Allocat	ion of	olaces				
			-			
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Teachi	ng cvcl	e				
		e: every year, winter sem	ester			
		LPO I (examination regulation		rammes)		
				a		
Module	anne	ars in				
		gree (1 major) Biology (2	011)			
		gree (1 major) Biology (2 gree (1 major) Psycholog	-			
		gree (1 major, 1 minor) P				
		gree (1 major, 1 minor) P		udies (2013)		
Bachel	or's de	gree (1 major, 1 minor) R	ussian Language and	d Culture (2008)		
		gree (2 majors) Special E	-			
-		logiae Catholic Theology	-			
		gree (2 majors) English a		-		
		gree (2 majors) German groe (4 major) Coograph		ture (2013)		
		gree (1 major) Geography groo (1 major) Mathemat				
		gree (1 major) Mathemat gree (1 major) Musicolog				
		gree (1 major) Musicolog gree (1 major) Physics (2	,			
Bachelor's	with 1 ma	jor Nanostructure Technology	-	 generated 19-Apr-2025 exected to the second se	-	page 13 / 181

Bachelor's degree (1 major) Psychology (2015) Bachelor's degree (1 major) Business Management and Economics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Music Education (2015) Bachelor's degree (1 major) Computational Mathematics (2015) Bachelor's degree (1 major) Political and Social Studies (2015) Bachelor's degree (1 major) Functional Materials (2015) Bachelor's degree (1 major) Academic Speech Therapy (2015) Bachelor's degree (1 major) Indology/South Asian Studies (2015) Bachelor's degree (1 major, 1 minor) Egyptology (2015) Bachelor's degree (1 major, 1 minor) Pedagogy (2015) Bachelor's degree (1 major, 1 minor) History (2015) Bachelor's degree (1 major, 1 minor) Musicology (2015) Bachelor's degree (1 major, 1 minor) Philosophy (2015) Bachelor's degree (1 major, 1 minor) Pre- and Protohistoric Archaeology (2015) Bachelor's degree (1 major, 1 minor) Ancient World (2015) Bachelor's degree (1 major, 1 minor) Philosophy and Religion (2015) Bachelor's degree (1 major, 1 minor) Theological Studies (2015) Bachelor's degree (1 major, 1 minor) Political and Social Studies (2015) Bachelor's degree (1 major, 1 minor) Russian Language and Culture (2015) Bachelor's degree (1 major, 1 minor) German Language and Literature (2015) Bachelor's degree (2 majors) Egyptology (2015) Bachelor's degree (2 majors) Pedagogy (2015) Bachelor's degree (2 majors) Protestant Theology (2015) Bachelor's degree (2 majors) Musicology (2015) Bachelor's degree (2 majors) Philosophy (2015) Bachelor's degree (2 majors) Special Education (2015) Bachelor's degree (2 majors) Pre- and Protohistoric Archaeology (2015) Bachelor's degree (2 majors) Latin Philology (2015) Bachelor's degree (2 majors) Music Education (2015) Bachelor's degree (2 majors) Philosophy and Religion (2015) Bachelor's degree (2 majors) Theological Studies (2015) Bachelor's degree (2 majors) Political and Social Studies (2015) Bachelor's degree (2 majors) Russian Language and Culture (2015) Bachelor's degree (2 majors) Greek Philology (2015) Bachelor's degree (2 majors) European Ethnology (2015) Bachelor's degree (2 majors) Indology/South Asian Studies (2015) Bachelor's degree (2 majors) Geography (2015) Bachelor's degree (2 majors) French Studies (2015) Bachelor's degree (2 majors) History (2015) Bachelor's degree (2 majors) Sport Science (Focus on health and Pedagogics in Movement) (2015) Bachelor's degree (2 majors) German Language and Literature (2015) Bachelor's degree (1 major) Mathematical Physics (2016) Bachelor's degree (1 major, 1 minor) French Studies (2016) Bachelor's degree (2 majors) French Studies (2016) Bachelor's degree (1 major, 1 minor) Italian Studies (2016) Bachelor's degree (2 majors) Italian Studies (2016) Bachelor's degree (1 major, 1 minor) Spanish Studies (2016) Bachelor's degree (2 majors) Spanish Studies (2016) Bachelor's degree (1 major) Romanic Languages (French/Italian) (2016) Bachelor's degree (1 major) Romanic Languages (French/Spanish) (2016) Bachelor's degree (1 major) Romanic Languages (Italian/Spanish) (2016) Bachelor's degree (1 major) Business Information Systems (2016) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 14 / 181 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

Module Catalogue for the Subject Nanostructure Technology Bachelor's with 1 major, 180 ECTS credits

Bachelor's degree (1 major) Games Engineering (2016) Bachelor's degree (1 major, 1 minor) English and American Studies (2016) Bachelor's degree (2 majors) English and American Studies (2016) Bachelor's degree (1 major) Media Communication (2016) Bachelor's degree (1 major, 1 minor) Digital Humanities (2016) Bachelor's degree (1 major) Biology (2017) Bachelor's degree (1 major, 1 minor) Geography (2017) Bachelor's degree (1 major, 1 minor) History of Medieval and Modern Art (2017) Bachelor's degree (2 majors) History of Medieval and Modern Art (2017) Bachelor's degree (2 majors) Comparative Indo-European Linguistics (2017) Bachelor's degree (1 major) Aerospace Computer Science (2017) Bachelor's degree (1 major, 1 minor) Museology and material culture (2017) Bachelor's degree (1 major) Economathematics (2017) Bachelor's degree (1 major) Games Engineering (2017) Bachelor's degree (1 major) Computer Science (2017) Bachelor's degree (1 major) Media Communication (2018) Bachelor's degree (1 major) Biomedicine (2018) Bachelor's degree (1 major) Human-Computer Systems (2018) Bachelor's degree (2 majors) Classical Archaeology (2018) Bachelor's degree (1 major, 1 minor) Classical Archaeology (2018) Bachelor's degree (1 major, 1 minor) Digital Humanities (2018) Bachelor's degree (2 majors) Digital Humanities (2018) Bachelor's degree (1 major) Computer Science (2019) Bachelor's degree (1 major, 1 minor) English and American Studies (2019) Bachelor's degree (1 major) Indology/South Asian Studies (2019) Bachelor's degree (1 major) Business Information Systems (2019) Bachelor's degree (2 majors) Indology/South Asian Studies (2019) Bachelor's degree (1 major) Business Management and Economics (2019) Bachelor's degree (1 major) Modern China (2019) Bachelor's degree (1 major) Biomedicine (2020) Bachelor's degree (1 major) Pedagogy (2020) Bachelor's degree (1 major) Political and Social Studies (2020) Bachelor's degree (1 major) Business Information Systems (2020) Bachelor's degree (1 major, 1 minor) Political and Social Studies (2020) Bachelor's degree (2 majors) European Ethnology (2020) Bachelor's degree (2 majors) Political and Social Studies (2020) Bachelor's degree (2 majors) Special Education (2020) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major) Aerospace Computer Science (2020) Bachelor's degree (1 major, 1 minor) Museology and material culture (2020) Bachelor's degree (1 major, 1 minor) Pedagogy (2020) Bachelor's degree (2 majors) Pedagogy (2020) Bachelor's degree (1 major) Psychology (2020) Bachelor's degree (1 major) Biology (2021) Magister Theologiae Catholic Theology (2021) Bachelor's degree (2 majors) History (2021) Bachelor's degree (1 major, 1 minor) History (2021) Bachelor's degree (1 major) Media Communication (2021) Bachelor's degree (2 majors) Theological Studies (2021) Bachelor's degree (1 major, 1 minor) Theological Studies (2021) Bachelor's degree (1 major, 1 minor) English and American Studies (2021) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-(2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

Bachelor's degree (2 majors) English and American Studies (2021) Bachelor's degree (1 major) Functional Materials (2021) Bachelor's degree (1 major) Computer Science und Sustainability (2021) Bachelor's degree (2 majors) Comparative Indo-European Linguistics (2021) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (2 majors) Special Education (2021) Bachelor's degree (1 major) Business Information Systems (2021) Bachelor's degree (1 major) Economathematics (2021) Bachelor's degree (1 major) Business Management and Economics (2021) Bachelor's degree (1 major) Human-Computer Systems (2022) Bachelor's degree (1 major, 1 minor) Museology and material culture (2022) Bachelor's degree (1 major) Biology (2022) Bachelor's degree (1 major) Economathematics (2022) Bachelor's degree (1 major) Mathematical Data Science (2022) Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022) Bachelor's degree (2 majors) Ancient Near Eastern Archaeology (2022) Bachelor's degree (1 major, 1 minor) Ancient World (2022) Bachelor's degree (2 majors) Ancient Near Eastern Studies (2022) Bachelor's degree (1 major) Franco-German studies: language, culture, digital competence (2022) Bachelor's degree (1 major) European Law (2023) Bachelor's degree (1 major, 1 minor) English and American Studies (2023) Bachelor's degree (2 majors) English and American Studies (2023) Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023) Bachelor's degree (1 major) Mathematics (2023) Bachelor's degree (1 major) Business Information Systems (2023) Bachelor's degree (1 major) Economathematics (2023) Bachelor's degree (1 major, 1 minor) History of Medieval and Modern Art (2023) Bachelor's degree (2 majors) History of Medieval and Modern Art (2023) Bachelor's degree (2 majors) Special Education (2023) Bachelor's degree (1 major) Business Management and Economics (2023) Bachelor's degree (1 major) Geography (2023) Bachelor's degree (2 majors) Geography (2023) Bachelor's degree (1 major, 1 minor) Geography (2023) Bachelor's degree (2 majors) European Ethnology/Empiric Cultural Studies (2023) Bachelor's degree (1 major) Mathematical Physics (2024) Bachelor's degree (2 majors) German Language and Literature (2024) Bachelor's degree (1 major, 1 minor) German Language and Literature (2024) Bachelor's degree (1 major) Music Education (2024) Bachelor's degree (2 majors) Music Education (2024) Bachelor's degree (1 major, 1 minor) Music Education (2024) Bachelor's degree (1 major) Indology/South Asian Studies (2024) Bachelor's degree (2 majors) Indology/South Asian Studies (2024) Bachelor's degree (1 major, 1 minor) Indology/South Asian Studies (2024) Bachelor's degree (1 major, 1 minor) Ancient World (2024) Bachelor's degree (2 majors) Digital Humanities (2024) Bachelor's degree (1 major, 1 minor) Digital Humanities (2024) Bachelor's degree (1 major) Midwifery (2024) Bachelor's degree (2 majors) Greek Philology (2024) Bachelor's degree (2 majors) Latin Philology (2024) Bachelor's degree (1 major) Business Information Systems (2024) Bachelor's degree (1 major) Economathematics (2024) Bachelor's degree (1 major) Business Management and Economics (2024) Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 16 / 181 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020



Bachelor's degree (1 major) Human-Computer-Interaction (2024) Bachelor's degree (2 majors) Art Education (2024) Bachelor's degree (1 major) Digital Business & Data Science (2024) Bachelor's degree (1 major) Classics (2024) Bachelor's degree (1 major) Diversity, Ethics and Religions (2024) Bachelor's degree (1 major) Functional Materials (2025) Bachelor's degree (1 major) (2025) Bachelor's degree (1 major, 1 minor) European Ethnology/Empiric Cultural Studies (2025) Bachelor's degree (2 majors) Pedagogy (2025) Bachelor's degree (2 majors) Pedagogy (2025) Bachelor's degree (1 major) Economathematics (2025) Bachelor's degree (1 major) Academic Speech Therapy (2025) Bachelor's degree (1 major, 1 minor) Pedagogy (2025) Bachelor's degree (1 major, 1 minor) Pedagogy (2025) Bachelor's degree (1 major, 1 minor) Pedagogy (2025) Bachelor's degree (1 major) Academic Speech Therapy (2025) Bachelor's degree (1 major, 1 minor) Pedagogy (2025)

Julius-Maxi

UNIVERSITÄT

WÜRZBURG

Module	e title				Abbreviation
Genera	l and A	nalytical Chemistry for s	tudents of natural so	ciences (lab)	08-ACP-NF-152-m01
Module	e coord	inator		Module offered	lby
holder	of the (Chair of Anorganic Chemi	stry	Institute of Inor	rganic Chemistry
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s))
2		successfully completed	o8-AC-ExChem		
Duratio	n	Module level	Other prerequisites	;	
1 seme	ster	undergraduate			
Conten	ts	0	Į.		
lated le course	ecture(s focuse	s). After a safety briefing,	the students autono	mously conduct	lge they have gained through the re- experiments in the laboratory. The f simple substances and analyses of
Intende	ed lear	ning outcomes			
have de	evelope		the necessary stoichi	ometric calculat	m experiments to solve them. They ions and describe the chemical pro-
Course	S (type, r	umber of weekly contact hours,	anguage — if other than Ge	rman)	
P (4)					
		essment (type, scope, langua le for bonus)	ge — if other than German,	examination offered –	– if not every semester, information on whether
pages e Langua	each) a Ige of a	chtestate (pre and post- nd assessment of practions ssessment: German and ffered: Once a year, sum	cal performance (2 to /or English		. 15 minutes each, log approx. 5 to 10 inations)
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
60 h					
Teachi	ng cycl	e			
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	ammes)	
Module	e appea	irs in			
Bachel	or's de	gree (1 major) Physics (20	015)		
		gree (1 major) Nanostruc	•, .	5)	
		gree (1 major) Physics (20			
		gree (1 major) Nanostruc		0)	
Bachel	or's de	gree (1 major) Quantum 1	echnology (2021)		

Module	title				Abbreviation
Organi	c Chem	istry for students of med	licine, biomedicine, d	lental medicine and	08-0C-NF-152-m01
natural			,		
Module	e coord	inator		Module offered by	
	n, Biom	ture "Organische Chemie Iedizin, Zahnmedizin, Ing In"		Institute of Organic	Chemistry
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
3		rical grade			
Duratio		Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts	Ŭ	1		
This mo	dule p	rovides students with an	overview of the theo	retical principles of o	organic chemistry.
		ning outcomes			
		e become familiar with th	e fundamental princi	ples of organic chem	istry.
		umber of weekly contact hours, l	•		7 ·
V (2)	- (()pe,				
.,	l of ass	ecsment (type scope langua	ge — if other than German	examination offered — if no	t every semester, information on whether
		le for bonus)			t every semester, mornation on whether
written	examiı	nation (approx. 60 minut	es)		
Langua	ge of a	ssessment: German and	/or English		
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
90 h					
Teachir	ng cycl	e			
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
		_			
Module	appea	irs in			
		gree (1 major) Psychology	/ (2010)		
Bachel	or's de	gree (1 major, 1 minor) Pe	edagogy (2013)		
		gree (1 major, 1 minor) Po			
		gree (1 major, 1 minor) Ru		Culture (2008)	
		gree (2 majors) Special E logiae Catholic Theology	-		
-		mination for the teaching	-	English (2000)	
		mination for the teaching			
		mination for the teaching			
		mination for the teaching			
		mination for the teaching			(2009)
		mination for the teaching mination for the teaching		-	
		mination for the teaching			
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First state examination for the teaching degree Grundschule Catholic Theology (2009) First state examination for the teaching degree Grundschule Mathematics (2009) First state examination for the teaching degree Grundschule Music (2009) First state examination for the teaching degree Grundschule Physics (2009) First state examination for the teaching degree Grundschule Social Science (2009) First state examination for the teaching degree Grundschule Science of Sport (2009) First state examination for the teaching degree Hauptschule English (2009) First state examination for the teaching degree Hauptschule Biology (2009) First state examination for the teaching degree Hauptschule Chemistry (2009) First state examination for the teaching degree Hauptschule Geography (2009) First state examination for the teaching degree Hauptschule Protestant Theology (2009) First state examination for the teaching degree Hauptschule German (2009) First state examination for the teaching degree Hauptschule History (2009) First state examination for the teaching degree Hauptschule Catholic Theology (2009) First state examination for the teaching degree Hauptschule Mathematics (2009) First state examination for the teaching degree Hauptschule Music (2009) First state examination for the teaching degree Hauptschule Physics (2009) First state examination for the teaching degree Hauptschule Social Science (2009) First state examination for the teaching degree Hauptschule Science of Sport (2009) First state examination for the teaching degree Realschule English (2009) First state examination for the teaching degree Realschule Biology (2009) First state examination for the teaching degree Realschule Chemistry (2009) First state examination for the teaching degree Realschule Geography (2009) First state examination for the teaching degree Realschule Protestant Theology (2009) First state examination for the teaching degree Realschule French Studies (2009) First state examination for the teaching degree Realschule German (2009) First state examination for the teaching degree Realschule History (2009) First state examination for the teaching degree Realschule Computer Science (2012) First state examination for the teaching degree Realschule Catholic Theology (2009) First state examination for the teaching degree Realschule Mathematics (2009) First state examination for the teaching degree Realschule Music (2009) First state examination for the teaching degree Realschule Physics (2009) First state examination for the teaching degree Realschule Science of Sport (2009) First state examination for the teaching degree Gymnasium English (2009) First state examination for the teaching degree Gymnasium Biology (2009) First state examination for the teaching degree Gymnasium Chemistry (2009) First state examination for the teaching degree Gymnasium Geography (2009) First state examination for the teaching degree Gymnasium French Studies (2009) First state examination for the teaching degree Gymnasium German (2009) First state examination for the teaching degree Gymnasium History (2009) First state examination for the teaching degree Gymnasium Greek Philology (2009) First state examination for the teaching degree Gymnasium Computer Science (2009) First state examination for the teaching degree Gymnasium Italian Studies (2009) First state examination for the teaching degree Gymnasium Catholic Theology (2009) First state examination for the teaching degree Gymnasium Latin Philology (2009) First state examination for the teaching degree Gymnasium Mathematics (2012) First state examination for the teaching degree Gymnasium Mathematics (2009) First state examination for the teaching degree Gymnasium Music (2009) First state examination for the teaching degree Gymnasium Physics (2009) First state examination for the teaching degree Gymnasium Russian (2009) First state examination for the teaching degree Gymnasium Social Science (2009) First state examination for the teaching degree Gymnasium Spanish Studies (2009) First state examination for the teaching degree Gymnasium Science of Sport (2009) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 20 / 181 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

First state examination for the teaching degree Gymnasium Music Education, Advanced Studies (2009) First state examination for the teaching degree Sonderpädagogik Pedagogy of Secondary Education (2009) First state examination for the teaching degree Sonderpädagogik Pedagogy of Primary Education (2009) First state examination for the teaching degree Sonderpädagogik Teaching at the German Mittelschule (2013) First state examination for the teaching degree Mittelschule English (2013) First state examination for the teaching degree Mittelschule Biology (2013) First state examination for the teaching degree Mittelschule Chemistry (2013) First state examination for the teaching degree Mittelschule Geography (2013) First state examination for the teaching degree Mittelschule Protestant Theology (2013) First state examination for the teaching degree Mittelschule German (2013) First state examination for the teaching degree Mittelschule History (2013) First state examination for the teaching degree Mittelschule Catholic Theology (2013) First state examination for the teaching degree Mittelschule Mathematics (2013) First state examination for the teaching degree Mittelschule Physics (2013) First state examination for the teaching degree Mittelschule Social Science (2013) First state examination for the teaching degree Mittelschule Science of Sport (2013) Bachelor's degree (2 majors) English and American Studies (2009) Bachelor's degree (2 majors) German Language and Literature (2013) Bachelor's degree (1 major) Geography (2015) Bachelor's degree (1 major) Mathematics (2015) Bachelor's degree (1 major) Musicology (2015) Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Psychology (2015) Bachelor's degree (1 major) Business Management and Economics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Music Education (2015) Bachelor's degree (1 major) Computational Mathematics (2015) Bachelor's degree (1 major) Political and Social Studies (2015) Bachelor's degree (1 major) Academic Speech Therapy (2015) Bachelor's degree (1 major) Indology/South Asian Studies (2015) Bachelor's degree (1 major, 1 minor) Egyptology (2015) Bachelor's degree (1 major, 1 minor) Pedagogy (2015) Bachelor's degree (1 major, 1 minor) History (2015) Bachelor's degree (1 major, 1 minor) Musicology (2015) Bachelor's degree (1 major, 1 minor) Philosophy (2015) Bachelor's degree (1 major, 1 minor) Pre- and Protohistoric Archaeology (2015) Bachelor's degree (1 major, 1 minor) Ancient World (2015) Bachelor's degree (1 major, 1 minor) Philosophy and Religion (2015) Bachelor's degree (1 major, 1 minor) Theological Studies (2015) Bachelor's degree (1 major, 1 minor) Political and Social Studies (2015) Bachelor's degree (1 major, 1 minor) Russian Language and Culture (2015) Bachelor's degree (1 major, 1 minor) German Language and Literature (2015) Bachelor's degree (2 majors) Egyptology (2015) Bachelor's degree (2 majors) Pedagogy (2015) Bachelor's degree (2 majors) Protestant Theology (2015) Bachelor's degree (2 majors) Musicology (2015) Bachelor's degree (2 majors) Philosophy (2015) Bachelor's degree (2 majors) Special Education (2015) Bachelor's degree (2 majors) Pre- and Protohistoric Archaeology (2015) Bachelor's degree (2 majors) Latin Philology (2015) Bachelor's degree (2 majors) Music Education (2015) Bachelor's degree (2 majors) Philosophy and Religion (2015) Bachelor's degree (2 majors) Theological Studies (2015) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 21 / 181 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

Bachelor's degree (2 majors) Political and Social Studies (2015) Bachelor's degree (2 majors) Russian Language and Culture (2015) Bachelor's degree (2 majors) Greek Philology (2015) Bachelor's degree (2 majors) European Ethnology (2015) Bachelor's degree (2 majors) Indology/South Asian Studies (2015) First state examination for the teaching degree Grundschule English (2015) First state examination for the teaching degree Grundschule Biology (2015) First state examination for the teaching degree Grundschule Chemistry (2015) First state examination for the teaching degree Grundschule Geography (2015) First state examination for the teaching degree Grundschule German (2015) First state examination for the teaching degree Grundschule Catholic Theology (2015) First state examination for the teaching degree Grundschule Mathematics (2015) First state examination for the teaching degree Grundschule Pedagogy of Primary Education (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Social Science (2015) First state examination for the teaching degree Grundschule Didactics in English (Primary School) (2015) First state examination for the teaching degree Grundschule Didactics in Biology (Primary School) (2015) First state examination for the teaching degree Grundschule Didactics in Chemistry (Primary School) (2015) First state examination for the teaching degree Grundschule Didactics in Geography (Primary School) (2015) First state examination for the teaching degree Grundschule Didactics in German (Primary School) (2015) First state examination for the teaching degree Grundschule Didactics in History (Primary School) (2015) First state examination for the teaching degree Grundschule Didactics in Catholic Theology (Primary School) (2015) First state examination for the teaching degree Grundschule Art Education in Primary School (2015) First state examination for the teaching degree Grundschule Didactics in Science of Sport (Primary School) (2015) First state examination for the teaching degree Grundschule Didactics in Mathematics (Primary School) (2015) First state examination for the teaching degree Grundschule Music Education in Primary School (2015) First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015) First state examination for the teaching degree Grundschule Didactics in Social Science (Primary School) (2015) First state examination for the teaching degree Grundschule Science of Sport (2015) First state examination for the teaching degree Realschule English (2015) First state examination for the teaching degree Realschule Biology (2015) First state examination for the teaching degree Realschule Chemistry (2015) First state examination for the teaching degree Realschule Geography (2015) First state examination for the teaching degree Realschule Protestant Theology (2015) First state examination for the teaching degree Realschule French Studies (2015) First state examination for the teaching degree Realschule German (2015) First state examination for the teaching degree Realschule History (2015) First state examination for the teaching degree Realschule Computer Science (2015) First state examination for the teaching degree Realschule Catholic Theology (2015) First state examination for the teaching degree Realschule Mathematics (2015) First state examination for the teaching degree Realschule Physics (2015) First state examination for the teaching degree Realschule Science of Sport (2015) First state examination for the teaching degree Gymnasium English (2015) First state examination for the teaching degree Gymnasium Biology (2015) First state examination for the teaching degree Gymnasium Chemistry (2015) First state examination for the teaching degree Gymnasium Geography (2015) First state examination for the teaching degree Gymnasium French Studies (2015) First state examination for the teaching degree Gymnasium German (2015) First state examination for the teaching degree Gymnasium History (2015) First state examination for the teaching degree Gymnasium Greek Philology (2015) First state examination for the teaching degree Gymnasium Computer Science (2015) First state examination for the teaching degree Gymnasium Italian Studies (2015) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 22 / 181 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

First state examination for the teaching degree Gymnasium Catholic Theology (2015) First state examination for the teaching degree Gymnasium Latin Philology (2015) First state examination for the teaching degree Gymnasium Mathematics (2015) First state examination for the teaching degree Gymnasium Physics (2015) First state examination for the teaching degree Gymnasium Russian (2015) First state examination for the teaching degree Gymnasium Social Science (2015) First state examination for the teaching degree Gymnasium Spanish Studies (2015) First state examination for the teaching degree Gymnasium Science of Sport (2015) First state examination for the teaching degree Sonderpädagogik Pedagogy of Primary Education (2015) First state examination for the teaching degree Sonderpädagogik Didactics in German (Primary School) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Catholic Theology (Primary School) (2015) First state examination for the teaching degree Sonderpädagogik Art Education in Primary School (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Science of Sport (Primary School) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Mathematics (Primary School) (2015) First state examination for the teaching degree Sonderpädagogik Music Education in Primary School (2015) First state examination for the teaching degree Sonderpädagogik Didactics in English (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Ergonomics (Teaching at the German Mittelschule) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Biology (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Chemistry (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Geography (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Protestant Theology (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in German (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in History (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Catholic Theology (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Art Education in Middle School (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Science of Sport (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Mathematics (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Music Education in Middle School (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Social Science (Middle School) (2015) First state examination for the teaching degree Sonderpädagogik Teaching at the German Mittelschule (2015) First state examination for the teaching degree Mittelschule English (2015) First state examination for the teaching degree Mittelschule Biology (2015) First state examination for the teaching degree Mittelschule Chemistry (2015) First state examination for the teaching degree Mittelschule Geography (2015) First state examination for the teaching degree Mittelschule Protestant Theology (2015) First state examination for the teaching degree Mittelschule German (2015) First state examination for the teaching degree Mittelschule History (2015) First state examination for the teaching degree Mittelschule Catholic Theology (2015) First state examination for the teaching degree Mittelschule Mathematics (2015) First state examination for the teaching degree Mittelschule Physics (2015) First state examination for the teaching degree Mittelschule Social Science (2015) First state examination for the teaching degree Mittelschule Didactics in English (Middle School) (2015)

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 23 / 181
(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	

First state examination for the teaching degree Mittelschule Ergonomics (Teaching at the German Mittelschule) (2015) First state examination for the teaching degree Mittelschule Didactics in Biology (Middle School) (2015) First state examination for the teaching degree Mittelschule Didactics in Chemistry (Middle School) (2015) First state examination for the teaching degree Mittelschule Didactics in Geography (Middle School) (2015) First state examination for the teaching degree Mittelschule Didactics in Protestant Theology (Middle School) (2015) First state examination for the teaching degree Mittelschule Didactics in German (Middle School) (2015) First state examination for the teaching degree Mittelschule Didactics in History (Middle School) (2015) First state examination for the teaching degree Mittelschule Didactics in Catholic Theology (Middle School) (2015) First state examination for the teaching degree Mittelschule Art Education in Middle School (2015) First state examination for the teaching degree Mittelschule Didactics in Science of Sport (Middle School) (2015) First state examination for the teaching degree Mittelschule Didactics in Mathematics (Middle School) (2015) First state examination for the teaching degree Mittelschule Music Education in Middle School (2015) First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015) First state examination for the teaching degree Mittelschule Didactics in Social Science (Middle School) (2015) First state examination for the teaching degree Mittelschule Science of Sport (2015) First state examination for the teaching degree Mittelschule Teaching at the German Mittelschule (2015) Bachelor's degree (2 majors) Geography (2015) Bachelor's degree (2 majors) French Studies (2015) Bachelor's degree (2 majors) History (2015) Bachelor's degree (2 majors) Sport Science (Focus on health and Pedagogics in Movement) (2015) Bachelor's degree (2 majors) German Language and Literature (2015) Bachelor's degree (1 major) Mathematical Physics (2016) First state examination for the teaching degree Grundschule Protestant Theology (2015) First state examination for the teaching degree Grundschule Music (2015) First state examination for the teaching degree Grundschule Didactics in Protestant Theology (Primary School) (2015) First state examination for the teaching degree Realschule Music (2015) First state examination for the teaching degree Gymnasium Music (2015) First state examination for the teaching degree Gymnasium Music Education, Advanced Studies (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Protestant Theology (Primary School) (2015) First state examination for the teaching degree Mittelschule Music (2015) Bachelor's degree (1 major, 1 minor) French Studies (2016) Bachelor's degree (2 majors) French Studies (2016) Bachelor's degree (1 major, 1 minor) Italian Studies (2016) Bachelor's degree (2 majors) Italian Studies (2016) Bachelor's degree (1 major, 1 minor) Spanish Studies (2016) Bachelor's degree (2 majors) Spanish Studies (2016) Bachelor's degree (1 major) Romanic Languages (French/Italian) (2016) Bachelor's degree (1 major) Romanic Languages (French/Spanish) (2016) Bachelor's degree (1 major) Romanic Languages (Italian/Spanish) (2016) Bachelor's degree (1 major) Business Information Systems (2016) First state examination for the teaching degree Gymnasium French Studies (2016) First state examination for the teaching degree Gymnasium Italian Studies (2016) First state examination for the teaching degree Gymnasium Spanish Studies (2016) First state examination for the teaching degree Realschule French Studies (2016) Bachelor's degree (1 major) Games Engineering (2016) Bachelor's degree (1 major, 1 minor) English and American Studies (2016) Bachelor's degree (2 majors) English and American Studies (2016) First state examination for the teaching degree Grundschule English (2016)

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 24 / 181
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First state examination for the teaching degree Grundschule Didactics in English (Primary School) (2016) First state examination for the teaching degree Realschule English (2016) First state examination for the teaching degree Gymnasium English (2016) First state examination for the teaching degree Mittelschule English (2016) First state examination for the teaching degree Mittelschule Didactics in English (Middle School) (2016) First state examination for the teaching degree Sonderpädagogik Didactics in English (Middle School) (2016) Bachelor's degree (1 major) Media Communication (2016) Bachelor's degree (1 major, 1 minor) Digital Humanities (2016) Bachelor's degree (1 major, 1 minor) Geography (2017) Bachelor's degree (1 major, 1 minor) History of Medieval and Modern Art (2017) Bachelor's degree (2 majors) History of Medieval and Modern Art (2017) Bachelor's degree (2 majors) Comparative Indo-European Linguistics (2017) Bachelor's degree (1 major) Aerospace Computer Science (2017) Bachelor's degree (1 major, 1 minor) Museology and material culture (2017) Bachelor's degree (1 major) Economathematics (2017) Bachelor's degree (1 major) Games Engineering (2017) Bachelor's degree (1 major) Computer Science (2017) First state examination for the teaching degree Gymnasium Greek Philology (2018) Bachelor's degree (1 major) Media Communication (2018) Bachelor's degree (1 major) Biomedicine (2018) Bachelor's degree (1 major) Human-Computer Systems (2018) Bachelor's degree (2 majors) Classical Archaeology (2018) Bachelor's degree (1 major, 1 minor) Classical Archaeology (2018) Bachelor's degree (1 major, 1 minor) Digital Humanities (2018) Bachelor's degree (2 majors) Digital Humanities (2018) First state examination for the teaching degree Grundschule Physics (2018) First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018) First state examination for the teaching degree Realschule Physics (2018) First state examination for the teaching degree Gymnasium Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018) First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018) Bachelor's degree (1 major) Computer Science (2019) First state examination for the teaching degree Gymnasium Mathematics (2019) Bachelor's degree (1 major, 1 minor) English and American Studies (2019) Module studies (Bachelor) Chemistry (2019) Bachelor's degree (1 major) Indology/South Asian Studies (2019) Bachelor's degree (1 major) Business Information Systems (2019) Bachelor's degree (2 majors) Indology/South Asian Studies (2019) Bachelor's degree (1 major) Business Management and Economics (2019) Bachelor's degree (1 major) Modern China (2019) Module studies (Bachelor) Orientierungsstudien (2020) Bachelor's degree (1 major) Biomedicine (2020) Bachelor's degree (1 major) Pedagogy (2020) Bachelor's degree (1 major) Political and Social Studies (2020) Bachelor's degree (1 major) Business Information Systems (2020) Bachelor's degree (1 major, 1 minor) Political and Social Studies (2020) Bachelor's degree (2 majors) European Ethnology (2020) Bachelor's degree (2 majors) Political and Social Studies (2020) Bachelor's degree (2 majors) Special Education (2020) First state examination for the teaching degree Mittelschule Biology (2020 (Prüfungsordnungsversion 2015)) First state examination for the teaching degree Sonderpädagogik Didactics in Biology (Middle School) (2020 (Prüfungsordnungsversion 2015)) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 25 / 181 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

First state examination for the teaching degree Mittelschule Didactics in Biology (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Chemistry (2020 (Prüfungsordnungsversion 2015)) First state examination for the teaching degree Mittelschule Didactics in Chemistry (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule German (2020 (Prüfungsordnungsversion 2015)) First state examination for the teaching degree Mittelschule Didactics in German (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule English (2020 (Prüfungsordnungsversion 2016)) First state examination for the teaching degree Mittelschule Didactics in English (Middle School) (2020 (Prüfungsordnungsversion 2016))

First state examination for the teaching degree Mittelschule Protestant Theology (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Didactics in Protestant Theology (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Geography (2020 (Prüfungsordnungsversion 2015)) First state examination for the teaching degree Mittelschule Didactics in Geography (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule History (2020 (Prüfungsordnungsversion 2015)) First state examination for the teaching degree Mittelschule Didactics in History (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Catholic Theology (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Didactics in Catholic Theology (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Mathematics (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Didactics in Mathematics (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Art Education in Middle School (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Science of Sport (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Didactics in Science of Sport (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Music (2020 (Prüfungsordnungsversion 2015)) First state examination for the teaching degree Mittelschule Music Education in Middle School (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Mittelschule Teaching at the German Mittelschule (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in English (Middle School) (2020 (Prüfungsordnungsversion 2016))

First state examination for the teaching degree Sonderpädagogik Didactics in Chemistry (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in Geography (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in Protestant Theology (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in German (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in History (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in Catholic Theology (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Art Education in Middle School (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in Science of Sport (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in Mathematics (Middle School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Music Education in Middle School (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Teaching at the German Mittelschule (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Art Education in Primary School (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Music Education in Primary School (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in Science of Sport (Primary School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in German (Primary School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in Mathematics (Primary School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Pedagogy of Primary Education (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in Protestant Theology (Primary School) (2020 (Prüfungsordnungsversion 2015))

First state examination for the teaching degree Sonderpädagogik Didactics in Catholic Theology (Primary School) (2020 (Prüfungsordnungsversion 2015))

Bachelor's degree (1 major) Physics (2020)

Bachelor's degree (1 major) Nanostructure Technology (2020)

Bachelor's degree (1 major) Mathematical Physics (2020)

Bachelor's degree (1 major) Aerospace Computer Science (2020)

Bachelor's degree (1 major, 1 minor) Museology and material culture (2020)

First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2020)

First state examination for the teaching degree Grundschule Physics (2020)

First state examination for the teaching degree Gymnasium Physics (2020)

First state examination for the teaching degree Realschule Physics (2020)

First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)

First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)

First state examination for the teaching degree Mittelschule Physics (2020)

Bachelor's degree (1 major, 1 minor) Pedagogy (2020)

Bachelor's degree (2 majors) Pedagogy (2020)

First state examination for the teaching degree Grundschule Political and Social Studies (2020)

First state examination for the teaching degree Grundschule Didactics in Political and Social Studies (Primary School) (2020)

First state examination for the teaching degree Sonderpädagogik MS-Didaktik Career and Economics (2020) First state examination for the teaching degree Sonderpädagogik Didactics in Political and Social Studies (Secondary School) (2020)

First state examination for the teaching degree Mittelschule MS-Didaktik Career and Economics (2020) First state examination for the teaching degree Mittelschule Didactics in Political and Social Studies (Secondary School) (2020)

First state examination for the teaching degree Mittelschule Political and Social Studies (2020) First state examination for the teaching degree Gymnasium Political and Social Studies (2020) Bachelor's degree (1 major) Psychology (2020)

Magister Theologiae Catholic Theology (2021)

Bachelor's degree (2 majors) History (2021)

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 27 / 181
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Bachelor's degree (1 major, 1 minor) History (2021) First state examination for the teaching degree Grundschule History (2021) First state examination for the teaching degree Gymnasium History (2021) First state examination for the teaching degree Realschule History (2021) First state examination for the teaching degree Mittelschule History (2021) Bachelor's degree (1 major) Media Communication (2021) Bachelor's degree (2 majors) Theological Studies (2021) Bachelor's degree (1 major, 1 minor) Theological Studies (2021) Bachelor's degree (1 major, 1 minor) English and American Studies (2021) Bachelor's degree (2 majors) English and American Studies (2021) First state examination for the teaching degree Grundschule Pedagogy of Primary Education (2021) First state examination for the teaching degree Gymnasium English (2021) First state examination for the teaching degree Gymnasium Philosophy and Ethics (2021) Bachelor's degree (1 major) Computer Science und Sustainability (2021) Bachelor's degree (2 majors) Comparative Indo-European Linguistics (2021) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (2 majors) Special Education (2021) Bachelor's degree (1 major) Business Information Systems (2021) Bachelor's degree (1 major) Economathematics (2021) Bachelor's degree (1 major) Business Management and Economics (2021) First state examination for the teaching degree Sonderpädagogik Pedagogy of Primary Education (2021) Bachelor's degree (1 major) Human-Computer Systems (2022) Bachelor's degree (1 major, 1 minor) Museology and material culture (2022) Bachelor's degree (1 major) Economathematics (2022) Bachelor's degree (1 major) Mathematical Data Science (2022) Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022) First state examination for the teaching degree Gymnasium Philosophy and Ethics (2022) Bachelor's degree (2 majors) Ancient Near Eastern Archaeology (2022) Bachelor's degree (1 major, 1 minor) Ancient World (2022) Bachelor's degree (2 majors) Ancient Near Eastern Studies (2022) Bachelor's degree (1 major) Franco-German studies: language, culture, digital competence (2022) First state examination for the teaching degree Gymnasium Russian (2023) First state examination for the teaching degree Gymnasium Mathematics (2023) First state examination for the teaching degree Gymnasium English (2023) First state examination for the teaching degree Realschule English (2023) First state examination for the teaching degree Grundschule English (2023) First state examination for the teaching degree Grundschule Didactics in English (Primary School) (2023) First state examination for the teaching degree Mittelschule English (2023) First state examination for the teaching degree Mittelschule Didactics in English (Middle School) (2023) First state examination for the teaching degree Sonderpädagogik Didactics in English (Middle School) (2023) First state examination for the teaching degree Gymnasium Geography (2023) First state examination for the teaching degree Realschule Geography (2023) First state examination for the teaching degree Grundschule Geography (2023) First state examination for the teaching degree Mittelschule Geography (2023) Bachelor's degree (1 major) European Law (2023) Bachelor's degree (1 major, 1 minor) English and American Studies (2023) Bachelor's degree (2 majors) English and American Studies (2023) Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023) Bachelor's degree (1 major) Mathematics (2023) Bachelor's degree (1 major) Business Information Systems (2023) Bachelor's degree (1 major) Economathematics (2023) Bachelor's degree (1 major, 1 minor) History of Medieval and Modern Art (2023) Bachelor's degree (2 majors) History of Medieval and Modern Art (2023) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 28 / 181 ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020 (2020)

(2020)

Bachelor's degree (2 majors) Special Education (2023) Bachelor's degree (1 major) Business Management and Economics (2023) Bachelor's degree (1 major) Geography (2023) Bachelor's degree (2 majors) Geography (2023) Bachelor's degree (1 major, 1 minor) Geography (2023) Bachelor's degree (2 majors) European Ethnology/Empiric Cultural Studies (2023) First state examination for the teaching degree Grundschule German (2024) First state examination for the teaching degree Gymnasium German (2024) First state examination for the teaching degree Realschule German (2024) First state examination for the teaching degree Sonderpädagogik Didactics in German (Middle School) (2024) First state examination for the teaching degree Mittelschule Didactics in German (Middle School) (2024) First state examination for the teaching degree Grundschule Didactics in German (Primary School) (2024) First state examination for the teaching degree Sonderpädagogik Didactics in German (Primary School) (2024) First state examination for the teaching degree Mittelschule German (2024) Bachelor's degree (1 major) Mathematical Physics (2024) Bachelor's degree (2 majors) German Language and Literature (2024) Bachelor's degree (1 major, 1 minor) German Language and Literature (2024) Bachelor's degree (1 major) Music Education (2024) Bachelor's degree (2 majors) Music Education (2024) Bachelor's degree (1 major, 1 minor) Music Education (2024) First state examination for the teaching degree Grundschule Music Education in Primary School (2024) First state examination for the teaching degree Sonderpädagogik Music Education in Primary School (2024) First state examination for the teaching degree Mittelschule Music Education in Middle School (2024) First state examination for the teaching degree Sonderpädagogik Music Education in Middle School (2024) Bachelor's degree (1 major) Indology/South Asian Studies (2024) Bachelor's degree (2 majors) Indology/South Asian Studies (2024) Bachelor's degree (1 major, 1 minor) Indology/South Asian Studies (2024) Bachelor's degree (1 major, 1 minor) Ancient World (2024) Bachelor's degree (2 majors) Digital Humanities (2024) Bachelor's degree (1 major, 1 minor) Digital Humanities (2024) Bachelor's degree (1 major) Midwifery (2024) Bachelor's degree (2 majors) Greek Philology (2024) Bachelor's degree (2 majors) Latin Philology (2024) First state examination for the teaching degree Gymnasium Latin Philology (2024) Bachelor's degree (1 major) Business Information Systems (2024) Bachelor's degree (1 major) Economathematics (2024) Bachelor's degree (1 major) Business Management and Economics (2024) Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024) First state examination for the teaching degree Gymnasium English (2024) First state examination for the teaching degree Mittelschule MS-Didaktik Career and Economics (2024) First state examination for the teaching degree Sonderpädagogik MS-Didaktik Career and Economics (2024) First state examination for the teaching degree Grundschule History (2024) First state examination for the teaching degree Gymnasium History (2024) First state examination for the teaching degree Realschule History (2024) First state examination for the teaching degree Mittelschule History (2024) First state examination for the teaching degree Mittelschule Didactics in History (Middle School) (2024) First state examination for the teaching degree Sonderpädagogik Didactics in History (Middle School) (2024) First state examination for the teaching degree Grundschule Didactics in History (Primary School) (2024) First state examination for the teaching degree Gymnasium Greek Philology (2024) Bachelor's degree (1 major) Human-Computer-Interaction (2024) First state examination for the teaching degree Grundschule Art Education in Primary School (2024) First state examination for the teaching degree Sonderpädagogik Art Education in Primary School (2024) First state examination for the teaching degree Sonderpädagogik Art Education in Middle School (2024) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 29 / 181 ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

First state examination for the teaching degree Mittelschule Art Education in Middle School (2024) Bachelor's degree (2 majors) Art Education (2024) Bachelor's degree (1 major) Digital Business & Data Science (2024) Bachelor's degree (1 major) Classics (2024) Bachelor's degree (1 major) Diversity, Ethics and Religions (2024) Bachelor's degree (1 major) (2025) Bachelor's degree (1 major, 1 minor) European Ethnology/Empiric Cultural Studies (2025) Bachelor's degree (1 major) Pedagogy (2025) Bachelor's degree (2 majors) Pedagogy (2025)

Bachelor's degree (1 major) Economathematics (2025)

Julius-Maxi

UNIVERSITÄT

WÜRZBURG

Bachelor's degree (1 major) Academic Speech Therapy (2025)

Bachelor's degree (1 major, 1 minor) Pedagogy (2025)

Bachelor's degree (1 major) Games Engineering (2025)



Classical Physics (16 ECTS credits)

Bachelor's with 1 major Nanostructure Technology (2020) JMU Würzburg • generated 19-Apr-2025 • exam. reg. data record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

finition, measurement p 2. Point Mechanics: Kin motion, free fall, slate l 3. Newton's laws: Force	e Institute of Ap ing e evel duate duate uantities, prefa procedures, SI), ematics, motio tter; circular mo	Only after succ. con Other prerequisites Admission prerequi 13 exercise sheets p approx. 50% of exer lecturer will inform s of the semester.	site to assessment: o per semester). Stude rcises will qualify for students about the ro ties, dimensional an	11-E-M-152-mo1 and Astronomy completion of exercises (approx. nts who successfully completed admission to assessment. The espective details at the beginning nalysis, time / length / mass (de-
Managing Director of th ECTS Method of grad 8 numerical grad 9 Module I 1 semester undergrad 1 semester undergrad 1. Principles: Physical q finition, measurement p 2. Point Mechanics: Kin motion, free fall, slate I 3. Newton's laws: Force	ing e evel duate uantities, prefa procedures, SI), ematics, motio tter; circular mo	Only after succ. con Other prerequisites Admission prerequi 13 exercise sheets p approx. 50% of exer lecturer will inform s of the semester.	Faculty of Physics a npl. of module(s) site to assessment: o per semester). Stude rcises will qualify for students about the re	completion of exercises (approx. nts who successfully completed admission to assessment. The espective details at the beginning
ECTS Method of grad 8 numerical grad Duration Module 1 semester undergrad 1 semester undergrad 1. Principles: Physical q finition, measurement p 2. Point Mechanics: Kin motion, free fall, slate l 3. Newton's laws: Force	ing e evel duate uantities, prefa procedures, SI), ematics, motio tter; circular mo	Only after succ. con Other prerequisites Admission prerequi 13 exercise sheets p approx. 50% of exer lecturer will inform s of the semester.	npl. of module(s) site to assessment: oper semester). Stude rcises will qualify for students about the ro	completion of exercises (approx. nts who successfully completed admission to assessment. The espective details at the beginning
ECTS Method of grad 8 numerical grad Duration Module 1 semester undergrad 1 semester undergrad 1. Principles: Physical q finition, measurement p 2. Point Mechanics: Kin motion, free fall, slate l 3. Newton's laws: Force	ing e evel duate uantities, prefa procedures, SI), ematics, motio tter; circular mo	Only after succ. con Other prerequisites Admission prerequi 13 exercise sheets p approx. 50% of exer lecturer will inform s of the semester.	npl. of module(s) site to assessment: oper semester). Stude rcises will qualify for students about the ro	completion of exercises (approx. nts who successfully completed admission to assessment. The espective details at the beginning
8 numerical grad Duration Module I 1 semester undergra Contents 1. Principles: Physical q finition, measurement p 2. Point Mechanics: Kin motion, free fall, slate I 3. Newton's laws: Force	e evel duate uantities, prefa procedures, SI), ematics, motio tter; circular mo	 Other prerequisites Admission prerequi 13 exercise sheets p approx. 50% of exer lecturer will inform s of the semester. ctors, derived quanti importance of metro	site to assessment: o per semester). Stude rcises will qualify for students about the ro ties, dimensional an	nts who successfully completed admission to assessment. The espective details at the beginning
Duration Module I 1 semester undergra 1 semester undergra Contents undergra 1. Principles: Physical q finition, measurement p 2. Point Mechanics: Kin motion, free fall, slate l 3. Newton's laws: Force	evel duate uantities, prefa procedures, SI), ematics, motio tter; circular mo	Admission prerequi 13 exercise sheets p approx. 50% of exer lecturer will inform s of the semester. ctors, derived quanti importance of metro	site to assessment: oper semester). Stude rcises will qualify for students about the ro ties, dimensional an	nts who successfully completed admission to assessment. The espective details at the beginning
1 semester undergra Contents 1. Principles: Physical q finition, measurement p 2. Point Mechanics: Kin motion, free fall, slate l 3. Newton's laws: Force	duate uantities, prefa procedures, SI), ematics, motio tter; circular mo	Admission prerequi 13 exercise sheets p approx. 50% of exer lecturer will inform s of the semester. ctors, derived quanti importance of metro	site to assessment: oper semester). Stude rcises will qualify for students about the ro ties, dimensional an	nts who successfully completed admission to assessment. The espective details at the beginning
Contents 1. Principles: Physical q finition, measurement p 2. Point Mechanics: Kin motion, free fall, slate l 3. Newton's laws: Force	uantities, prefa procedures, SI), ematics, motio tter; circular mo	13 exercise sheets p approx. 50% of exer lecturer will inform s of the semester. ctors, derived quanti importance of metro	per semester). Stude rcises will qualify for students about the ro ties, dimensional an	nts who successfully completed admission to assessment. The espective details at the beginning
1. Principles: Physical q finition, measurement p 2. Point Mechanics: Kin motion, free fall, slate l 3. Newton's laws: Force	procedures, SI), ematics, motion tter; circular mo	importance of metro		nalysis, time / length / mass (de-
finition, measurement p 2. Point Mechanics: Kin motion, free fall, slate l 3. Newton's laws: Force	procedures, SI), ematics, motion tter; circular mo	importance of metro		nalysis, time / length / mass (de-
 4. Work and energy: (Ki 5. Elastic, inelastic and and balance system, ro 6. Conservative and nor and potential of gravity 7. Rotational motion: An gies to linear translation in the central potential; 8. Tidal forces: Inertial s gal force; 9. Galilean transformati postulates, problem of pulse; 10. Rigid body and gyro their stability, tensor or tation, the Earth as a sp 11. Friction: Static and c mation; 12. Vibration: Represen power approach, Taylor vibration (resonant cassistic) 13. Coupled vibrations: non-linear dynamics an 14. Waves: Wave equati at the open and closed relation; 15. Elastic deformation 16. Fluids: Hydrostatic p 	anisotropic frienetic) performa super-elastic co cket equation; n-conservative f (general relation ngular momentu n, applications, system, reference on: Brief digress simultaneity, Lo scope: Determi the example o inning top; ynamic friction tation by means expansion, have expansion, have expansion, have expansion, have expansion, have expansion, have expansion, have expansion, have expansion, application tation by means expansion, have expansion, have expansion, have expansion, have expansion, have expansion and chaos; on, transverse end, speed of so of solid bodies: or solid bodies:	otion in polar coordir im definition, weight ction. Preparation of nce, examples; ollision: Energy and r force fields: Potential ons); um, angular velocity, satellites (geostation ce systems, apparent soin to Maxwell's eq orentz transformation ning the centre of ma f the elasticity tensor , stick-slip motion, rc s of complex e-function eriodic limit), forced d eigenfunctions, do and longitudinal wav sound; interference, I Elastic modulus, gen oyancy, surface tensor	ors, special cases: Unates; vs. mass forces on t the equations of more nomentum conserva I, potential energy; la torque, rotational er nary and interstellar) t forces, Foucault per uations, ether, Mich n, time dilation and la tess, inertia tensor an r, physics of the bike olling friction, viscou on, equation of moti n; spring and pendul vibration, Fourier an uble pendulum, deter res, polarisation, prir Doppler effect; phase neral Hooke's law, ef-	ation, surges in centre of mass aw, weight scale, field strength nergy, moment of inertia, analo-), escape velocities, trajectories ndulum, Coriolis force, centrifu- elson interferometer, Einstein's ength contraction, relativistic im- d -ellipsoid, principal axes and e; gyroscope: Precession and nu- s friction, laminar flow, eddy for- on (DGL) on forces, torque and lum, physical pendulum, dampec alysis; erministic vs. chaotic motion, nciple of superposition, reflection e and group velocity, dispersion

Intended learning outcomes

The students understand the basic contexts and principles of mechanics, vibration, waves and kinetic theory of gases. They are able to apply mathematical methods to the formulation of physical contexts and autonomously apply their knowledge to the solution of mathematical-physical tasks.

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

V (4) + Ü (2)

Module taught in: Ü: German or English

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)

Language of assessment: German and/or English

Allocation of places

Additional information

Registration: If a student registers for the exercises and obtains the qualification for admission to assessment, this will be considered a declaration of will to seek admission to assessment pursuant to Section 20 Subsection 3 Sentence 4 ASPO (general academic and examination regulations). If the module coordinators subsequently find that the student has obtained the qualification for admission to assessment, they will put the student's registration for assessment into effect. Only those students that meet the respective prerequisites can successfully register for an assessment. Students who did not register for an assessment or whose registration for an assessment was not put into effect will not be admitted to the respective assessment. If a student takes an assessment to which he/she has not been admitted, the grade achieved in this assessment will not be considered.

Workload

240 h

Teaching cycle

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

§ 53 | Nr. 1 a) § 77 | Nr. 1 a)

Modulo annoarc in

Module appears in					
Bachelor's degree (1 major) Physics (2015)					
Bachelor's degree (1 major) Nanostructure Technology (2015)					
Bachelor's degree (1 major) Mathematical Physics (2015)					
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015)					
First state examination for the teaching degree Grundschule Physics (2015)					
First state examination for the teaching degree Realschule Physics (2015)					
First state examination for the teaching degree Gymnasium Physics (2015)					
First state examination for the teaching degree Mittelschule Physics (2015)					
Bachelor's degree (1 major) Mathematical Physics (2016)					
First state examination for the teaching degree Grundschule Physics (2018)					
First state examination for the teaching degree Realschule Physics (2018)					
First state examination for the teaching degree Gymnasium Physics (2018)					
First state examination for the teaching degree Mittelschule Physics (2018)					
Bachelor's degree (1 major) Physics (2020)					
Bachelor's degree (1 major) Nanostructure Technology (2020)					
Bachelor's degree (1 major) Mathematical Physics (2020)					
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020)					
First state examination for the teaching degree Grundschule Physics (2020)					
First state examination for the teaching degree Gymnasium Physics (2020)					
First state examination for the teaching degree Realschule Physics (2020)					
Bachelor's with 1 major Nanostructure Technology (2020)	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da- ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	page 33 / 181			

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First state examination for the teaching degree Mittelschule Physics (2020) Bachelor's degree (1 major) Functional Materials (2021) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024) Bachelor's degree (1 major) Functional Materials (2025)

Module title				Abbreviation	
Classical Physics 2 (Heat and Electromagnetism) 11-E-E-152-mo1					
Module coordinator			Module offered by	,	
Managing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy	
	od of grading	Only after succ. con			
		Only after Succ. con			
	rical grade				
13 exercise sheets per semester). Students who suc approx. 50% of exercises will qualify for admission t					
		Admission prerequisite to assessment: completion of exercises (approx. 13 exercise sheets per semester). Students who successfully completed approx. 50% of exercises will qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the semester.			
Contents					
2. Heat condu 3. Fundament 4. Heat engine 5. Real gases phenomena (c 6. Electrostati point charge; 7. Gaussian so cial symmetric 8. Electrical pre equipotential lace effects, S 9. Matter in th on, thermionic 10. Capacitor, dia in the cap ectric displace 11. Electricity, 12. Resistance ohmic, NTC, P 13. Circuits, el suring instrum 14. Power and 15. Transfer m 16. Magnetost gnetic field; A 17. Vector pot Helmholtz coi 18. Moving ch pole field; mo 19. matter in t ferromagnetis 20. inductance, se 21. Maxwell's equator; Kana	e E-field, charge in a hon c emission, dipole in hom mirror charge, definition acitor; electrical polarisate ement; electrolytic capaci introduction, current der e and conductivity, resisti TC); ectrical networks, Kirchh nents; Wheatstone bridge energy in the circuit; Cap echanisms, conduction i tatics, fundamental laws; mper's Law, analogous to ential, formal derivation,	sion, convection, rac namics, entropy, irrev iciency, example: Sti tter (also solids), van e region, Joule-Thom rical charge, forces; e mb's law, definition of differential form; box, electric. potentiant examples: Sphere hogeneous field, Mill hogeneous and inhor , capacity; plate and tion, displacement and itor; Piezoelectric effen sity, drift velocity, co wity, temperature dep off's rules (meshes, re pacitor charge; galvan n solids: Band mode permanent magnet, o e-box, magn. river, analogous to electric ic field, current balar ctrometer, Wien filter s of the field on matter electron, behaviour on, Lenz's rule, flux c s: Transformer, gener loice of integration an ations, amplitude, pe , capacitor and coil, p	liant heat; versibility, Maxwell's rling engine; der Waals, critical p son; electric field, reps. fie of "river"; Gaussian s al, potential differer e, hollow sphere, cap ikan experiment, Bra nogeneous field; inc spherical capacitor; nd orientation polari ect; onduction mechanism bendence; Ohm's law nodes); internal resis nic element; thermov l, semiconductor; lin field properties, def swirl; e scalar potential; ca nce, Lorentz force, rig s, Hall effect; electro er, relative permeabi at interfaces; hange, eddy electric rator; rea, displacement cu	s demon; point, phase transition eld concept, field line surface, divergence to note, voltage; potention pacitor plates, electron aun tube; electron: F duction, Faraday cago combination of capa sation, microscopic ms; w; realisations (resist stance of a voltage s voltage; le in liquids and gase initions and units; E lculation of fields, es ght-hand rule, electri on: e / m determination interprise (mathematication) bit, susceptibility; p field, Waltenhofen's urrent; Maxwell's exterprise value, o	ons, critical es, field of a theorem; spe- al equation, ic dipole; ield emissi- e; acitors; me- image; diel- stive and non- ource, mea- es; arth's ma- xamples, ic motor; di- ion; bara-, dia-, s pendulum; ension, wave

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(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	

23. Resonant circuits, combinations of RLC; series and parallel resonant circuit; forced vibration, damped harmonic oscillator (related to 11-E-M);

24: Hertz dipole, characteristics of irradiation, near field, far field; Rayleigh scattering; accelerated charge, synchrotron radiation, X-rays; 25. Electromagnetic waves: Principles, Maxwell's determination to electromagnetism, radiation pressure (Poynting vector, radiation pressure).

Intended learning outcomes

The students understand the basic principles and contexts of thermodynamics, science of electricity and magnetism. They know relevant experiments to observe and measure these principles and contexts. They are able to apply mathematical methods to the formulation of physical contexts and autonomously apply their knowledge to the solution of mathematical-physical tasks.

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

V (4) + Ü (2)

Module taught in: Ü: German or English

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) Language of assessment: German and/or English

Allocation of places

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Additional information

Registration: If a student registers for the exercises and obtains the qualification for admission to assessment, this will be considered a declaration of will to seek admission to assessment pursuant to Section 20 Subsection 3 Sentence 4 ASPO (general academic and examination regulations). If the module coordinators subsequently find that the student has obtained the qualification for admission to assessment, they will put the student's registration for assessment into effect. Only those students that meet the respective prerequisites can successfully register for an assessment. Students who did not register for an assessment or whose registration for an assessment to whose not put into effect will not be admitted to the respective assessment. If a student takes an assessment to which he/she has not been admitted, the grade achieved in this assessment will not be considered.

Workload

240 h

Teaching cycle

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

§ 53 | Nr. 1 a)

§ 77 | Nr. 1 a)

Module appears in

Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Realschule Physics (2015) First state examination for the teaching degree Gymnasium Physics (2015) First state examination for the teaching degree Mittelschule Physics (2015) First state examination for the teaching degree Mittelschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Realschule Physics (2015) Bachelor's degree (1 major) Mathematical Physics (2016) First state examination for the teaching degree Grundschule Physics (2018) First state examination for the teaching degree Realschule Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) First state examination for the teaching degree Grundschule Physics (2020) First state examination for the teaching degree Gymnasium Physics (2020) First state examination for the teaching degree Realschule Physics (2020) First state examination for the teaching degree Mittelschule Physics (2020) First state examination for the teaching degree Mittelschule Physics (2020) Bachelor's degree (1 major) Functional Materials (2021) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024) Bachelor's degree (1 major) Functional Materials (2025)



Optics and Quantum Physics I

(6 ECTS credits)

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Module	e title				Abbreviation
Optics	and Qu	antum Physics			11-E-OAV-152-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	Methe	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	on	Module level	Other prerequisites	;	
2 seme	ester	undergraduate			
Conten	Its				

A. optics and quanta

Light (linked to 11-E-E): basic concepts, the speed of light, Huygens-Fresnel principle: reflection, refraction.
 Light in matter: propagation velocity in the medium; dispersion, complex and frequency-dependent dielectric constant; absorption, Kramers-Kronig relation, interfaces, Fresnel equations, polarization, generation by absorption, birefringence, optical activity (dipole)

3. Geometrical optics: basic concepts, Fermat's principle, optical path, planar interfaces, Snell's law, total reflection, optical tunneling, evanescent waves, prism; normal and anomalous dispersion, curved interfaces, thin and thick lenses, lens systems, lens grinder formula, aberrations, imaging errors (spherical & chromatic aberration, astigmatism, coma, distortion, correction approaches).

4. Optical instruments: characteristics; camera, eye, magnifying glass, microscope, telescope types, bundle beam vs. image construction (electron lenses, electron microscope), confocal microscopy.

5. Wave optics: spatial and temporal coherence, Young's double slit experiment, interference pattern (intensity profile), thin films, parallel layers, wedge-shaped layers, phase shift, Newton rings, interferometer (Michelson, Mach-Zender, Fabry-Perot).

6. Diffraction in the far field: Fraunhofer diffraction, , single slit, intensity distribution, apertures, resolving power, Rayleigh & Abbé criterion, Fourier optics, optical grating, n-fold slit, intensity distribution, grating spectrometer and resolution, diffraction off atomic lattices, convolution theorem.

7. Diffraction in the near field: Fresnel, near-field diffraction at circular apertures/disks, Fresnel zone plate, near-field microscopy, holography, Huygens-Fresnel concept; white light hologram.

8. Failure of classical physics I - from light wave to photon: black body radiation and Planck's quantum hypothesis; photoelectric effect and Einstein's explanation, Compton effect, light as a particle, wave-particle duality, , quantum structure of nature

9. Failure of classical physics II - particles as waves: de Broglie's matter wave concept; diffraction of particle waves (Davisson-Germer-experiment, double slit interference).

10. Wave mechanics: wave packets, phase and group velocity (recap of 11-EM), uncertainty principle, Nyquist-Shannon theorem, wave function as probability amplitude, probability of residence, measurement process in quantum mechanics (double-slit experiment & which-way information, collapse of the wave function, Schrödinger's cat).

11. Mathematical concepts of quantum mechanics: Schrödinger equation as wave equation, conceptual comparison to wave optics, free particle and particles in a potential, time-independent Schrödinger equation as eigenvalue equation, simple examples in 1D (potential step, potential barrier and tunnel effect, box potential and energy quantization, harmonic oscillator), box potential in higher dimensions and degeneracy, formal theory of QM (states, operators, observables).

B. atomic and molecular physics

1. Structure of atoms: experimental evidence for the existence of atoms, size of the atom, charges and masses in the atom, isotopes, internal structure, Rutherford experiment, instability of the "classical" Rutherford atom 2. Quantum mechanical foundations of atomic physics (short recap of part A.): light as particle beam, particles as waves, wave functions and probability interpretation, uncertainty relation and stability of the atom, energy quantization in the atom, Franck-Hertz experiment, atomic spectra, Bohr's model and its limitations, non-relativistic Schrödinger equation.

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3. The non-relativistic hydrogen atom: hydrogen and hydrogen-like atoms, central-symmetric potential and angular momentum in QM, Schrödinger equation of the H-atom, atomic orbitals, radial and angular wave functions, quantum numbers, energy eigenvalues.

4. Atoms in external fields: orbital magnetic dipole moment, gyromagnetic ratio, magentic fields: normal Zeeman effect, electrical fields: Stark effect.

5. Fine and hyperfine structure: electronic spin and magnetic spin moment, Stern-Gerlach experiment, Einstein-de Haas effect, glimpse of the Dirac equation (spin as relativistic phenomenon and existence of antimatter), electron spin resonance (ESR), spin-orbit coupling, relativistic fine structure, Lamb shift (quantum electrodynamics), nuclear spin and hyperfine structure.

6. Multielectron atoms: helium atom as simplest example, indistinguishability of identical particles, (anti)symmetry with respect to particle exchange, fermions and bosons, relationship to spin, Pauli principle, orbital and spin wave function of two-particle systems (spin singlets and triplets), LS- and jj-coupling, periodic table of the elements, Aufbau principles and Hund's rules.

7. Light-matter interaction: time-dependent perturbation theory (Fermi's Golden Rule) and optical transitions, matrix elements and dipole approximation, selection rules and symmetry, line broadening (lifetime, Doppler effect, collision broadening), atomic spectroscopy.

8. LASER: elementary optical processes (absorption, spontaneous and stimulated emission), stimulated emission as light amplification, Einstein's rate equations, thermal equilibrium, non-equilibrium character of a laser: rate equations, population inversion, and laser condition, principle structure of a laser, optical pumping, 2-, 3- and 4-level lasers, examples (ruby laser, He-Ne laser, semiconductor laser).

9. Inner-shell excitations and x-ray physics: generation of x-ray radiation, Bremsstrahlung and characteristic spectrum, x-ray emission for elemental analysis (EDX), x-ray absorption and contrast formation in x-ray images, x-ray photoemission, non-radiative Auger processes, synchrotron radiation, application examples.

10. Molecules and chemical bonding: molecular hydrogen ion (H2+) as simplest example: rigid molecule approximation and LCAO approach, bonding and antibonding molecular orbitals, hydrogen molecule (H2): molecular orbital vs. Heitler-London approximation, biatomic heteronuclear molecules: covalent vs. ionic bonding, van der Waals bonds and Lennard-Jones potential, (time allowing: conjugated molecules).

11. Molecule rotations and vibrations: Born-Oppenheimer approximation, rigid rotator (symmetric and unsymmetrical molecules), centrifugal splitting/expansion, molecule as (an)harmonic oscillator, Morse potential, normal vibrational modes, vibrational-rotational interaction.

12. Molecular spectroscopy: transition matrix elements, vibrational spectroscopy: infrared spectroscopy and Raman effect, vibrational-rotational transitions: Fortrat diagram, electronic transitions: Franck-Condon principle.

Intended learning outcomes

The students understand the basic principles and contexts of radiation, wave and quantum optics and quantum phenomena as well as Atomic and Molecular Physics. They understand the theoretical concepts and know the structure and application of important optical instruments and measuring methods. They understand the ideas and concepts of quantum theory and Astrophysics and the relevant experiments to observe and measure quantum phenomena. They are able to discuss their knowledge and to integrate it into a bigger picture.

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

V (4) + V (4)

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

oral examination of one candidate each (approx. 30 minutes) Language of assessment: German and/or English

Allocation of places

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Additional information

Workload

180 h

Teaching cycle

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

Module appears in

Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020)

Bachelor's degree (1 major) Quantum Technology (2021)

exchange program Physics (2023)



Optics and Quantum Physics II

(10 ECTS credits)

Module	e title				Abbreviation	
Optics	and Wa	aves - Exercises			11-E-OA-152-m01	
Module	e coord	inator		Module offered by	<u> </u>	
Manag	ing Dire	ector of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
5	nume	rical grade		-		
Duratio		Module level	Other prerequisites	;		
1 seme	ster	undergraduate				
Conten	Its					
tical pa films, i	ath, ligh nterfero	nt in matter, polarizatio ometers, Fraunhofer di	ontent of 11-E-OAV. An n, Geometrical Optics, ffraction optical grating quantum structure of r	Optical instruments, , Fresnel diffraction,	, wave optics, interfe	erence, thin
Intend	ed lear	ning outcomes				
to appl	ly math		rinciples and contexts ne formulation of physi sical tasks.			
Course	S (type, r	number of weekly contact hour	s, language — if other than Ge	rman)		
Ü (2)						
Module	e taugh	t in: Ü: German or Engl	ish			
		sessment (type, scope, lang le for bonus)	guage — if other than German,	examination offered — if no	ot every semester, informati	ion on whether
		nation (approx. 120 mi				
		ssessment: German ar	id/or English			
Allocat	ion of _l	olaces				
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	e				
		LPO I (examination regulation	ons for teaching-degree progra	ammes)		
§ 53 N § 77 N						
Module	e appea	ars in				
		gree (1 major) Physics	-			
			ucture Technology (201			
			ng degree Grundschule			
			ng degree Realschule I ng degree Gymnasium	-		
			ng degree Mittelschule			
		gree (1 major) Physics		, , , , ,		
			ucture Technology (202	o)		
		gree (1 major) Quantun	1 Technology (2021)			
exchan	ige pro	gram Physics (2023)				
Bachelor's (2020)	with 1 ma	jor Nanostructure Technology	-	• generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte	-	page 43 / 181

Module	title				Abbreviation
Atoms a	and Mo	olecules - Exercises			11-E-AA-202-m01
Module	coord	inator		Module offered by	
Managi	ng Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
5	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semes	ster	undergraduate			
Conten	ts				
ture of a nics of	atoms, the hyc	Experimental fundament	al laws of quantum p ternal fields, multi-el	physics, the Schrödir ectron atoms, optica	by 11-E-OAV. Among others Struc- nger equation, quantum mecha- al transitions and spectroscopy,
Intende	ed learr	ning outcomes			
phenon	nena, a antum	itomic and molecular phy	vsics. they will be abl	e to formulate physi	fundamental laws of quantum cal interrelationships of atomic hematical-physical tasks autono-
Course	5 (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)	
Ü (2) Module	taugh	t in: German or English			
		e ssment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether
		nation (approx. 120 minu ssessment: German and/			
Allocati	ion of p	olaces			
Additio	nal info	ormation			
Worklo	ad				
150 h					
Teachir	ng cycl	e			
Referre	d to in	LPO I (examination regulations	s for teaching-degree progra	mmes)	
Module	appea	irs in			
		gree (1 major) Physics (20		```	
		gree (1 major) Nanostruct gree (1 major) Quantum T		0)	
	-	gree (1 major) Quantum 1 gram Physics (2023)	echnology (2021)		
	0 - 1 - 50	, ,,			



Solid State Physics

(8 ECTS credits)

Module	e title				Abbreviation
Introdu	iction t	o Solid State Physics			11-E-F-152-m01
Module	e coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of Ap	plied 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	ster	undergraduate			
Conten	ts				
Somme deman 2. Cryst tice def tronic p 3. The r theory: 4. Struc electro 5. lattic branch exampl 6. Ther therma 7. Elect strongl on 8. Supe	erfeld c n-Franz tal stru fects; p properti reciproo Scatte cture de n diffra ce vibra ; quant les of d mal pro l expar rrons in y boun	oefficient; electrons in fie e law; Hall effect; limitatio cture, periodic lattice; typ olycrystals; amorphous s ies cal lattice (RG), motivatio ring; Ewald construction; etermination, probes: X-r ction, LEED tions (phonons), equatio ispersion curves (occ. Kr operties of insulators, Ein hsion; thermal conductivi a periodic potential, Blo d electrons (tight binding	elds: Drude-Lorentz-Sons of the model bes of lattices; Bravai solids; group theoreti n: Diffraction; Bragg Bragg equation; Lau ay, electron, neutron ons of motion; disper- um; optical propertie amers-Kronig), measu stein and Debye moo ty; Umklapp process ch theorem; band str g, LCAO); examples of	Sommerfeld; electrica is lattice; Miller indic ical approaches, the condition; definition e's equation; structu ; methods: Laue, Del sion; group velocity; es in the infrared; die urement methods del; phonon density o es; crystal defects ructure; approximatio f band structures, Fe	ermi-Dirac statistics; spec. heat, al and thermal conductivity, Wie- ces; simple crystal structures; lat- importance of symmetry for elec- ; Brillouin zones; diffraction ure and form factor bye-Scherrer, rotating crystal; diatomic base: optical, acoustic electric function (Lorentz model); of states; anharmonicity and on of nearly free electrons (NFE); rmi surfaces, spin-orbit interacti- odes, band structure, many-par-
Intende	ed lear	ning outcomes			
dynami ture of Solid-S	ics, the solids tate Ph	rmal properties, principle and know the experiment	es of electronic prope tal methods and theo oply mathematical m	erties (free electron g pretical models for th ethods to the formul	es (bonding and structure, lattice gas)). They understand the struc- e description of phenomena of ation of physical contexts and asks.
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	rman)	
V (4) + Module	• •	t in: Ü: German or Englisł	1		
		sessment (type, scope, langua le for bonus)	ge — if other than German, o	examination offered — if no	t every semester, information on whether
		nation (approx. 120 minu ssessment: German and,			
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
240 h					

Teaching cycle

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

Module appears in

Bachelor's degree (1 major) Mathematics (2015) Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Mathematical Physics (2015) Bachelor's degree (1 major) Computational Mathematics (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Mathematical Physics (2016) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Mathematics (2023) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024)



Theoretical Physics I

(6 ECTS credits)

Module	title				Abbreviation	
Quantu	m Mec	hanics and Statistical	Physics		11-T-QS-152-m01	
Module	e coord	inator		Module offered by		
Managi and Ast	-	ector of the Institute of	Theoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS		od of grading	Only after succ. con	pl. of module(s)		
6		rical grade		•		
Duratio		Module level	Other prerequisites			
2 seme	ster	undergraduate				
Conten	ts	Y				
A. Quar	ntum m	echanics:				
-			ssical physics; fundam	nental historical expe	eriments; from class	ical physics
		echanics (QM);				
			uation (SG): SG for free			
		ement; correspondence ons of SG	e principles: postulates	s of QM; Enrentest th	eorem; continuity eo	quation; sta-
			quations; Physical sigr	ificance of the eigen	values of an operato	or; state
			ations in state space; te			
		of QM (and their interp	retation): state; measu	rement; chronologica	al development; ene	ergy-time un-
certaint		sional problems. The h	armonic oscillator; pot	ontial loval, notantia	I barriar, potantial w	ulli cummo
try prop			annonic oscillator, por	ential level, potentia	i bamer, potential w	/ell, symme-
			scription in Dirac notat	ion; Spin 1/2 in the ł	nomogeneous magn	etic field;
		ems (qubits);				<i>.</i>
			and rotations; eigenvan n polar coordinates (co		momentum operator	rs (abstract);
			Bonding states in 3D;			
	•	· –	; Hamiltonian operator	-	ect; canonical and k	inetic mo-
			ronov-Bohm effect; Scl	nrödinger, Heisenber	g and interaction re	presentation;
		e electron in a magnet				
		angular momenta;	using angular moment	um algebra;		
		•	ary perturbation theory	(with examples); var	riational method; Wł	KB method;
		nt perturbation theory;			,	
-			ntical particles; helium	atom; Hartree and H	lartree-Fock approxi	mation; ato-
mic stru	ucture	and Hund's rules;				
B. Stati	stical F	Physics and thermodyn	amics:			
			of statistics (central lim	it theorem and statis	tics of extremes); m	icro- and ma-
	•		onal probability, statis	-		
			obability theory; entrop gy and / or particle excl		s; thermodynamic e	quilibrium in
			ar oscillators; ideal gas			
			amics: The 1st law; qua		entropy and tempera	ature; gene-
			aw; reversibility; trans			
	-		fundamentals relation		c potentials; change	es of state;
	•		gine and efficiency); cl s: Systems of identical		ni gas: ideal Bose ga	is and Bo-
se-Eins	tein co	ndensation; grids and	normal modes: Phonor	15;		
			pproximation methods			
			; interacting phonons (rticularities in
1 and 2	unnen	Sions); rang-Lee-theor	ems; Van der Waals eq	uation for real intera	cung gases;	
Pachala	with a most	or Nanoctructure Technology	IA11 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	generated to Apr access	am rog da	n290 (0 / +0+
Bachelor's (2020)	witii 1 maj	or Nanostructure Technology		generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturted		page 49 / 181

7. Critical phenomena: Scaling laws, critical slowing down, fast variable as Bad (electron-phonon interaction and BCS superconductivity); magnetism (quantum criticality at low temperatures, quantum phase transitions at T = o); problems of the thermodynamic limit

Intended learning outcomes

The students have knowledge of the methods of Theoretical Physics. They know the principles of mechanics, Statistical Physics and thermodynamics. They are able to discuss the acquired theoretical concepts and to attribute them to bigger physical contexts.

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

V (4) + V (4)

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

oral examination of one candidate each (approx. 30 minutes) Language of assessment: German and/or English

Allocation of places

Additional information

--

Workload

180 h

Teaching cycle

--

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

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Module appears in

Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023)



Theoretical Physics II

(10 ECTS credits)

Bachelor's with 1 major Nanostructure Technology

(2020)

Modul	e title			·	Abbreviation
Quantu	um Mec	hanics - Exercises			11-T-QA-152-m01
Module	e coord	inator		Module offered by	<u> </u>
Manag and As		ector of the Institute of Th	eoretical Physics	Faculty of Physics a	and Astronomy
ECTS	<u> </u>	od of grading	Only after succ. con	npl. of module(s)	
5	1	rical grade		<u></u>	
Duratio		Module level	Other prerequisites		
1 seme	ster	undergraduate	13 exercise sheets p approx. 50% of exer	er semester). Stude cises will qualify for	completion of exercises (approx. nts who successfully completed admission to assessment. The espective details at the beginning
Conten	Its				
dinger spin-1/	equatio 2 syste	on (SG), formalisation of	QM, eigenvalue equa central potential, hy	tions, postulates of drogen atom, mover	thers Wave function and Schrö- QM, one-dimensional problems, nent in the electromagnetic field, trons, etc.
Intend	ed lear	ning outcomes			
	hem to				s and are able to independently to interpret the results in a physi-
Course	S (type, r	umber of weekly contact hours, l	anguage — if other than Ge	rman)	
Ü (2) Module	e taugh	t in: Ü: German or Englisł	1		
		essment (type, scope, langua le for bonus)	ge — if other than German,	examination offered — if no	ot every semester, information on whether
		nation (approx. 120 minu ssessment: German and,			
Allocat	ion of p	olaces			
		ormation			
this will 3 Sente find the gistrati ly regis sessmo	II be co ence 4 / at the s on for a ster for a ent was	nsidered a declaration of ASPO (general academic tudent has obtained the assessment into effect. O an assessment. Students not put into effect will n	will to seek admissi and examination reg qualification for adm nly those students th who did not register ot be admitted to the	on to assessment pu ulations). If the mod ission to assessmer nat meet the respect for an assessment o respective assessm	n for admission to assessment, ursuant to Section 20 Subsection ule coordinators subsequently nt, they will put the student's re- ive prerequisites can successful- or whose registration for an as- tent. If a student takes an as- ssessment will not be considered.
Worklo	ad				
150 h					
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination regulation	s for teaching-degree progra	immes)	
Module	e appea	irs in			

JMU Würzburg • generated 19-Apr-2025 • exam. reg. data record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

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Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023)

Modul	e title				Abbreviation
Statist	ical Ph	ysics - Exercises			11-T-SA-152-m01
Modul	e coord	inator		Module offered by	<u> </u>
Manag		ector of the Institute of 1	heoretical Physics	Faculty of Physics a	and Astronomy
ECTS		od of grading	Only after succ. cor	npl. of module(s)	
5	nume	rical grade			
Duratio	on	Module level	Other prerequisites	5	
1 seme	ster	undergraduate	, , , 		
Conten		undergraduate			
Among potent	others ials, qu	Principles of statistics,	Statistical Physics, id and Bose gas, system	leal systems, fundam	e content of 11 T-SEV content. nental theorems, thermodynam cles, approximation methods,
Intend	ed lear	ning outcomes			
and are	e able t		hem to the descriptio		dynamics and Statistical Physic blems of Statistical Physics and
Course	S (type, r	number of weekly contact hours	, language — if other than Ge	erman)	
Ü (2) Module	e taugh	t in: Ü: German or Englis	sh		
Metho	d of ass			examination offered — if no	ot every semester, information on whether
written	exami	nation (approx. 120 min			
	_	ssessment: German an	d/or English		
Allocat	ion of _l	olaces			
Additio	onal inf	ormation			
Worklo	ad				
150 h					
Teachi	ng cvcl	e			
	0.94				
	ad to in	LPO I (examination regulation	ins for teaching degree progr	ammec)	
Referre			ins for teaching-degree progr	unines)	
		•			
Modul					
		gree (1 major) Physics (2	-	-)	
		gree (1 major) Nanostru gree (1 major) Mathema	•	5)	
		gree (1 major) Mathema gree (1 major) Mathema	•		
		gree (1 major) Mathema gree (1 major) Physics (2	•		
		gree (1 major) Nanostru		20)	
		gree (1 major) Mathema			
		gree (1 major) Quantum	•		
		gram Physics (2023)			
	متامطم	(
Bachel	or s de	gree (1 major) Mathema	tical Physics (2024)		
		gree (1 major) Mathema		• generated 19-Apr-2025 • exa	am. reg. da- page 54 / 18



Mathematics (24 ECTS credits)

Bachelor's with 1 major Nanostructure Technology (2020) JMU Würzburg • generated 19-Apr-2025 • exam. reg. data record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

Module	e title				Abbreviation
Mather	natics	1 for Students of Physics	and Nanostructure T	echnology	10-M-PHY1-152-m01
Module	e coord	inator		Module offered	d by
Dean o	f Studi	es Mathematik (Mathema	atics)	Institute of Ma	thematics
ECTS	Meth	od of grading	Only after succ. com	pl. of module(s	;)
8	nume	rical grade			
Duratio	on in the second s	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
		on numbers and functio aces, simple differential (eries, differentia	al and integral calculus in one varia-
Intende	ed lear	ning outcomes			
ple pro	blems		ng sciences, in particu		learns to apply these methods to sim- of physics and nanostructure techno-
Course	S (type, 1	number of weekly contact hours, l	anguage — if other than Ger	man)	
V (5) +					
Module	e taugh	t in: Ü: German or Englisl	1		
		sessment (type, scope, langua ile for bonus)	ge — if other than German, e	examination offered ·	— if not every semester, information on whether
b) oral c) oral	examir examir Ige of a	mination (approx. 90 to 1 nation of one candidate e nation in groups (groups of ssessment: German and bonus	ach (approx. 20 minu of 2, 15 minutes per c	ites) or	
Allocat	ion of	olaces			
Additio	nal inf	ormation			
Worklo	ad				
240 h					
Teachi	ng cycl	e			
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
		-	• • •		
Module	e appea	ars in			
		gree (1 major) Physics (20	015)		
		gree (1 major) Nanostruct		5)	
		gree (1 major) Physics (20			
Bachel	or's de	gree (1 major) Nanostruct	ture Technology (202	o)	

Module	e title				Abbreviation
Mathe	matics	2 for Students of Physic	s and Nanostructure Tec	hnology	10-M-PHY2-152-m01
Module	e coord	linator	M	odule offered	d by
Dean o	f Studi	es Mathematik (Mathem	atics) In	stitute of Ma	thematics
ECTS	Meth	od of grading	Only after succ. compl	. of module(s	
8	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
			uations, matrix calculus, quations, Fourier analysis		heory, differential and integral calcu
Intend	ed lear	ning outcomes			
se met	hods to		ural and engineering sci		ematics. He/She learns to apply the ticular in the field of physics and na-
Course	S (type,	number of weekly contact hours,	language — if other than Germa	n)	
V (5) +	• •				
Module	e taugh	it in: Ü: German or Englis	sh		
			age — if other than German, exa	mination offered	— if not every semester, information on whether
		ble for bonus)	· · · · · ·	<u> </u>	
b) oral c) oral	examii examir ige of a	nation of one candidate nation in groups (groups ussessment: German and	120 minutes, usually cho each (approx. 20 minute of 2, 15 minutes per can l/or English	s) or	
Allocat	ion of	places			
Additio	onal inf	ormation			
Worklo	ad				
240 h					
Teachi	ng cycl	e			
Referre	ed to in	LPO I (examination regulation	ns for teaching-degree programm	ies)	
Module	e appe	ars in			
		gree (1 major) Physics (2	2015)		
		gree (1 major) Nanostruc			
		gree (1 major) Physics (2 gree (1 major) Nanostruc			

Module title				Abbreviation
	3 for Students of Physics	and related Discipli	nes (Differential	11-M-D-152-m01
Equations)		-		
Module coord	inator		Module offered by	
Managing Dire and Astrophys	ector of the Institute of Th sics	neoretical Physics	Faculty of Physics	and Astronomy
ECTS Methe	od of grading	Only after succ. con	npl. of module(s)	
8 nume	rical grade			
Duration	Module level	Other prerequisites		
1 semester	undergraduate			
Contents				
Ordinary diffe Fundamentals 1. Ordinary dif 1.1 Solution m 1.2 Existence 1.3 Systems o 1.4 Greens fur 1.5 Hermitsch 2. Function th 2.1 Complex f	and uniqueness theorem f differential equations nction for inhomogeneou e DGL, Legendre DGL eory unctions	stems of differential e	equations.	
 2.3 Singulariti 2.4 Complex i 2.5 Laurent se 2.6 Analytical 2.7 gamma, b 2.8 Differentia 2.9 Saddle po 		ny integral theorem ourier transformation hic functions, whole tions, sets of Weierst ex, Bessel differentia	functions rasse and Mittag-Le	effler
	ar differential equations ning outcomes			
The student h on methods fo	as basic knowledge of m	uations as well as th		quations and knowledge of soluti- tions of a complex variable and is
Courses (type, r	number of weekly contact hours, I	language — if other than Gei	rman)	
V (4) + Ü (2) Module taugh	t in: Ü: German or Englisl	h		
Method of ass module is creditat		ge — if other than German,	examination offered — if n	ot every semester, information on whether
Language of a	nation (approx. 120 minu ssessment: German and			
Allocation of	places			
Additional inf	ormation			

Workload

240 h

Teaching cycle

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

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Module appears in

Bachelor's degree (1 major) Physics (2015)

Bachelor's degree (1 major) Nanostructure Technology (2015)

Bachelor's degree (1 major) Functional Materials (2015)

Bachelor's degree (1 major) Physics (2020)

Bachelor's degree (1 major) Nanostructure Technology (2020)

Bachelor's degree (1 major) Functional Materials (2021)

Bachelor's degree (1 major) Quantum Technology (2021)

exchange program Physics (2023)

Bachelor's degree (1 major) Functional Materials (2025)



Laboratory Course Physics

(11 ECTS credits)

	e title				Abbreviation
Labora	tory Co	ourse Physics A (Mechan	ics, Heat, Electrom	agnetism)	11-P-PA-152-m01
Modul	e coord	inator		Module offer	ed by
Manag	ging Dire	ector of the Institute of A	pplied Physics	Faculty of Phy	sics and Astronomy
ECTS	Meth	od of grading	Only after succ. o	compl. of module	(s)
3		successfully completed			
Duratio		Module level	Other prerequisit	ρς	
		undergraduate			
1 seme					
Measu rents,	rement heat ca		ity of bodies, dyna	mic viscosity, ela	e.g. measurement of voltages and construction of sticity, surface tension, spring con-
Intend	ed lear	ning outcomes			
le to in measu	idepend iring pro	dently plan and conduct	experiments, to co	operate with othe	experimenting techniques. They are a ere a series, and to document the results in a
P (2)	.,,,,,,,	,,			
Metho		S essment (type, scope, langua	age — if other than Germa	an, examination offered	I — if not every semester, information on whether
Prepar cessfu can be	ing, pei lly com repeat	pleted if a Testat (exam) ed once. After completio	(record of readings is passed. Exactly n of all experiment	one experiment t s, talk (with discu	experiments will be considered suc- hat was not successfully completed ussion; approx. 30 minutes) to test th
Prepar cessfu can be candid pleted	ing, pei lly com repeat late's u	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor	(record of readings is passed. Exactly n of all experiment sics-related conten	one experiment t s, talk (with discu ts of the module.	hat was not successfully completed
Prepar cessfu can be candid pleted Allocat	ing, per lly com repeat late's u can be tion of j	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor	(record of readings is passed. Exactly n of all experiment sics-related conten	one experiment t s, talk (with discu ts of the module.	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat	ing, per lly com repeat late's u can be tion of p	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places	(record of readings is passed. Exactly n of all experiment sics-related conten	one experiment t s, talk (with discu ts of the module.	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Additic Worklo	ing, per lly com repeat late's u can be tion of p	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places	(record of readings is passed. Exactly n of all experiment sics-related conten	one experiment t s, talk (with discu ts of the module.	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Additio Worklo 90 h Teachi	ing, per lly com repeat late's u can be tion of p	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places	(record of readings is passed. Exactly n of all experiment sics-related conten	one experiment t s, talk (with discu ts of the module.	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Worklo 90 h Teachi 	ing, per lly com repeat late's u can be tion of p onal inf pad	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places	(record of readings is passed. Exactly n of all experiment sics-related conten nponents of the as	one experiment t is, talk (with discu ts of the module. sessment have to	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Worklo 90 h Teachi Referro	ing, per lly com repeat late's u can be tion of p onal inf pad	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places formation	(record of readings is passed. Exactly n of all experiment sics-related conten nponents of the as	one experiment t is, talk (with discu ts of the module. sessment have to	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Additio 90 h Teachi Referro Modul	ing, per lly com repeat late's u can be tion of p onal inf oad ng cycl ed to in e appea	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places formation	(record of readings is passed. Exactly n of all experiment sics-related conten nponents of the as	one experiment t is, talk (with discu ts of the module. sessment have to	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Worklo 90 h Teachi Referro Bachel Bachel	ing, per lly com repeat late's u can be tion of p onal inf oad ng cycl ed to in e appea lor's de lor's de	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places formation e LPO I (examination regulation ars in gree (1 major) Mathemat gree (1 major) Physics (2	(record of readings is passed. Exactly n of all experiment sics-related conten nponents of the as s for teaching-degree pro- ics (2015) 015)	one experiment t is, talk (with discu- ts of the module. sessment have to ogrammes)	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Additio 90 h Teachi Referro Bachel Bachel Bachel Bachel	ing, per lly com repeat late's u can be tion of p onal inf oad ong cycl ed to in e appea lor's de lor's de lor's de	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places formation e LPO I (examination regulation ars in gree (1 major) Mathemat gree (1 major) Nanostruc	(record of readings is passed. Exactly n of all experiment sics-related conten nponents of the as s for teaching-degree pro- cics (2015) 015) ture Technology (2	one experiment t is, talk (with discu- ts of the module. sessment have to ogrammes)	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Additic Worklc 90 h Teachi Referro Bachel Bachel Bachel Bachel Bachel	ing, per ing, per lly com repeat late's u can be tion of p onal inf oad ng cycl ed to in e appea lor's de lor's de lor's de	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places formation e LPO I (examination regulation ars in gree (1 major) Mathemat gree (1 major) Nanostruc gree (1 major) Mathemat	(record of readings is passed. Exactly n of all experiment sics-related conten nponents of the as sis for teaching-degree pro- cics (2015) o15) ture Technology (2 cical Physics (2015)	one experiment t is, talk (with discu- ts of the module. sessment have to ogrammes)	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Worklo 90 h Teachi Referro Bachel Bachel Bachel Bachel Bachel Bachel	ing, per lly com repeat late's u can be tion of p onal inf onal inf oad ad ed to in e appea lor's de lor's de lor's de lor's de lor's de	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places formation e LPO I (examination regulation ars in gree (1 major) Mathemat gree (1 major) Nanostruc gree (1 major) Mathemat gree (1 major) Mathemat gree (1 major) Computation	(record of readings is passed. Exactly n of all experiment sics-related conten mponents of the as s for teaching-degree pro- cics (2015) o15) ture Technology (2 ical Physics (2015) ional Mathematics	one experiment t is, talk (with discu- ts of the module. sessment have to ogrammes) 015) (2015)	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Worklo 90 h Teachi Referro Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	ing, per ing, per lly com repeat late's u can be tion of p onal inf oad onal inf oad ad ad ad ad ad ad ad ad ad ad ad ad a	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places formation e LPO I (examination regulation ars in gree (1 major) Mathemat gree (1 major) Nanostruc gree (1 major) Mathemat gree (1 major) Mathemat gree (1 major) Computati gree (1 major) Computati	(record of readings is passed. Exactly n of all experiment sics-related conten nponents of the as is for teaching-degree pro- ics (2015) 015) ture Technology (2 ical Physics (2015) ional Mathematics e Computer Science	one experiment t is, talk (with discu- ts of the module. sessment have to ogrammes) 015) (2015) e (2015)	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Worklo 90 h Teachi Referro Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	ing, per ing, per lly com repeat late's u can be tion of p onal inf oad of a cycl ad ad ad ad ad ad ad ad ad ad ad ad ad	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places ormation e LPO I (examination regulation ars in gree (1 major) Mathemat gree (1 major) Nanostruc gree (1 major) Mathemat gree (1 major) Mathemat gree (1 major) Aerospace gree (1 major) Mathemat	(record of readings is passed. Exactly n of all experiment sics-related conten nponents of the as s for teaching-degree pro- cics (2015) o15) ture Technology (2 ical Physics (2015) ional Mathematics e Computer Science ical Physics (2016)	one experiment t is, talk (with discu- ts of the module. sessment have to ogrammes) 015) (2015) e (2015)	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com
Prepar cessfu can be candid pleted Allocat Additic Worklc 90 h Teachi Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	ing, per ing, per lly com repeat late's u can be tion of p onal inf oad onal inf oad oad ed to in e appea lor's de lor's de	forming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both cor places formation e LPO I (examination regulation ars in gree (1 major) Mathemat gree (1 major) Nanostruc gree (1 major) Mathemat gree (1 major) Mathemat gree (1 major) Computati gree (1 major) Computati	(record of readings is passed. Exactly n of all experiment sics-related conten nponents of the as is for teaching-degree pro- sics (2015) 015) ture Technology (2 ical Physics (2015) ional Mathematics computer Science ical Physics (2016) computer Science	one experiment t is, talk (with discu- ts of the module. sessment have to ogrammes) 015) (2015) e (2015)	hat was not successfully completed ission; approx. 30 minutes) to test th Talks that were not successfully com

Julius-Maximilians-UNIVERSITÄT WÜRZBURG

Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major) Aerospace Computer Science (2020) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Mathematics (2023) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024)

Module title				Abbreviation	
Laboratory Course Physics B (Classical Physics, Electricity, Circuits) 11-P-NB-152-m01					
Module coordinator			Module offered by		
Managing 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)		
4 (not)	successfully completed				
Duration	Module level	Other prerequisites			
1 semester	undergraduate	Students are highly recommended to complete modules 11-P-PA and 11- P-FR1 prior to completing module 11-P-NB.			
Contents					
Physical laws	of optics, vibrations and	waves, science of ele	ectricity and circuits	with electric components.	
Intended lear	rning outcomes				
le to indepen measuring pr principles of	dently plan and conduct of otocol. They are able to e statistics and to draw, pro	experiments, to coop valuate the measurin esent and discuss the	erate with others, ar g results on the bas conclusions.	menting techniques. They are ab- nd to document the results in a is of error propagation and of the	
	number of weekly contact hours, I	anguage — if other than Ger	rman)		
P (2)					
Method of as module is credita		ge — if other than German, o	examination offered — if no	ot every semester, information on whether	
Preparing, pe cessfully com can be repea candidate's u	pleted if a Testat (exam) ted once. After completion	record of readings or is passed. Exactly on n of all experiments, ics-related contents	e experiment that w talk (with discussior of the module. Talks	eriments will be considered suc- as not successfully completed n; approx. 30 minutes) to test the that were not successfully com- uccessfully completed.	
Allocation of	places				
Additional in	formation				
Workload					
120 h					
Teaching cycle					
Referred to in LPO I (examination regulations for teaching-degree programmes)					
Module appe	ars in				
	egree (1 major) Nanostruc				
Bachelor's de	egree (1 major) Nanostruci	ture Technology (202	0)		

Module title				Abbreviation		
Advanced Lab periments)	ooratory Course Physics (C (Modern Physics, Co	omputer Aided Ex-	11-P-NC-152-m01		
Module coordinator			Module offered by			
Managing Dir	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy		
ECTS Meth	od of grading	Only after succ. com	npl. of module(s)			
4 (not)	successfully completed					
Duration	Module level	Other prerequisites	Other prerequisites			
1 semester	undergraduate	Students are highly recommended to complete module 11-P-NB prior to completing module 11-P-NC.				
Contents						
	of wave optics, Molecula ised devices with examp			rn measuring methods using spe-		
Intended lear	ning outcomes					
to record mea by using error and discuss t	suring results in a structu propagation and statisti hem in a scientific paper	ured manner, even in cs. They are able to e and a presentation.	case of huge data tr valuate results, to d	erimental setups. They are able affic, and to analyse the results raw conclusions and to present		
	number of weekly contact hours, I	language — if other than Ger	man)			
P (2)						
Method of ass module is creditat		ge — if other than German, e	examination offered — if no	ot every semester, information on whether		
Preparing, pe cessfully com can be repeat candidate's u	pleted if a Testat (exam) ed once. After completion	record of readings or is passed. Exactly on n of all experiments, t ics-related contents of	e experiment that wa talk (with discussion of the module. Talks	riments will be considered suc- as not successfully completed a; approx. 30 minutes) to test the that were not successfully com- uccessfully completed.		
Allocation of	places					
Additional inf	ormation					
Workload						
120 h						
Teaching cycl	e					
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appea	ars in					
Bachelor's de	gree (1 major) Nanostruci	tura Tachnalagu (aga	`			



Compulsory Electives

(32 ECTS credits)



Semiconductor Electronics

(6 ECTS credits)

Module title			Abbreviation			
Electronic Circuits 11-EL-152-m01						
Module coordinator			Module offered by			
Managi	ing Dire	ector of the Institute of A	f Applied Physics Faculty of Physics and Astronomy			
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					
Principles of electronic components and circuits. Analogous circuit technology: Passive (resistors, capacitors, coils and diodes) and active components (bipolar and field-effect transistors, operational amplifiers). Digital circuits: different types of gates and CMOS circuits. Microcontroller						
Intende	ed learr	ning outcomes				
The stu circuit t		nave knowledge of the logy.	oractical setup of elect	ronic circuits from th	e field of analogous	and digital
Course	S (type, n	umber of weekly contact hours	, language — if other than Ge	rman)		
V (3) + Module		t in: German or English				
		sessment (type, scope, lang le for bonus)	uage — if other than German,	examination offered — if no	t every semester, informati	on on whether
 b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: Once a year, summer semester 						
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
180 h						
Teachi	ng cycl	e				
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020)						
Bachelor's (2020)	with 1 maj	or Nanostructure Technology	-	generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturted	-	page 67 / 181



Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023)

Module	e title				Abbreviation			
Physics of Semiconductor Devices				11-SPD-152-m01				
-								
Module coordinator				Module offered by	Module offered by			
Managi	ing Dire	ector of the Institute of A	Applied Physics	Faculty of Physics a	and Astronomy			
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							
Based on the fundamentals of Semiconductor Physics, the lecture provides an insight into semiconductor key technologies and discusses the main components in the fields of electronics and photonics on the basis of examples. The basic part introduces the crystal structures and band and phonon dispersions of technologically relevant semiconductors. The following part discusses the principles of charge transport involving non-equilibrium effects based on the charge carrier density of the thermal equilibrium. The part on technology gives an insight into the methods of production of semiconductor materials and presents the most important methods of planar technology. It discusses the way of functioning of the following components, sorted according to volume components, interface components and application fields: Rectifier diodes, Zener diodes, varistor, varactor, tunnel diodes, IMPATT, Baritt- and Gunn diodes, photodiode, solar cell, LED, semiconductor injection laser, transistor, JFET, Thyristor, Diac, Triac, Schottky diode, MOSFET, MESFET, HFET. It highlights the importance of low-dimensional charge carrier systems for technology and basic research and shows recent developments in the components sector. Intended learning outcomes The students know the characteristics of semiconductors, they have gained an overview of the electronic and phonon band structures of important semiconductors and the resulting electronic, optical and thermal properties. They know the principles of charge transport as well as the Poisson, Boltzmann and continuity equation for the solution of questions. They understand the structure and way of functioning of the main components of electronics (diode, transistor, field-effect transistor, thyristor, diac, triac), of microwave applications (tunnel, Impatt, Baritt or Gunn diode) and of optoelectronics (photo diode, solar cell, light-emitting diode, semiconductor injection laser), they know the realisation possibilities of low-dimensional charge carrier systems on the basis of semiconductors a								
Course	S (type, r	number of weekly contact hours	s, language — if other than Ger	rman)				
	V (3) + R (1) Module taught in: German or English							
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 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: Once a year, summer semester 								
Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. da- page 69 / 181								
Bachelor's (2020)	with 1 ma	jor Nanostructure Technology		generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte		page 69 / 181		

Allocation of places

Additional information

Workload

180 h

Teaching cycle

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

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Module appears in

Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Master's degree (1 major) Functional Materials (2016) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Functional Materials (2022) exchange program Physics (2023) Master's degree (1 major) Functional Materials (2025)

Module title					Abbreviation		
Semiconductor Lasers and Photonics 11-HLF-152-mo1							
Module coordinator				Module offered by			
Managing Director of the Institute of App			Applied Physics	Faculty of Physics a	nd Astronomy		
ECTS Method of grading C			Only after succ. con	Only after succ. compl. of module(s)			
6	nume	rical grade					
Duratio	n	Module level	Other prerequisites				
1 seme	ster	graduate					
Conten	ts						
This lecture discusses the principles of laser physics, based on the example of semiconductor lasers, and cur- rent developments regarding components. The principles of lasers are described on the basis of a general laser model, which will then be extended to special aspects of semiconductor lasers. Basic concepts such as thres- hold condition, characteristic curve and laser efficiency are derived from coupled rate equations for charge car- riers and photons. Other topics of the lecture are optical processes in semiconductors, layer and ridge wavegui- des, laser resonators, mode selection, dynamic properties as well as technology for the generation of semicon- ductor lasers. The lecture closes with current topics of laser research such as quantum dot lasers, quantum cas- cade lasers, terahertz lasers or high-performance lasers.							
		ning outcomes					
		have advanced knowle modern questions and	• • •				
Course	S (type, r	number of weekly contact hour	s, language — if other than Ge	rman)			
V (3) + Module		t in: German or English					
Method	d of ass	sessment (type, scope, lang	uage — if other than German,	examination offered — if no	t every semester, informat	ion on whether	
		le for bonus)					
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: Once a year, summer semester 							
Allocat							
Additional information							
Workload							
180 h							
Teaching cycle							
Referred to in LPO I (examination regulations for teaching-degree programmes)							
 Module appears in							
Bachelor's (2020)	with 1 ma	or Nanostructure Technology	-	e generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturted	-	page 71 / 181	

Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Master's degree (1 major) Functional Materials (2016) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Functional Materials (2022) exchange program Physics (2023) Master's degree (1 major) Functional Materials (2025)

Module	e title				Abbreviation	
Fundam	nentals	of Semiconductor Physi	cs		11-HLP-152-m01	
Module	e coord	inator		Module offered by		
Managi	ing Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con			
6		rical grade		•		
Duratio		Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
2. Cryst 3. Optic 4. Elect 5. Temp 6. (Sem	tal form cal exci ron-ph peratur ni-)mag	roperties nation and electronic ban itations and their couplin onon coupling e-dependent transport pu metic semiconductors	g effects			
		ning outcomes		· DI · TI		с :
		are familiar with the princ id know their physical pro				re of semi-
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ge	rman)		
V (3) + I Module		t in: German or English				
Method	d of ass	sessment (type, scope, langua le for bonus)	ge — if other than German,	examination offered — if no	t every semester, informati	on on whether
 b) oral e c) oral e d) proje e) prese lf a writ stead ta of asse nation e Langua 	examir examin ect repo entatio ten exa ake the ssmen date at ge of a	mination (approx. 90 to 1 nation of one candidate e ation in groups (groups of ort (approx. 8 to 10 pages n/talk (approx. 30 minut amination was chosen as e form of an oral examina t is changed, the lecturer the latest. ssessment: German and, ffered: Once a year, sum	ach (approx. 30 minu of 2, approx. 30 minu of or es). method of assessmution of one candidate must inform student /or English	tes per candidate) of ent, this may be char e each or an oral exar	nged and assessmer mination in groups.	If the method
Allocat	ion of p	olaces				
 Additio	nal inf	ormation				
Worklo	ad					
180 h						
Teachir	ng cycl	e				
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	mmes)		
Module	e appea	ars in				
		gree (1 major) Physics (20 gree (1 major) Nanostruct	-	5)		
		jor Nanostructure Technology	JMU Würzburg •	generated 19-Apr-2025 • exa	-	page 73 / 181

Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023)

Module	title				Abbreviation	
Crystal	Growt	h, thin Layers and Lith	ography	-	11-KDS-152-m01	
Module	e coord	inator		Module offered by		
Managi	ng Dire	ector of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites	5		
1 seme	ster	undergraduate				
Conten	ts	<u> </u>				
Crystal	growth	, thin films, lithograph	V.			
	-	ning outcomes	<u>, </u>			
laborat	ory. Th	have knowledge of crys ey have methodologica d applications of litho	al knowledge of the pro			
Course	S (type, r	number of weekly contact hour	s, language — if other than Ge	rman)		
V (3) + I Module	• •	t in: German or English				
		sessment (type, scope, lang le for bonus)	uage — if other than German,	examination offered — if no	t every semester, informati	on on whether
d) proje e) prese If a writ stead ta of asse nation o Langua	ect repo entatio ten exa ake the ssmen date at ge of a	ation in groups (group ort (approx. 8 to 10 pag n/talk (approx. 30 min amination was chosen t form of an oral examin t is changed, the lectur the latest. ssessment: German ar ffered: Once a year, wi	es) or utes). as method of assessm nation of one candidat er must inform studen Id/or English	ent, this may be chan e each or an oral exa	nged and assessmer mination in groups.	If the method
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
180 h						
Teachir	ıg cycl	е				
Referre	d to in	LPO I (examination regulati	ons for teaching-degree progr	ammes)		
Module	e appea	urs in				
Bachelo Bachelo Bachelo Bachelo Bachelo	or's de or's de or's de or's de or's de	gree (1 major) Physics (gree (1 major) Nanostru gree (1 major) Physics (gree (1 major) Nanostru gree (1 major) Quantun gram Physics (2023)	icture Technology (201 (2020) icture Technology (202	-		
Bachelor's		jor Nanostructure Technology		• generated 19-Apr-2025 • exa lor (180 ECTS) Nanostrukturte		page 75 / 181
(2020)			la record bache		LIIIIK - 2020	

Module	e title				Abbreviation
Current	t Topics	s in Semiconductor Elect	ronics		11-BXN6A-152-m01
Module	e coord	inator		Module offered by	
chairpe	erson o	f examination committee	_	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	unknown	Approval by examination	ation committee req	uired.
Conten	ts				
No info	rmatio	n on contents available.			
Intende	ed learı	ning outcomes			
No info	rmatio	n on intended learning ou	utcomes available.		
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)	
V (3) +	R (1)				
Method	d of ass	essment (type, scope, langua	ge — if other than German, e	examination offered — if no	t every semester, information on whether
		le for bonus)			didate each (approx. 30 minutes)
sentation If a writt stead ta of asse nation	on/talk ten exa ake the ssmen date at	a (approx. 30 minutes). Amination was chosen as Form of an oral examina	method of assessme tion of one candidate must inform student	ent, this may be chai each or an oral exa	t (approx. 8 to 10 pages) or pre- nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
180 h					
Teachir	ng cycl	e			
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
Module	e appea	ars in			
		gree (1 major) Nanostruct	•, •		
		gree (1 major) Nanostruct		o)	
Bachel	or's de	gree (1 major) Quantum T	echnology (2021)		



Materials Science

(ECTS credits)

Module	e title				Abbreviation	
Nanoar	nalytics	5			11-NAN-152-m01	
Module	e coord	inator		Module offered by		
Manag	ing Dire	ector of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	5		
1 seme	ster	graduate				
Conten	ts					
level up of X-ray py. Sca croscop ray abs	o to an / metho nning t oe Se orptior		ion of chemical compo rial systems on the na Electron probes: Scan	sition, spectroscopy noscale Scanning p ning electron micros	of electronic proper probes: Atomic force cope. Transmission	ties, usage microsco- electron mi-
	-	ning outcomes				
vel. The	ey knov thods f	have basic knowledge v microscoping proced or the determination of ds.	ures that are used in pi	ractice in labs and th	e industry as well as	s spectrosco-
Course	S (type, r	number of weekly contact hour	s, language — if other than Ge	rman)		
V (3) + Module		t in: German or English				
Metho	d of ass	sessment (type, scope, lang	uage — if other than German,	examination offered — if no	t every semester, informat	ion on whether
module is	creditab	le for bonus)				
 b) oral c) oral of d) projection e) pression If a write stead to of asseen to a stead t	examir examin ect repo entatio tten exa ake the ssmen date at ge of a	mination (approx. 90 to aation of one candidate ation in groups (group) ort (approx. 8 to 10 pag n/talk (approx. 30 min amination was chosen e form of an oral examin t is changed, the lectur the latest. ssessment: German ar ffered: Once a year, wi	e each (approx. 30 minu s of 2, approx. 30 minu es) or utes). as method of assessm nation of one candidate er must inform student	ites per candidate) o ent, this may be char e each or an oral exa	nged and assessmer mination in groups.	If the method
Allocat		· · · · · ·				
 Additio	onal inf	ormation				
Worklo	ad					
180 h						
Teachi	ng cycl	e				
Referre	d to in	LPO I (examination regulati	ons for teaching-degree progra	ammes)		
Module	e appea	nrs in				
				. , .		
Bachelor's (2020)	with 1 ma	or Nanostructure Technology	-	• generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturtee	-	page 78 / 181

Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Master's degree (1 major) Functional Materials (2016) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023)

Module	title				Abbreviation
Solid S	tate Ph	ysics 2			11-FK2B-202-m01
Module	coord	inator		Module offered by	
Managi	ng Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
8		rical grade			
Duratio		Module level	Other prerequisites		
1 seme		undergraduate			
Conten		undergraduate			
a. Elect b. Block c. Elect 2. Semi a. Elect b. Ferm c. Elect d. Boltz 3. The c a. Macr b. Polar plasmo c. Ferro 4. Semi a. Chara b. Intrir c. Dope d. Phys e. Hetel 5. Magr a. Atom b. Dia- c. Ferro 6. Supe a. Phen b. Mode c. Tunn	rical ar n theor rons -classi rical tra- i surfac rical tra- mann- lielectr oscopi rizabilit ns, into magne conduc acterist nsic ser d semi ics and rostruc netism ic dia- and pa magne ercondu omena els of s el expe	cal models of dynamic pr ansport in partially and co ces; measurement technic ansport in external magne equations of transport ic function and ferroelect c electrodynamics and m ty of solids, of lattices, of er-band transitions, Want tism ctors tics niconductors conductors l applications of p-n junc tures and paramagnetism ramagnetism in metals tism uctivity uperconductivity eriments und applications	rocesses ompletely filled band ques etic fields crics icroscopic theory valence electrons an nier-Mott excitons		ns; optical phonons, polaritons,
		ning outcomes effects, concepts and mo	dels in advanced sol	id state physics. Fan	niliarity with the theoretical prin-
	-	h applications of experim		. ,	
· · · · · · · · · · · · · · · · · · ·		umber of weekly contact hours, l	anguage — if other than Ger	man)	
V (4) + I Module	• •	t in: German or English			
Method	l of ass	essment (type, scope, langua	ge — if other than German, e	examination offered — if no	t every semester, information on whether
		le for bonus)			
b) oral (c) oral (d) proje	examin examin ect repo	nination (approx. 90 to 1 ation of one candidate e ation in groups (groups c ort (approx. 8 to 10 pages n/talk (approx. 30 minut	ach (approx. 30 minu of 2, approx. 30 minut) or		r

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 80 / 181
(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	

If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.

Language of assessment: German and/or English

Assessment offered: In the semester in which the course is offered and in the subsequent semester

Allocation of places

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Additional information

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Workload

240 h

Teaching cycle

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

Module appears in

Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023)

Module	e title				Abbreviation	
Princip	les of E	Energy Technologies			11-ENT-152-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. con		· · · · · · · · · · · · · · · · · · ·	
6	1	rical grade		• • • •		
Duratio		Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts		Į.			
as rene ting ma studen verters Electric	ewable aterials ts. Ene . Nucle city. Bic	iples of energy conservat resources of energy. We , selective layers, highly rgy conservation via ther ar power plants. Hydroel mass. Geothermal energ ning outcomes	also discuss aspects activated carbons). T mal insulation. Thern ectricity. Wind turbing	of optimising materi he course is especia hodynamic energy ef es. Photovoltaics. So	als (e.g. nanostructu lly suitable for teach ficiency. Fossil fired	ured insula- ing degree energy con-
		know the principles of dia ge. They understand the				
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Gei	man)		
V (3) +		tin Common on Frailiah				
		t in: German or English				
		sessment (type, scope, langua ile for bonus)	ge — if other than German,	examination offered — if no	t every semester, informati	ion on whether
b) oral c) oral d) proje e) pres If a writ stead t of asse nation Langua Assess	examin examin ect repo entatio tten exa ake the essmen date at age of a ment o	mination (approx. 90 to 1 nation of one candidate e ation in groups (groups o ort (approx. 8 to 10 pages n/talk (approx. 30 minut amination was chosen as e form of an oral examina t is changed, the lecturer the latest. ssessment: German and ffered: Once a year, wint	ach (approx. 30 minu of 2, approx. 30 minu s) or es) method of assessmo tion of one candidate must inform student /or English	tes per candidate) o ent, this may be chan e each or an oral exa	nged and assessmer mination in groups.	If the method
Allocat	ion of _l	olaces				
Additio	onal inf	ormation				
	-					
Worklo	ad					
180 h						
Teachi	ng cycl	e				
		LPO I (examination regulation	s for teaching-degree progra	mmes)		
§ 22 § 22 § 22	Nr. 2 f)					
Module	e appea	ars in				
Bachelor's (2020)	with 1 ma	jor Nanostructure Technology	-	generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte	-	page 82 / 181

Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015) First state examination for the teaching degree Realschule Physics (2015) First state examination for the teaching degree Gymnasium Physics (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015) First state examination for the teaching degree Mittelschule Physics (2015) First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015) Master's degree (1 major) Functional Materials (2016) First state examination for the teaching degree Grundschule Physics (2018) First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018) First state examination for the teaching degree Realschule Physics (2018) First state examination for the teaching degree Gymnasium Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018) First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2020) First state examination for the teaching degree Grundschule Physics (2020) First state examination for the teaching degree Gymnasium Physics (2020) First state examination for the teaching degree Realschule Physics (2020) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020) First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020) First state examination for the teaching degree Mittelschule Physics (2020) Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Functional Materials (2022) exchange program Physics (2023) Master's degree (1 major) Functional Materials (2025)

Module	title				Abbreviation
Nanote	chnolo	gy in Energy Research			11-NTE-152-m01
Module	coord	inator		Module offered by	
Managi	ng Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
process and str cal con accumu	ses or a uctures texts. l' ılators,	applications by using spe that have optimised pro tuses specific materials	cial functional mater perties due to effects and components as e ver and particle syste	ials. This module co s of nanotechnology. examples, such as th	In be heightened in numerous vers special materials, surfaces It explains the underlying physi- permal insulation materials, heat ective properties, nanoporous va-
Intende	ed learı	ning outcomes			
researc	h. They		echnology to influend	e the properties of r	echnology in the field of energy materials and their applications.
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)	
V (3) + Module		t in: German or English			
Method	l of ass	essment (type, scope, langua	ge — if other than German, e	examination offered — if no	t every semester, information on whether
		le for bonus)			
b) oral e c) oral e d) proje e) prese lf a writ stead ta of asse nation Langua Assess	examin examin ect repo entatio ten exa ake the ssmen date at ge of a ment o	form of an oral examina t is changed, the lecturer the latest. ssessment: German and, ffered: Once a year, sum	ach (approx. 30 minu of 2, approx. 30 minut of or es). method of assessme tion of one candidate must inform student /or English	tes per candidate) of ent, this may be char each or an oral exam	r nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
180 h					
Teachir	ıg cycl	9			
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
Module			Table 1		
Bachelo	or's de	gree (1 major) Nanostruct	ure Technology (2015	5)	I

Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Functional Materials (2022) exchange program Physics (2023) Master's degree (1 major) Functional Materials (2025)

	e title				Abbreviation
Labora	tory Co	ourse Physical Technolog	y of Material Synthe	sis	11-PPT-152-m01
Module	e coord	inator		Module offered by	
Managi	ing Dire	ector of the Institute of A _l	pplied Physics	Faculty of Physics a	and Astronomy
ECTS	Methe	od of grading	Only after succ. con	npl. of module(s)	
8	(not) s	successfully completed			
Duratio	n	Module level	Other prerequisites	5	
1 seme	ster	undergraduate		nswerkstoffe (Functi ke module 11-P-FR1.	onal Materials, Bachelor's) are
Conten	ts				
Physica nologie		rial properties, growth ar	nd coating procedure	s, methods of chara	cterisation and structuring tech-
Intende	ed lear	ning outcomes			
The stu terial sy		- ,	ractical basics of mat	terial characterisatio	n and physical technology for ma
Course	S (type, r	number of weekly contact hours,	language — if other than Ge	rman)	
P (5) Module	e taugh	t in: German or English			
Method	d of ass	sessment (type, scope, langua	age — if other than German,	examination offered — if no	ot every semester, information on whether
module is	creditab	le for bonus)			
	ation o	f the experiment will be c	onsidered successfu	Illy completed if a pr	e-experiment oral test (approx. 15
minutes if a Test sessme en succ ted. Langua	s) is pa tat (exa ent can cessful ge of a	assed. Performing and ev am) is passed. An experin be repeated once in the	aluating the experim ment log (approx. 8 p respective semester. e semester will the mo /or English	ents will be conside bages) must be prepa . Only if both compo	e-experiment oral test (approx. 15 red successfully completed if a ared. Each component of the as- nents of the assessment have be- e considered successfully comple-
minutes if a Test sessme en succ ted. Langua	s) is pa tat (exa ent can cessful ge of a ment o	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same ssessment: German and ffered: Once a year, wint	aluating the experim ment log (approx. 8 p respective semester. e semester will the mo /or English	ents will be conside bages) must be prepa . Only if both compo	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assessi	s) is pa tat (exa ent can cessful ge of a ment o	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same ssessment: German and ffered: Once a year, wint	aluating the experim ment log (approx. 8 p respective semester. e semester will the mo /or English	ents will be conside bages) must be prepa . Only if both compo	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assess Allocat	s) is pa tat (exa ent can cessful ge of a ment o ion of p	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same ssessment: German and ffered: Once a year, wint	aluating the experim ment log (approx. 8 p respective semester. e semester will the mo /or English	ents will be conside bages) must be prepa . Only if both compo	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assess Allocat	s) is pa tat (exa ent can cessful ge of a ment o ion of p	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same assessment: German and ffered: Once a year, wint places	aluating the experim ment log (approx. 8 p respective semester. e semester will the mo /or English	ents will be conside bages) must be prepa . Only if both compo	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assess Allocat	s) is pa tat (exa ent can cessful ge of a ment o ion of p	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same assessment: German and ffered: Once a year, wint places	aluating the experim ment log (approx. 8 p respective semester. e semester will the mo /or English	ents will be conside bages) must be prepa . Only if both compo	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assess Allocati Additio	s) is pa tat (exa ent can cessful ge of a ment o ion of p	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same assessment: German and ffered: Once a year, wint places	aluating the experim ment log (approx. 8 p respective semester. e semester will the mo /or English	ents will be conside bages) must be prepa . Only if both compo	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assess Allocati Additio	s) is pa tat (exa ent can cessful ge of a ment o ion of j nal inf	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same assessment: German and ffered: Once a year, wint places	aluating the experim ment log (approx. 8 p respective semester. e semester will the mo /or English	ents will be conside bages) must be prepa . Only if both compo	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assessi Allocati Additio Worklo 240 h	s) is pa tat (exa ent can cessful ge of a ment o ion of j nal inf	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same assessment: German and ffered: Once a year, wint places	aluating the experim ment log (approx. 8 p respective semester. e semester will the mo /or English	ents will be conside bages) must be prepa . Only if both compo	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assessi Allocati Additio 240 h Teachir 	s) is pa tat (exa ent can cessful ge of a ment o ion of j nal inf ad	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same assessment: German and ffered: Once a year, wint places ormation	aluating the experim ment log (approx. 8 p respective semester. e semester will the me /or English er semester	ents will be conside pages) must be prepa . Only if both compo odule component be	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assessi Allocati Additio 240 h Teachir 	s) is pa tat (exa ent can cessful ge of a ment o ion of j nal inf ad	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same assessment: German and ffered: Once a year, wint places	aluating the experim ment log (approx. 8 p respective semester. e semester will the me /or English er semester	ents will be conside pages) must be prepa . Only if both compo odule component be	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assessi Allocati Additio 240 h Teachir Referre	s) is pa tat (exa ent can cessful ge of a ment o ion of j nal inf ad	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same assessment: German and ffered: Once a year, wint places ormation e LPOI (examination regulation	aluating the experim ment log (approx. 8 p respective semester. e semester will the me /or English er semester	ents will be conside pages) must be prepa . Only if both compo odule component be	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assess Allocati Additio 240 h Teachir Referre Module	s) is pa tat (exa ent can cessful ge of a ment o ion of p mal inf ad ng cycl	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same assessment: German and ffered: Once a year, wint places ormation e LPOI (examination regulation ars in	aluating the experim ment log (approx. 8 p respective semester. e semester will the me /or English er semester s for teaching-degree progra	ents will be consider pages) must be prepa . Only if both compo odule component be	red successfully completed if a ared. Each component of the as- nents of the assessment have be
minutes if a Test sessme en succ ted. Langua Assess Allocati Additio 240 h Teachir Referre Bachelo	s) is pa tat (exa ent can cessful ge of a ment o ion of j mal inf ad ad ad ad ad ad ad ad ad ad ad ad ad	assed. Performing and ev am) is passed. An experin be repeated once in the ly completed in the same assessment: German and ffered: Once a year, wint places ormation e LPOI (examination regulation	aluating the experim ment log (approx. 8 p respective semester. e semester will the me /or English er semester 	ents will be consider pages) must be prepa . Only if both compo odule component be	red successfully completed if a ared. Each component of the as- nents of the assessment have be

Contin	e title				Abbreviation	
CUALIII	g Techi	nologies based on Vapo	ur Deposition		11-BVG-202-m01	
			•	1		
Module				Module offered by		
Manag	ing Dir	ector of the Institute of A	Applied Physics	Faculty of Physics a	ind Astronomy	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	undergraduate				
Conten	nts		•			
		technical basics of PVD on of coating materials o		processes. Layer de	position and layer ch	naracterizati-
		ning outcomes				
The stu industr	udent h rial sigr	as in-depth knowledge nificance and diversity.			ses and gains insig	hts into their
	_	number of weekly contact hours	, language — if other than Ge	rman)		
V (3) + Module		t in: German or English				
		s essment (type, scope, langu ole for bonus)	uage — if other than German,	examination offered — if no	ot every semester, informat	ion on whether
stead t of asse nation Langua	ake the essmen date at age of a	amination was chosen a e form of an oral examin t is changed, the lecture t the latest. ussessment: German and	ation of one candidate	e each or an oral exa	mination in groups.	If the method
		ffered: Once a year, sur				
credita	ble for	ffered: Once a year, sur bonus				
	ble for	ffered: Once a year, sur bonus				
credita Allocat 	ble for t ion of	ffered: Once a year, sur bonus places				
credita Allocat 	ble for t ion of	ffered: Once a year, sur bonus				
credita Allocat Additio	ble for tion of p	ffered: Once a year, sur bonus places				
credita Allocat Additio Worklo	ble for tion of p	ffered: Once a year, sur bonus places				
credita Allocat Additio Worklo 150 h	ble for tion of p onal inf	offered: Once a year, sur bonus places formation				
credita Allocat Additio Worklo	ble for tion of p onal inf	offered: Once a year, sur bonus places formation				
credita Allocat Additio 150 h Teachin 	ble for tion of p onal inf pad	offered: Once a year, sur bonus places formation	nmer semester			
credita Allocat Additio 150 h Teachin 	ble for tion of p onal inf pad	offered: Once a year, sur bonus places formation	nmer semester	ummes)		
credita Allocat Additio 150 h Teachin 	ble for tion of p onal inf oad ng cycl	offered: Once a year, sur bonus places formation e E LPOI (examination regulation	nmer semester	ummes)		
credita Allocat Additio 150 h Teachin Referre Bachel	ble for tion of p onal inf oad ng cycl ed to in e appea or's de	offered: Once a year, sur bonus places formation e LPO I (examination regulation ars in gree (1 major) Physics (2)	nmer semester			
credita Allocat Additio 150 h Teachin Referre Bachel Bachel Bachel	ble for tion of p onal inf oad ng cycl ed to in e appea or's de or's de	offered: Once a year, sur bonus places formation e LPO I (examination regulation ars in gree (1 major) Physics (2 gree (1 major) Nanostru	nmer semester			
credita Allocat Additio Worklo 150 h Teachin Referre Bachel Bachel Bachel Bachel	ble for tion of p onal inf oad ng cycl ed to in e appea or's de or's de or's de	offered: Once a year, sur bonus places formation e LPO I (examination regulation ars in gree (1 major) Physics (2 gree (1 major) Nanostru gree (1 major) Quantum	nmer semester			
credita Allocat Additio Yorklo 150 h Teachin Referre Bachel Bachel Bachel Bachel Master	ble for tion of p onal inf oad ng cycl ed to in e appea or's de or's de or's de r's degr	offered: Once a year, sur bonus places formation e LPO I (examination regulation ars in gree (1 major) Physics (2 gree (1 major) Nanostru	nmer semester			



Master's degree (1 major) Functional Materials (2025)

Module	title				Abbreviation	
Molecu	lar Ma	terials (Lecture)			08-FU-MoMaV-152-	m01
Module	coord	inator		Module offered by		
degree	progra	mme coordinator Funk	tionswerkstoffe (Func-	Chair of Chemical T	echnology of Materi	al Synthesis
tional N						
ECTS		od of grading	Only after succ. con	npl. of module(s)		
5		rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme		undergraduate				
Conten						
Chemic ticles, t		ds and molecular intera	actions, supramolecula	ir chemistry, molecu	lar materials, colloid	ls, nanopar-
		ning outcomes				
		e developed an underst	anding of the relations	hin hatwaan tha nh	vical chamical and	tachnalagi
cal prop teractio	perties ons and lves wi	of materials and their s I how they determine the of the topic in the field, of	structure. They know th ne properties of molecu	e significance of var Ilar materials. They h	ious inter and intran nave learned how to	nolecular in- familiarise
		umber of weekly contact hour	s, language — if other than Ge	rman)		
V (3) + 9		,				
		sessment (type, scope, lang	uage — if other than German,	examination offered — if no	t every semester, informat	ion on whether
		le for bonus)			, ,	
tes) or o 20 page	c) oral es) or e	mination (approx. 90 t examination in groups) presentation (approx ssessment: German an	of up to 3 candidates (. 30 minutes)] as well a	approx. 15 minutes p	oer candidate) or d) l	og (approx.
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
150 h						
Teachir	ıg cycl	e				
Referre	d to in	LPO I (examination regulation	ons for teaching-degree progra	mmes)		
Module	e appea	ars in				
		gree (1 major) Nanostru		5)		
		gree (1 major) Function ee (1 major) Chemistry				
	-	ning degree Gymnasiun		ion PLUS Elite Netwo	ork Bayaria (FNB) (2)	016)
		y course MINT Teacher				
		ee (1 major) Chemistry		·		
		ning degree Gymnasiun				020)
		y course MINT Teacher gree (1 major) Nanostru			B) (2020)	
Dachell	JI S UP	Siee (I major) Nanosliu	iciaie recimology (202	0)		
Bachelor's ((2020)	with 1 maj	or Nanostructure Technology	-	generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte	-	page 89 / 181

Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Chemistry (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Chemic	e title				Abbreviation	
	cally ar	nd bio-inspired Nanotec	hnology for Material S	Synthesis	08-FU-NT-152-m01	
Module	e coord	linator		Module offered	l by	
degree tional <i>I</i>		mme coordinator Funkt ials)	ionswerkstoffe (Func-	Chair of Chemi	cal Technology of Materi	al Synthesis
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
5		rical grade		-		
Duratio		Module level	Other prerequisites			
	-	undergraduate				
1 seme						
ted ma	terials				risation and application biomaterials, introducti	
Intend	ed lear	ning outcomes				
Studen	its hav	e developed a sound kn	owledge of sol-gel che	emistry and biom	nineralisation.	
Course	S (type,	number of weekly contact hours	, language — if other than Ge	rman)		
V (4)						
a) writt b) oral c) oral d) log (e) pres	s credital en exa examin examir (approx entation age of a	nle for bonus) mination (approx. 90 to nation of one candidate nation in groups of up to x. 20 pages) or on (approx. 30 minutes) assessment: German and	180 minutes) or each (20 to 30 minute 3 candidates (approx	es) or	– if not every semester, informat candidate) or	
 Additic	onal inf	ormation				
 Worklo	ad					
 Worklo	oad		-			
150 h		e				
		e				
150 h Teachi i 	ng cycl					
150 h Teachin Referre	ng cycl	e LPO I (examination regulatio	ns for teaching-degree progra	ammes)		
150 h Teachin Referre	ng cycl ed to in	LPO I (examination regulatio	ns for teaching-degree progra	ımmes)		
150 h Teachin Referre Module	ng cycl ed to in e appea	LPOI (examination regulatio				
150 h Teachin Referre Bachel Bachel Master	ng cycl ed to in e apper or's de or's degr	LPO I (examination regulation ars in gree (1 major) Nanostrue gree (1 major) Functiona ee (1 major) Chemistry (cture Technology (201 Il Materials (2015) 2016)	5)		
150 h Teachin Referre Bachel Bachel Master Master Supple Master	ng cycl ed to in e appea or's de or's degr 's teac ementa 's degr	LPO I (examination regulation ars in gree (1 major) Nanostrue gree (1 major) Functiona ee (1 major) Chemistry (hing degree Gymnasium ry course MINT Teacher ee (1 major) Chemistry (cture Technology (201 Il Materials (2015) 2016) I MINT Teacher Educat Education PLUS, Elite 2018)	5) ion PLUS, Elite N Network Bavaria		
150 h Teachin Referre Bachel Bachel Bachel Master Master Supple Master Supple Bachel	ng cycl ed to in e apper or's degr d's teac ementa d's teac ementa or's degr	LPO I (examination regulation ars in gree (1 major) Nanostrue gree (1 major) Functiona ee (1 major) Chemistry (hing degree Gymnasium ry course MINT Teacher ee (1 major) Chemistry (cture Technology (201 Il Materials (2015) 2016) MINT Teacher Educat Education PLUS, Elite 2018) MINT Teacher Educat Education PLUS, Elite cture Technology (202	5) ion PLUS, Elite N Network Bavaria ion PLUS, Elite N Network Bavaria	I (ENB) (2016) Ietwork Bavaria (ENB) (2	



Master's degree (1 major) Chemistry (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Module	Module title Abbreviation						
Nanoso	Nanoscale Materials 08-PCM3-152-m01						
Module	e coord	inator		Module offered by			
lecture	r of the	seminar "Nanoskalige N	Naterialien"	Institute of Physica	l and Theoretical Chemistry		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)			
5	nume	rical grade					
Duratio	on	Module level	Other prerequisites				
1 seme	ster	graduate					
Conten	ts		• •				
		liscusses advanced topic naracterisation methods			e structure, properties, fabricati- rials.		
Intende	ed lear	ning outcomes					
		able to characterise nanc noscale materials.	oscale materials. They	/ are able to name ar	nalytical methods and applicati-		
Course	S (type, r	number of weekly contact hours,	language — if other than Ge	rman)			
S (2) +	Ü (1)						
		Sessment (type, scope, langua le for bonus)	age — if other than German,	examination offered — if no	ot every semester, information on whether		
(approx	x. 30 m Ige of a	inutes) ssessment: German and		on of one candidate	each (approx. 20 minutes) or talk		
Allocat	ion of p	olaces					
Additio	nal inf	ormation					
Worklo	ad						
150 h							
Teaching cycle							
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module	e appea	urs in					
Bachel	or's de	gree (1 major) Nanostruc	ture Technology (201	5)			
Bachel	or's de	gree (1 major) Nanostruc	ture Technology (202	o)			

Module title					Abbreviation		
Materia	al Scier	nce 1 (Basic introductio	on)		08-FU-MaWi1-152-1	m01	
Module	e coord	inator		Module offered by	Module offered by		
			nology of Material Syn-	Chair of Chemical T	echnology of Mater	ial Synthesis	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)			
5	nume	rical grade					
Duratio	•	Module level	Other prerequisites				
1 seme	ster	undergraduate					
Conten							
Uncerta	ainty ar	nalysis, process engine nology, coating process	eering: mixing, comminu ses, sintering.	ution, agglomeration	, separation, drying	g, conveying.	
Intende	ed lear	ning outcomes					
ques a in hanc about r	nd can dling of nomeno	suggest ways of fabric measurement data as clature, significance as	given objective they are ation, processing and t well as statistical and s well as practically dete	reatment of material systematic errors and ermining characterist	s. Furthermore they d posess extensive	areconfiden knowledge	
Course	S (type, r	number of weekly contact hour	rs, language — if other than Ger	rman)			
V (3) +	Ü (1)						
		s essment (type, scope, lang ole for bonus)	guage — if other than German, o	examination offered — if no	t every semester, informa	tion on whether	
d) log (e) pres	approx entatio	ation in groups of up to 20 pages) or .n (approx. 30 minutes) .ssessment: German ar		. 15 minutes per cano	lidate) of		
	ion of p						
Additio	nal inf	ormation					
Worklo	bed						
150 h							
Teachi	ng cycl	e					
Referre	ed to in	LPO I (examination regulati	ions for teaching-degree progra	immes)			
Module appears in							
			ucture Technology (201	5)			
		gree (1 major) Function					
	-	ee (1 major) Chemistry			orly Dovoria (END) (
			m MINT Teacher Educat r Education PLUS, Elite I			2010)	
		ee (1 major) Chemistry		EN Davalla (EN			
	-		n MINT Teacher Educat	ion PLUS, Flite Netwo	ork Bavaria (FNR) (a	2020)	
			Education PLUS, Elite I				
JUDINE							
		jor Nanostructure Technology		generated 19-Apr-2025 • exa		page 94 / 18:	



Bachelor's degree (1 major) Nanostructure Technology (2020)

Module	e title			Abbreviation			
Materia	al Scier	nce 2 (The Material Gro	ups)		08-FU-MaWi2-152-	m01	
Module	o coord	inator		Module offered by	Module offered by		
		Chair of Chemical Techr	nology of Material Syn-	Chair of Chemical T	echnology of Mater	ial Synthesis	
thesis	thesis						
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)			
5	nume	rical grade					
Duratio	n	Module level	Other prerequisites				
1 seme	ster	undergraduate					
Conten	ts						
and pro loys. Ce mics; g	operties eramics lass. P	d properties of the mai s; thermo-mechanical t s: oxidic and non-oxidic olymer materials: therm	reatment; Martensitic t structural ceramics; e	ransitions; ductility lectric and magnetic	and strength; form properties of funct	memory al-	
		ning outcomes					
		e developed a knowled knowledge to research		d properties of the n	nain material group	s and are able	
Course	S (type, r	number of weekly contact hours	s, language — if other than Ger	man)			
V (3) +	Ü (1)						
		sessment (type, scope, lang	uage — if other than German, o	examination offered — if no	t every semester, informa	tion on whether	
		le for bonus) mination (approx. 90 to					
c) oral d) log (e) pres	examin approx entatio	ation of one candidate ation in groups of up to . 20 pages) or n (approx. 30 minutes) ssessment: German an	o 3 candidates (approx		didate) or		
Allocat							
Additio	nal inf	ormation					
Worklo	ad						
150 h							
Teachi	ng cycl	e					
		-					
Referre	d to in	LPO I (examination regulation	and for toaching dogree are	mmos)			
Module	e appea	nrs in					
Bachel	or's de	gree (1 major) Nanostru	cture Technology (201	5)			
		gree (1 major) Function					
	-	ee (1 major) Chemistry					
		ning degree Gymnasiun y course MINT Teacher				2016)	
		ee (1 major) Chemistry					
		ning degree Gymnasiun				2020)	
		y course MINT Teacher			B) (2020)		
		gree (1 major) Nanostru		0) generated 19-Apr-2025 • exa	am, reg. da-	page 96 / 181	
		s					

Bachelor's degree (1 major) Functional Materials (2021) Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Chemistry (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Bachelor's degree (1 major) Functional Materials (2025)

Modul	Module title Abbreviation					
Chemical Nanotechnology: Analytics and Applications 08-FU-NT-AA-152-mo1						
Modul	e coord	inator		Module offered by	<u></u>	
	e progra Matrier		ktionswerkstoffe (Func-	Chair of Chemical T	echnology of Material Synthesis	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
					echnology. Thermoanalysis, industry and technology.	
Intend	ed lear	ning outcomes				
Studer	nts hav	e developed an advan	ced knowledge of the ch	naracterisation and a	application of nanomaterials.	
		· · · ·	ırs, language — if other than Ge			
V (4)						
module i a) writt b) oral c) oral d) log e) pres Langua Alloca	is creditat ten exa examin examir (approx sentation age of a tion of	ble for bonus) mination (approx. 90 f nation of one candidat nation in groups of up s. 20 pages) or n (approx. 30 minutes ussessment: German a	to 180 minutes) or re each (20 to 30 minute to 3 candidates (approx	s) or	didate) or	
Worklo	nad					
150 h						
-	ing cycl	e				
		-				
	ed to in	LPO I (examination regula	tions for teaching-degree progra	ammes)		
Modul	e anne:	ars in				
Module appears inBachelor's degree (1 major) Nanostructure Technology (2015)Master's degree (1 major) Functional Materials (2016)Bachelor's degree (1 major) Nanostructure Technology (2020)Bachelor's degree (1 major) Quantum Technology (2021)Master's degree (1 major) Functional Materials (2022)Master's degree (1 major) Functional Materials (2025)						

Module title					Abbreviation		
Method	Methods of Non-Destructive Material Testing						
Module	coord	inator		Module offered by			
Managi	ng Dire	ector of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)			
4	nume	rical grade					
Duratio	n	Module level	Other prerequisites	i			
1 semes	ster	undergraduate					
Conten	Contents						
	Principles of non-destructive material and component testing. Thermography. Neutron radiography. X-ray testing. Ultrasound. Optical testing, laser. Image processing.						
Intende	ed leari	ning outcomes					
on (hea thods fo problen	it, X-ray or the c ns of m	v, terahertz), particles (letection of radiation t naterial testing and cha	of the generation and i neutrons) or ultrasoun ypes, particles and ultr racterisation. s, language – if other than Ge	d waves with materia asound waves and a	als. They know the a	oplied me-	
V (2) + I							
		t in: German or English					
module is	creditab	le for bonus)	guage — if other than German,	examination offered — if no	t every semester, informati	on on whether	
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: Once a year, winter semester 							
Allocati	ion of p	olaces					
Additio	nal inf	ormation					
	- d						
Worklo	au						
120 h		-					
Teaching cycle							
Referred to in LPO I (examination regulations for teaching-degree programmes)							
Module appears in							
Bachelo Master'	Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Master's degree (1 major) Functional Materials (2016) Bachelor's degree (1 major) Physics (2020)						
Bachelor's ((2020)	with 1 maj	or Nanostructure Technology	-	e generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturtee	-	page 99 / 181	

Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Functional Materials (2022) exchange program Physics (2023) Master's degree (1 major) Functional Materials (2025)



Life Sciences (ECTS credits)

Module title				Abbreviation		
Membranebiology of Plants for Advanced Students			ed Students		07-4BFPS2-152-m01	
Module	coord	inator		Module offered by		
holder	of the C	Chair of Plant Physiology	and Biophysics	Faculty of Biology		
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	Contents					
In this module, students will acquire the general fundamentals of plant membrane transport and the biophysical methods with which it can be characterised. For this purpose, students will be introduced to modern methods of molecular biology and imaging as well as data collection and analysis.						
Intende	ed learr	ning outcomes				
		erstand basic membrane act plants, isolated plant			experimental methods in experi- ms.	
Course	S (type, n	umber of weekly contact hours, la	anguage — if other than Ger	man)		
V (1) + Ü	(5) ت					
		s essment (type, scope, langua; le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether	
c) oral e d) oral e e) prese f) pract not exc	 b) log (approx. 10 to 20 pages) or c) oral examination of one candidate each (approx. 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 20 minutes per candidate) or e) presentation (approx. 20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours). Students will be informed about the method and length of the assessment prior to the course. 					
Allocation of places 16 places. Should the number of applications exceed the number of available places, places will be allocated as follows: Students of the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits will be given preferential con- sideration. Should the module be used in other subjects, there will be two quotas: 95% of places will be alloca- ted to students of the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits and 5% of places (a mi- nimum of one place in total) will be allocated to students of the Bachelor's degree subject Biologie (Biology) with 60 ECTS credits and to students of the Bachelor's degree subjects Computational Mathematics and Mathema- tik (Mathematics), each with 180 ECTS credits, as part of the application-oriented subject Biology (as well as po- tentially to students of other 'importing' subjects). Should the number of places available in one quota exceed the number of applications, the remaining places will be allocated to applicants from the other quota. Should there be, within one module component, several courses with a restricted number of places, there will be a uni- form regulation for the courses of one module component. In this case, places on all courses of a module com- ponent that are concerned will be allocated in the same procedure. In this procedure, applicants who already ha- ve successfully completed at least one other module component of the respective module will be given preferen- tial consideration.						
A waiting list will be maintained and places re-allocated as they become available. Selection process group 1 (95%): Places will primarily be allocated according to the applicants' previous acade- mic achievements. For this purpose, applicants will be ranked according to the number of ECTS credits they ha- ve achieved and their average grade of all assessments taken during their studies or of all module components in the subject of Biologie (Biology) (excluding Chemie (Chemistry), Physik (Physics), Mathematik (Mathematics))						

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ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020page 102 / 181

at the time of application. This will be done as follows: First, applicants will be ranked, firstly, according to their

average grade weighted according to the number of ECTS credits (qualitative ranking) and, secondly, according to their total number of ECTS credits achieved (quantitative ranking). The applicants' position in a third ranking will be calculated as the sum of these two rankings, and places will be allocated according to this third ranking. Among applicants with the same ranking, places will be allocated according to the qualitative ranking or otherwise by lot.

Selection process group 2 (5%): Places will be allocated according to the following quotas: Quota 1 (50 % of places): total number of ECTS credits already achieved in modules/module components of the Faculty of Biology; among applicants with the same number of ECTS credits achieved, places will be allocated by lot. Quota 2 (25 % of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. Quota 3 (25 % of places): lottery.

Should the module be used only in the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits, places will be allocated according to the selection process of group 1.

Additional information

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Workload

150 h

Teaching cycle

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

Module appears in

Bachelor's degree (1 major) Biology (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Biology (2017) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Biology (2021) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Biology (2022) exchange program Biosciences (2022)

Module title Abbreviation						
		otechnology			07-4S1AMB-152-m01	
Module				Module offered by		
-		Chair of Biotechnology ar		Faculty of Biology		
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5		rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	Contents					
technol lysis of	logy an biolog	d biomedicine and the u	nderlying physical pr Ilar and cellular level	inciples. It will discu . These methods inc	trument-based methods in bio- uss modern methods for the ana- clude light microscopy, fluore- netry and microfluidics.	
Intende	ed lear	ning outcomes				
		gain an overview of key n Il learn to decide what m			ctive advantages and disadvan- particular issue.	
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	man)		
V (2) + 2	S (2)					
		sessment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	ot every semester, information on whether	
written credital		nation (approx. 30 to 60 i bonus	minutes)			
Allocat	ion of p	olaces				
25 places. Should the number of applications exceed the number of available places, places will be allocated as follows: Students of the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits will be given preferential con- sideration. Should the module be used in other subjects, there will be two quotas: 95% of places will be alloca- ted to students of the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits and 5% of places (a mi- nimum of one place in total) will be allocated to students of the Bachelor's degree subject Biologie (Biology) with 60 ECTS credits and to students of the Bachelor's degree subjects Computational Mathematics and Mathema- tik (Mathematics), each with 180 ECTS credits, as part of the application-oriented subject Biology (as well as po- tentially to students of other 'importing' subjects). Should the number of places available in one quota exceed the number of applications, the remaining places will be allocated to applicants from the other quota. Should there be, within one module component, several courses with a restricted number of places, there will be a uni- form regulation for the courses of one module component. In this case, places on all courses of a module com- ponent that are concerned will be allocated in the same procedure. In this procedure, applicants who already ha- ve successfully completed at least one other module component of the respective module will be given preferen- tial consideration.						
A waiting list will be maintained and places re-allocated as they become available. Selection process group 1 (95%): Places will primarily be allocated according to the applicants' previous acade- mic achievements. For this purpose, applicants will be ranked according to the number of ECTS credits they ha- ve achieved and their average grade of all assessments taken during their studies or of all module components in the subject of Biologie (Biology) (excluding Chemie (Chemistry), Physik (Physics), Mathematik (Mathematics)) at the time of application. This will be done as follows: First, applicants will be ranked, firstly, according to their average grade weighted according to the number of ECTS credits (qualitative ranking) and, secondly, according to their total number of ECTS credits achieved (quantitative ranking). The applicants' position in a third ranking will be calculated as the sum of these two rankings, and places will be allocated according to the qualitative ranking or otherwi-						

se by lot.

Selection process group 2 (5%): Places will be allocated according to the following quotas: Quota 1 (50 % of places): total number of ECTS credits already achieved in modules/module components of the Faculty of Biology; among applicants with the same number of ECTS credits achieved, places will be allocated by lot. Quota 2 (25 % of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. Quota 3 (25 % of places): lottery.

Should the module be used only in the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits, places will be allocated according to the selection process of group 1.

Additional information

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Workload

150 h

Teaching cycle

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

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Module appears in

Bachelor's degree (1 major) Biology (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Nanostructure Technology (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major) Biology (2017)
Bachelor's degree (1 major) Nanostructure Technology (2020)
Bachelor's degree (1 major) Biology (2021)
Bachelor's degree (1 major, 1 minor) Biology (Minor, 2021)
Bachelor's degree (1 major) Quantum Technology (2021)
Bachelor's degree (1 major) Biology (2022)
exchange program Biosciences (2022)
Bachelor's degree (1 major) Mathematics (2023)

Module title					Abbreviation
Aspects of Molecular Biotechnology			07-4S1MOLB-152-m01		
Module	coord	inator		Module offered by	
holder	of the C	Chair of Biotechnology an	d Biophysics	Faculty of Biology	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
5		rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme		undergraduate			
mes, pr sor des	nental µ roductio ign, dru	on of biomolecules, mole	ecular biology, recom	binant DNA technolo	nobilisation of cells and enzy- ogy, protein engineering, biosen- ibodies, hybridoma technology,
Intende	ed learr	ning outcomes			
ges and Studen dently r	l disad ts will a review i	vantages. They will learn acquire a knowledge of fu	to decide what meth undamental methods lition, they will becon	od is most suitable f in biotechnology the ne acquainted with -	ogy and their respective advanta- for addressing a particular issue. at will enable them to indepen- or, where necessary, will be able
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)	
V (2) + 3	S (2)				
		essment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether
written credital		nation (approx. 30 to 60 i bonus	minutes)		
Allocat	ion of p	olaces			
25 places. Should the number of applications exceed the number of available places, places will be allocated as follows: Students of the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits will be given preferential con- sideration. Should the module be used in other subjects, there will be two quotas: 95% of places will be alloca- ted to students of the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits and 5% of places (a mi- nimum of one place in total) will be allocated to students of the Bachelor's degree subject Biologie (Biology) with 60 ECTS credits and to students of the Bachelor's degree subjects Computational Mathematics and Mathema- tik (Mathematics), each with 180 ECTS credits, as part of the application-oriented subject Biology (as well as po- tentially to students of other 'importing' subjects). Should the number of places available in one quota exceed the number of applications, the remaining places will be allocated to applicants from the other quota. Should there be, within one module component, several courses with a restricted number of places, there will be a uni- form regulation for the courses of one module component. In this case, places on all courses of a module com- ponent that are concerned will be allocated in the same procedure. In this procedure, applicants who already ha- ve successfully completed at least one other module component of the respective module will be given preferen- tial consideration. A waiting list will be maintained and places re-allocated as they become available.					
mic ach ve achie in the s at the ti average to their					

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(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	

Among applicants with the same ranking, places will be allocated according to the qualitative ranking or otherwise by lot.

Selection process group 2 (5%): Places will be allocated according to the following quotas: Quota 1 (50 % of places): total number of ECTS credits already achieved in modules/module components of the Faculty of Biology; among applicants with the same number of ECTS credits achieved, places will be allocated by lot. Quota 2 (25 % of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. Quota 3 (25 % of places): lottery.

Should the module be used only in the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits, places will be allocated according to the selection process of group 1.

Additional information

Workload

150 h

Teaching cycle

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

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Module appears in

Bachelor's degree (1 major) Biology (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Nanostructure Technology (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Master's degree (1 major) Functional Materials (2016)
Bachelor's degree (1 major) Biology (2017)
Bachelor's degree (1 major) Nanostructure Technology (2020)
Bachelor's degree (1 major) Biology (2021)
Bachelor's degree (1 major, 1 minor) Biology (Minor, 2021)
Bachelor's degree (1 major) Quantum Technology (2021)
Bachelor's degree (1 major) Biology (2022)
Master's degree (1 major) Functional Materials (2022)
exchange program Biosciences (2022)
Bachelor's degree (1 major) Mathematics (2023)
Master's degree (1 major) Functional Materials (2025)

Module title					Abbreviation	
Special Bioinformatics 1					07-4S1MZ6-152-m01	
Module coordinator				Module offered by		
holder	of the (Chair of Bioinformatics	-	Faculty of Biology		
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5		rical grade				
Duratio		Module level	Other prerequisites			
1 semes		undergraduate				
Fundar dament tic reco	nental tal prin nstruct	ciples of evolutionary bio ion.			ics (methods and markers), fun- structure prediction, phylogene-	
· · · · ·		ning outcomes				
Studen netic re			databases for sequer	ice analysis, RNA str	ructure prediction and phyloge-	
Courses	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)		
V (1) + Ü	(5) ت					
		s essment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether	
	ge of a	o to 20 pages) ssessment: German or Ei bonus	nglish			
Allocati	ion of p	olaces	,			
Allocation of places 20 places. Should the number of applications exceed the number of available places, places will be allocated as follows: Students of the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits will be given preferential con- sideration. Should the module be used in other subjects, there will be two quotas: 95% of places will be alloca- ted to students of the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits and 5% of places (a mi- nimum of one place in total) will be allocated to students of the Bachelor's degree subject Biologie (Biology) with 60 ECTS credits and to students of the Bachelor's degree subjects Computational Mathematics and Mathema- tik (Mathematics), each with 180 ECTS credits, as part of the application-oriented subject Biology (as well as po- tentially to students of other 'importing' subjects). Should the number of places available in one quota exceed the number of applications, the remaining places will be allocated to applicants from the other quota. Should there be, within one module component, several courses with a restricted number of places, there will be a uni- form regulation for the courses of one module component. In this case, places on all courses of a module com- ponent that are concerned will be allocated in the same procedure. In this procedure, applicants who already ha- ve successfully completed at least one other module component of the respective module will be given preferen- tial consideration. A waiting list will be maintained and places re-allocated as they become available. Selection process group 1 (95%): Places will primarily be allocated according to the auplicants' previous acade- mic achievements. For this purpose, applicants will be ranked according to the number of ECTS credits they ha- ve achieved and their average grade of all assessments taken during their studies or of all module components in the subject of Biologie (Biology) (excluding Chemie (Chemistry), Physik (Physics), Mathematics))						

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Selection process group 2 (5%): Places will be allocated according to the following quotas: Quota 1 (50 % of places): total number of ECTS credits already achieved in modules/module components of the Faculty of Biology; among applicants with the same number of ECTS credits achieved, places will be allocated by lot. Quota 2 (25 % of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. Quota 3 (25 % of places): lottery.

Should the module be used only in the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits, places will be allocated according to the selection process of group 1.

Additional information

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Workload

150 h

Teaching cycle

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

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Module appears in

Bachelor's degree (1 major) Biology (2015) Bachelor's degree (1 major) Mathematics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Computational Mathematics (2015) Bachelor's degree (1 major, 1 minor) Biology (Minor, 2015) Bachelor's degree (1 major) Biology (2017) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Biology (2021) Bachelor's degree (1 major, 1 minor) Biology (Minor, 2020) Bachelor's degree (1 major, 1 minor) Biology (Minor, 2021) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Biology (2022) exchange program Biosciences (2022) Bachelor's degree (1 major) Mathematics (2023)

Modul	e title				Abbreviation
Basics	in Ligh	t- and Electron-Microsco	ру		07-4S1MZ1-152-m01
Module coordinator				Module offered by	
head o	f the D	epartment of Electronmic	roscopy	Faculty of Biology	
ECTS	ECTS Method of grading Onl		Only after succ. con	npl. of module(s)	
5	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ester	undergraduate			
Conter	nts				
Fundar	mental	principles of confocal las	er scanning microsco	opy and electron mic	roscopy.
Intend	ed lear	ning outcomes			
Studer	its have	e acquired theoretical kn	owledge and practica	l skills in the area of	f light and electron microscopy.
Course	S (type, r	number of weekly contact hours,	language — if other than Ge	rman)	
V (1) +	Ü (5)				
		Sessment (type, scope, langua le for bonus)	ge — if other than German,	examination offered — if no	ot every semester, information on whether
written	-	nation (approx. 30 to 60	minutes)		
Allocat	tion of p	olaces			
Studer siderat ted to s nimum 60 ECT tik (Ma tential	I the nu its of th tion. Sh student of one S credi themat ly to stu	e Bachelor's degree sub ould the module be used s of the Bachelor's degre place in total) will be all ts and to students of the ics), each with 180 ECTS idents of other 'importing	ject Biologie (Biology d in other subjects, th ee subject Biologie (B ocated to students of Bachelor's degree su credits, as part of the g' subjects). Should t) with 180 ECTS cred ere will be two quota iology) with 180 ECT the Bachelor's degr bjects Computation e application-oriente he number of places	es will be allocated as follows: lits will be given preferential con- as: 95% of places will be alloca- 'S credits and 5% of places (a mi- ree subject Biologie (Biology) with al Mathematics and Mathema- ed subject Biology (as well as po- s available in one quota exceed as from the other quota. Should

there be, within one module component, several courses with a restricted number of places, there will be a uniform regulation for the courses of one module component. In this case, places on all courses of a module component that are concerned will be allocated in the same procedure. In this procedure, applicants who already have successfully completed at least one other module component of the respective module will be given preferential consideration.

A waiting list will be maintained and places re-allocated as they become available.

Selection process group 1 (95%): Places will primarily be allocated according to the applicants' previous academic achievements. For this purpose, applicants will be ranked according to the number of ECTS credits they have achieved and their average grade of all assessments taken during their studies or of all module components in the subject of Biologie (Biology) (excluding Chemie (Chemistry), Physik (Physics), Mathematik (Mathematics)) at the time of application. This will be done as follows: First, applicants will be ranked, firstly, according to their average grade weighted according to the number of ECTS credits (qualitative ranking) and, secondly, according to their total number of ECTS credits achieved (quantitative ranking). The applicants' position in a third ranking will be calculated as the sum of these two rankings, and places will be allocated according to the sthird ranking. Among applicants with the same ranking, places will be allocated according to the qualitative ranking or otherwise by lot.

Selection process group 2 (5%): Places will be allocated according to the following quotas: Quota 1 (50 % of places): total number of ECTS credits already achieved in modules/module components of the Faculty of Biology; among applicants with the same number of ECTS credits achieved, places will be allocated by lot. Quota 2 (25 % of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. Quota 3 (25 % of places): lottery.

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(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	

Should the module be used only in the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits, places will be allocated according to the selection process of group 1.

Additional information

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Workload

150 h

Teaching cycle

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

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Module appears in

Bachelor's degree (1 major) Biology (2015)
Bachelor's degree (1 major) Mathematics (2015)
Bachelor's degree (1 major) Nanostructure Technology (2015)
Bachelor's degree (1 major) Computational Mathematics (2015)
Bachelor's degree (1 major, 1 minor) Biology (Minor, 2015)
Bachelor's degree (1 major) Biology (2017)
Bachelor's degree (1 major) Nanostructure Technology (2020)
Bachelor's degree (1 major) Biology (2021)
Bachelor's degree (1 major, 1 minor) Biology (Minor, 2020)
Bachelor's degree (1 major) Quantum Technology (2021)
Bachelor's degree (1 major) Biology (2022)
exchange program Biosciences (2022)

Module	e title				Abbreviation		
Specifi	c Biote	chnology 2			07-5S2MZ4-152-m01		
Module	e coordi	nator		Module offered by			
holder	of the C	hair of Biotechnology an	d Biophysics	Faculty of Biology			
ECTS	Metho	d of grading	Only after succ. com	pl. of module(s)			
10	r i i i i i i i i i i i i i i i i i i i	ical grade					
Duratio	on	Module level	Other prerequisites				
1 seme		undergraduate					
Conten							
Under e lar biot scence	expert g echnolo micros	uidance, students will p ogy, nano and microsyste copy, fluorescence spect	erform selected expe ems biotechnology, b	riments on the follow iomaterials and bios	ogical and biophysical topics. wing topics: cellular and molecu- sensors, high-resolution fluore- on of cells.		
		ing outcomes					
applica acquair chanisr tools. Ir	itions th nted wit ms. Stu n the se	nat will enable them to in th - or, where necessary, dents will have acquired	dependently review will be able to indep practical experience e acquired detailed t	relevant literature. Ir endently acquaint th performing experim heoretical knowledg	biophysical methods and their addition, they will have become nemselves with - biophysical me- ents, using a variety of scientific re on these experiments and will y performed.		
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)			
Ü (7) + S Module		in: German and/or Engli	ish				
			ge — if other than German, e	examination offered — if no	t every semester, information on whether		
b) log (a c) oral e d) oral e e) prese f) practi not exc Studen	 a) written examination (approx. 45 to 60 minutes) or b) log (approx. 10 to 20 pages) or c) oral examination of one candidate each (approx. 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 20 minutes per candidate) or e) presentation (approx. 20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours). Students will be informed about the method and length of the assessment prior to the course. Language of assessment: German and/or English 						
Allocat	ion of p	laces					
Studen siderati ted to s nimum 60 ECTS tik (Mat tentially the num there be form res	the nu ts of the ion. Sho students of one S credit themati y to stu nber of e, withi gulation	e Bachelor's degree subj ould the module be used s of the Bachelor's degre place in total) will be allo s and to students of the ics), each with 180 ECTS dents of other 'importing applications, the remain n one module componer n for the courses of one r	ect Biologie (Biology) in other subjects, th e subject Biologie (B ocated to students of Bachelor's degree su credits, as part of the g' subjects). Should th ing places will be all nt, several courses wi nodule component. I) with 180 ECTS cred ere will be two quota iology) with 180 ECT the Bachelor's degr bjects Computation application-oriente he number of places ocated to applicants th a restricted numb n this case, places o	es will be allocated as follows: its will be given preferential con- as: 95% of places will be alloca- S credits and 5% of places (a mi- ee subject Biologie (Biology) with al Mathematics and Mathema- d subject Biology (as well as po- available in one quota exceed from the other quota. Should ber of places, there will be a uni- on all courses of a module com- edure, applicants who already ha-		

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ve successfully completed at least one other module component of the respective module will be given preferential consideration.

A waiting list will be maintained and places re-allocated as they become available.

Selection process group 1 (95%): Places will primarily be allocated according to the applicants' previous academic achievements. For this purpose, applicants will be ranked according to the number of ECTS credits they have achieved and their average grade of all assessments taken during their studies or of all module components in the subject of Biologie (Biology) (excluding Chemie (Chemistry), Physik (Physics), Mathematik (Mathematics)) at the time of application. This will be done as follows: First, applicants will be ranked, firstly, according to their average grade weighted according to the number of ECTS credits (qualitative ranking) and, secondly, according to their total number of ECTS credits achieved (quantitative ranking). The applicants' position in a third ranking will be calculated as the sum of these two rankings, and places will be allocated according to the sthird ranking. Among applicants with the same ranking, places will be allocated according to the qualitative ranking or otherwise by lot.

Selection process group 2 (5%): Places will be allocated according to the following quotas: Quota 1 (50 % of places): total number of ECTS credits already achieved in modules/module components of the Faculty of Biology; among applicants with the same number of ECTS credits achieved, places will be allocated by lot. Quota 2 (25 % of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. Quota 3 (25 % of places): lottery.

Should the module be used only in the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits, places will be allocated according to the selection process of group 1.

Additional information

--

Workload

300 h

Teaching cycle

--

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

--

Module appears in

Bachelor's degree (1 major) Biology (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Biology (2017) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Biology (2021) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Biology (2022) exchange program Biosciences (2022)

Module	e title				Abbreviation			
Labora	tory an	d Measurement Techn	ology in Biophysics		11-LMB-152-m01			
Module	e coord	inator		Module offered by				
Managi	ing Dire	ector of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)				
6	nume	rical grade						
Duratio	n	Module level	Other prerequisites	i				
1 seme	ster	graduate						
Conten	ts							
physica measui	The lecture covers relevant principles of molecular and cellular biology as well as the physical principles of bio- physical procedures for the examination and manipulation of biological systems. The main topics are optical measuring techniques and sensors, methods of single-particle detection, special microscoping techniques and methods of structure elucidation of biomolecules.							
Intende	ed lear	ning outcomes						
sical pr	oceduı ring tec	know the principles of res for the examination hniques and their app	and manipulation of b	iological systems. Th	ney have knowledge	of optical		
Course	S (type, r	number of weekly contact hour	s, language — if other than Ge	rman)				
V (3) + Module		t in: German or English						
Method	d of ass	sessment (type, scope, lang	guage — if other than German,	examination offered — if no	t every semester, informati	ion on whether		
module is	creditab	le for bonus)						
 b) oral c) oral of d) projection e) pressed lf a write stead ta of assed nation Langua 	examir examin ect repo entatio tten exa ake the ssmen date at ge of a	mination (approx. 90 to aation of one candidate ation in groups (group ort (approx. 8 to 10 pag n/talk (approx. 30 min amination was chosen to form of an oral examin t is changed, the lectur the latest. ssessment: German ar ffered: Once a year, su	e each (approx. 30 minus s of 2, approx. 30 minus es) or utes). as method of assessm nation of one candidate rer must inform student nd/or English	tes per candidate) o ent, this may be chan e each or an oral exa	nged and assessmer mination in groups.	If the method		
Allocat	ion of p	olaces						
Additio	nal inf	ormation						
Worklo	ad							
180 h								
Teachi	ng cycl	е						
Referre	d to in	LPO I (examination regulati	ons for teaching-degree progra	ammes)				
Module	e appea	ars in						
		gree (1 major) Physics (gree (1 major) Nanostru	-	5)				
	with 1 ma	jor Nanostructure Technology	-	generated 19-Apr-2025 • exa	-	page 114 / 181		
(2020)			ta record Bachel	or (180 ECTS) Nanostrukturte	chnik - 2020			

Master's degree (1 major) Functional Materials (2016) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Functional Materials (2022) exchange program Physics (2023) Master's degree (1 major) Functional Materials (2025)



Mathematics, Theory and Computer Aided Methods

(ECTS credits)

Module title				Abbreviation	
Introduction to Quantum Computing and Quantum Information 11-QUI-202-m01					
Module coor	dinator		Module offered by	1	
	rector of the Institute of	Theoretical Physics	Faculty of Physics a	and Astronomy	
· ·	nod of grading	Only after succ. cor	npl. of module(s)		
6 num	erical grade				
Duration	Module level	Other prerequisites	;		
1 semester	undergraduate				
Contents					
by density op ment, and er of quantum s quantum cor	ots of quantum theory an perators. Theory of the m ntanglement measures. C states. Introduction to qu nputation and error corre	easurement process. \ Quantum channels, Kra antum teleportation a	Von Neumann entrop aus operators and St	by, bipartite systems inespring theorem.	s, entangle- Decoherence
	rning outcomes				
of specific pr possible app	f the basic principles of roperties of quantum sys plications of quantum info ubject in the Master's stu	tems such as entangle ormation theory. The a	ement. Overview of th	ne most important t	heorems and
Courses (type,	, number of weekly contact hours	, language — if other than Ge	rman)		
V (3) + R (1) Module taug	ht in: German or English				
Method of as module is credita	ssessment (type, scope, languable for bonus)	uage — if other than German,	examination offered — if no	ot every semester, informa	tion on whether
b) oral exam c) oral exami d) project rep e) presentati If a written ex stead take th of assessme nation date a Language of	amination (approx. 90 to ination of one candidate nation in groups (groups oort (approx. 8 to 10 page on/talk (approx. 30 minu xamination was chosen a the form of an oral examin nt is changed, the lecture at the latest. assessment: German an offered: In the semester	each (approx. 30 minu of 2, approx. 30 minu es) or utes). as method of assessm ation of one candidate er must inform studen d/or English	ites per candidate) o ent, this may be cha e each or an oral exa ts about this by four	nged and assessme mination in groups. weeks prior to the c	If the method original exami-
Allocation of	places				
-					
Additional in	formation				
-					
Workload					
180 h					
Teaching cyo	le				
Referred to i	n LPO I (examination regulation	ns for teaching-degree progra	ammes)		
Module appe	ears in				
					1
achelor's with 1 m	ajor Nanostructure Technology	-	• generated 19-Apr-2025 • ex or (180 ECTS) Nanostrukturte	-	page 117 / 181

Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024)

Module	e title				Abbreviation
Introduction to Relativistic Physics and Classical Field Theory 11-RRF-202-m01					
Module coordinator				Module offered by	
	ing Dire trophys	ector of the Institute of Th sics	eoretical Physics	Faculty of Physics a	and Astronomy
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	ester	undergraduate			
Conten	nts				
basic c Theory as elen	concept , Conse nentary	s of classical field theory rvation Quantities, Curre foundations of the gene	using the example on the stand Noether The	f the scalar field. Ele prem. Elements of re	mulation in the Minkowski space ectrodynamics as Relativistic Field lativistic hydrodynamics as well g. black holes.
Intend	ed learı	ning outcomes			
in cova basics	ariant re of gene	presentation. Safe hand	ling of classical relat	ivistic field theories	ng classical relativistic problems as well as a rough overview of the courses in theoretical physics in
Course	S (type, n	number of weekly contact hours, l	anguage — if other than Ge	rman)	
V (3) + Module		t in: German or English			
Metho	d of ass	Sessment (type, scope, langua	ge — if other than German,	examination offered — if no	ot every semester, information on whether
module i	s creditab	le for bonus)			
 b) oral c) oral d) projection e) press lf a write stead to of asset nation Langua 	examin examin ect repo entatio tten exa ake the essmen date at age of a	e form of an oral examina	ach (approx. 30 minu of 2, approx. 30 minu of or es). method of assessm tion of one candidate must inform student /or English	tes per candidate) o ent, this may be cha e each or an oral exa	r nged and assessment may in- mination in groups. If the methoo weeks prior to the original exami
Allocat	tion of p	olaces			
 Additic	onal info	ormation			
Worklo	oad				
180 h					
Teachi	ng cycl	e			
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	immes)	
	e appea				
Bachel	or's de	gree (1 major) Physics (20	020)		
ممامعام		ior Nanostructure Technology		generated 19-Apr-2025 • exa	am, reg. da- page 119 / 181

Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024)

Module	e title	,			Abbreviation	
Statistics, Data Analysis and Computer Physics 11-SDC-152-mo1						
Module	e coord	inator		Module offered by		
Managi	ing Dire	ector of the Institute of A	pplied Physics	Faculty of Physics a	nd Astronomy	
ECTS		od of grading	Only after succ. con			
4	1	rical grade		•		
Duratio		Module level	Other prerequisites			
1 seme		graduate				
Conten		Sidduite				
		a analysis and compute	 r nhysics			
		ning outcomes				
				field of statistics de	ta analysia and Cam	
Physics		have specific and advan	ced knowledge in the	field of statistics, da	ita analysis and Corr	iputational
Course	S (type, r	number of weekly contact hours,	language — if other than Ger	man)		
V (2) + Module		t in: German or English				
Method	d of ass	sessment (type, scope, langu	age — if other than German,	examination offered — if no	t every semester, informati	ion on whether
		le for bonus)			· ·	
b) oral c) oral d d) proje e) prese If a writ stead ta of asse nation Langua	examir examin ect repo entatio tten exa ake the essmen date at age of a ment o	mination (approx. 90 to nation of one candidate lation in groups (groups ort (approx. 8 to 10 page n/talk (approx. 30 minu amination was chosen a e form of an oral examina- t is changed, the lecture t the latest. ssessment: German and ffered: Once a year, win places	each (approx. 30 minu of 2, approx. 30 minu (s) or tes). s method of assessme ation of one candidate r must inform student	tes per candidate) or ent, this may be char e each or an oral exar	nged and assessmer mination in groups.	If the method
Additio	onal inf	ormation				
Worklo	ad		_			
120 h						
Teachi	ng cycl	e				
		-	-			
Referre	ed to in	LPO I (examination regulatio	ns for teaching-degree progra	mmes)		
Module	e appea	ars in				
		gree (1 major) Physics (2	-			
		gree (1 major) Nanostruo		5)		
		gree (1 major) Mathema				
		gree (1 major) Mathema				
		gree (1 major) Physics (2		-)		
		gree (1 major) Nanostruo		0)		
		gree (1 major) Mathema	-	generated to App	um rog da	page test 1 : 0 :
Bachelor's (2020)	with 1 ma	jor Nanostructure Technology	-	generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturted	-	page 121 / 181



Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024)

Modul	e title				Abbreviation	
Numerical Mathematics 1 for students of other subjects					10-M-NUM1af-152-r	n01
Modul	e coord	inator		Module offered by		
Dean c	of Studio	es Mathematik (Mathema	atics)	Institute of Mathem	atics	
ECTS	1	od of grading	Only after succ. com		<u></u>	
	1					
10		rical grade				
Duratio		Module level	Other prerequisites			
1 semester undergraduate						
Conter	nts					
		stems of linear equation: tion with polynomials, sp				s of equati-
Intend	ed lear	ning outcomes				
The stu	udent is	acquainted with the fun oblems and knows abou	•		erical mathematics,	applies them
Course	es (type, r	umber of weekly contact hours,	language — if other than Ger	man)		
V (4) +	Ü (2)					
Metho	d of ass	s essment (type, scope, langua le for bonus)	age — if other than German, e	examination offered — if no	ot every semester, informat	ion on whether
c) oral Langua credita	examin age of a ible for		of 2, 10 to 15 minutes			
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	oad					
300 h						
-	ng cycl	9				
		-				
Referre	ed to in	LPOI (examination regulation	s for teaching-degree progra	mmes)		
Modul	e appea	in				
Bachel	lor's de	gree (1 major) Computer	Science (2015)			
		gree (1 major) Physics (2	_			
Bachel	lor's de	gree (1 major) Nanostruc	ture Technology (201	5)		
		gree (1 major) Aerospace		.015)		
		gree (1 major) Functional		,		
Bachelor's degree (1 major) Aerospace Computer Science (2017)						
		gree (1 major) Computer				
		gree (1 major) Computer	-			
		gree (1 major) Physics (2)		0)		
		gree (1 major) Nanostruc gree (1 major) Aerospace				
		gree (1 major) Aerospace gree (1 major) Functional	•	.020j		
Bachelor's	with 1 ma	or Nanostructure Technology	JMU Würzburg •	generated 19-Apr-2025 • exa	am. reg. da-	page 123 / 181
(2020)				or (180 ECTS) Nanostrukturte		

Bachelor's degree (1 major) Computer Science und Sustainability (2021) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Artificial Intelligence and Data Science (2022) Bachelor's degree (1 major) Artificial Intelligence and Data Science (2023) Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024) Bachelor's degree (1 major) Functional Materials (2025)

	e title				Abbreviation
Numeri	ical Matl	nematics 2 for student	ts of other subjects		10-M-NUM2af-152-m01
Module	e coordir	ator		Module offered by	<u>.</u>
Dean o	of Studies	Mathematik (Mather	natics)	Institute of Mathem	natics
ECTS	1	l of grading	Only after succ. con		
10	<u> </u>	cal grade			
Duratio	on l	Module level	Other prerequisites		
1 seme	ster ı	undergraduate			
Conten	its				
		olems, linear program problems.	ming, methods for initi	ial value problems fo	or ordinary differential equation
Intende	ed learni	ng outcomes			
about t	their adv		ns concerning the poss		erical mathematics and knows on in different fields of natural
Course	S (type, nu	mber of weekly contact hours	, language — if other than Ger	rman)	
V (4) +	Ü (2)				
		ssment (type, scope, lang	Jage — if other than German	examination offered — if no	ot every semester, information on whethe
	s creditable				
credita	age of as ble for b t ion of pl		d/or English		
		aces			
Additic	onal info	rmation			
Worklo	ad				
	<u></u>				
300 h					
Teachi	ng cycle				
Referre	ed to in L	POI (examination regulation	ons for teaching-degree progra	immes)	
Module	e appear	s in			
		s in ree (1 major) Physics (2015)		
Bachel	or's deg	ree (1 major) Physics (2015) cture Technology (201	5)	
Bachel Bachel	or's degi or's degi	ree (1 major) Physics (ree (1 major) Nanostru	-		
Bachel Bachel Bachel	or's degi or's degi or's degi	ree (1 major) Physics (ree (1 major) Nanostru	cture Technology (201) e Computer Science (2		
Bachel Bachel Bachel Bachel	or's degi or's degi or's degi or's degi	ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Aerospac ree (1 major) Functiona	cture Technology (201) e Computer Science (2	2015)	
Bachel Bachel Bachel Bachel Bachel Bachel	or's degi or's degi or's degi or's degi or's degi or's degi	ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Aerospac ree (1 major) Functiona ree (1 major) Aerospac ree (1 major) Physics (cture Technology (2019 e Computer Science (2 al Materials (2015) e Computer Science (2 2020)	2015) 2017)	
Bachel Bachel Bachel Bachel Bachel Bachel Bachel	or's degi or's degi or's degi or's degi or's degi or's degi or's degi	ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Aerospac ree (1 major) Functiona ree (1 major) Aerospac ree (1 major) Physics (ree (1 major) Nanostru	cture Technology (2019 e Computer Science (2 al Materials (2015) e Computer Science (2 2020) cture Technology (202	2015) 2017) 0)	
Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	or's degi or's degi or's degi or's degi or's degi or's degi or's degi or's degi	ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Aerospac ree (1 major) Functiona ree (1 major) Aerospac ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Aerospac	cture Technology (2019 e Computer Science (2 al Materials (2015) e Computer Science (2 2020) cture Technology (202 e Computer Science (2	2015) 2017) 0)	
Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	or's degi or's degi or's degi or's degi or's degi or's degi or's degi or's degi or's degi	ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Aerospac ree (1 major) Functiona ree (1 major) Aerospac ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Aerospac ree (1 major) Functiona	cture Technology (2019 e Computer Science (2 al Materials (2015) e Computer Science (2 2020) cture Technology (202 e Computer Science (2 al Materials (2021)	2015) 2017) 0)	
Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	or's degi or's degi or's degi or's degi or's degi or's degi or's degi or's degi or's degi or's degi	ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Aerospac ree (1 major) Functiona ree (1 major) Aerospac ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Functiona ree (1 major) Guantum	cture Technology (2019 e Computer Science (2 al Materials (2015) e Computer Science (2 2020) cture Technology (202 e Computer Science (2 al Materials (2021) Technology (2021)	2015) 2017) 0)	
Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	or's degi or's degi or's degi or's degi or's degi or's degi or's degi or's degi or's degi or's degi	ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Aerospac ree (1 major) Functiona ree (1 major) Aerospac ree (1 major) Physics (ree (1 major) Nanostru ree (1 major) Aerospac ree (1 major) Functiona	cture Technology (2019 e Computer Science (2 al Materials (2015) e Computer Science (2 2020) cture Technology (202 e Computer Science (2 al Materials (2021) Technology (2021)	2015) 2017) 0)	

Module	e title				Abbreviation	
Programming course for students of Mathematics and other subjects 10-					10-M-PRG-152-m01	
Module	e coord	inator		Module offered by		
Dean o	f Studie	es Mathematik (Mather	natics)	Institute of Mathen	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
3		successfully completed		•		
Duratio		Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten						
		odern programming lan				
			guage (e. g. c).			
		ning outcomes				
in math		able to work independ cs.	ently on small program	iming exercises and	l standard programm	ing problems
Course	S (type, n	number of weekly contact hours	s, language — if other than Ger	rman)		
P (2)						
Method		sessment (type, scope, lang	uage — if other than German,	examination offered — if n	ot every semester, informat	ion on whether
		le for bonus)				
		form of programming ex		25 hours)		
-	-	ssessment: German an ffered: Once a year, sur				
Allocat		*				
AllULAL		JIdles				
Additio	nal inf	ormation				
Worklo	ad					
90 h						
Teachi	ng cycl	e				
Referre	d to in	LPO I (examination regulation	ons for teaching-degree progra	immes)		
§ 22	Nr. 3 f)					
Module	e appea	urs in				
Bachel	or's de	gree (1 major) Mathema	atics (2015)			
		gree (1 major) Physics (
		gree (1 major) Nanostru		5)		
		gree (1 major) Economa				
		gree (1 major) Mathema	• -	`		
		gree (1 major) Computa		015)		
		gree (1 major) Functiona mination for the teachin		Mathematics (2015)		
		gree (1 major) Mathema		mainemailes (2015)	,	
		gree (1 major) Economa	•			
		mination for the teaching		Mathematics (2019))	
		gree (1 major) Physics (
		gree (1 major) Nanostru		o)		
		gree (1 major) Mathema				
Bachel	or's de	gree (1 major) Functiona	al Materials (2021)			
Bachelor's (2020)	with 1 maj	jor Nanostructure Technology	-	generated 19-Apr-2025 • ex or (180 ECTS) Nanostrukturte	-	page 126 / 181

Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Economathematics (2021) Bachelor's degree (1 major) Economathematics (2022) Bachelor's degree (1 major) Mathematical Data Science (2022) exchange program Mathematics (2023) First state examination for the teaching degree Gymnasium Mathematics (2023) Bachelor's degree (1 major) Mathematics (2023) Bachelor's degree (1 major) Economathematics (2023) Bachelor's degree (1 major) Economathematics (2023) Bachelor's degree (1 major) Mathematical Physics (2024) Bachelor's degree (1 major) Economathematics (2025) Bachelor's degree (1 major) Functional Materials (2025) Bachelor's degree (1 major) Economathematics (2025)

Module title				Abbreviation			
Computational Mathematics 10-M-COM-152-mo1					L		
Module	e coord	inator		Module offered by			
Dean o	of Studie	es Mathematik (Mathe	matics)	Institute of Mathem	atics		
ECTS	1	od of grading	Only after succ. compl. of module(s)				
4		successfully completed		• • • •			
Duratio		Module level	Other prerequisites	i			
1 seme	ster	undergraduate					
Conten	its						
merica and 10- rential	Introduction to modern mathematical software for symbolic computation (e. g. Mathematica or Maple) and nu- merical computation (e. g. Matlab) to supplement the basic modules in analysis and linear algebra (10-M-ANA-G and 10-M-LNA-G). Computer-based solution of problems in linear algebra, geometry, analysis, in particular diffe- rential and integral calculus; visualisation of functions.						
Intende	ed learı	ning outcomes					
		arns the use of advanc cation to solve mathem	ed modern mathemati natical problems.	cal software package	es, and is able to ass	sess their	
			s, language — if other than Ge	rman)			
V (1) +							
			uage — if other than German,	examination offered — if no	t every semester, informati	ion on whether	
		le for bonus)					
Langua	age of a	form of programming e ssessment: German ar ffered: Once a year, wi		25 hours)			
Allocat	ion of p	olaces					
Additio	onal inf	ormation					
Worklo	ad						
120 h							
Teachi	ng cycl	e					
Referre	ed to in	LPO I (examination regulati	ons for teaching-degree progra	ammes)			
§ 22	Nr. 3 f)						
Module	e appea	ins in					
Bachel	or's de	gree (1 major) Mathema	atics (2015)				
		gree (1 major) Physics (-				
			Icture Technology (201	5)			
		gree (1 major) Economa					
	Bachelor's degree (1 major) Mathematical Physics (2015)						
	Bachelor's degree (1 major) Computational Mathematics (2015) Bachelor's degree (1 major) Functional Materials (2015)						
			ng degree Gymnasium	Mathematics (2015)			
		gree (1 major) Mathema					
		gree (1 major) Economa	•				
			ng degree Gymnasium	Mathematics (2019)			
Bachel	or's de	gree (1 major) Physics ((2020)				
Bachelor's (2020)	with 1 maj	or Nanostructure Technology	-	• generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte	-	page 128 / 181	

Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major) Functional Materials (2021) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Economathematics (2022) Bachelor's degree (1 major) Economathematics (2022) Bachelor's degree (1 major) Mathematical Data Science (2022) exchange program Mathematics (2023) First state examination for the teaching degree Gymnasium Mathematics (2023) Bachelor's degree (1 major) Economathematics (2023) Bachelor's degree (1 major) Fucntomathematics (2024) Bachelor's degree (1 major) Functional Materials (2025) Bachelor's degree (1 major) Economathematics (2025)

Module	title				Abbreviation	
Mathem lysis)	natics A	4 for Students of Physic	s and related Discipli	ines (Complex Ana-	11-M-F-152-m01	
Module coordinator Module offered by						
Managir and Astr		ctor of the Institute of T ics	heoretical Physics	Faculty of Physics a	and Astronomy	
ECTS	Metho	d of grading	Only after succ. cor	npl. of module(s)		
8	numer	ical grade				
Duratio	n	Module level	Other prerequisites	5		
1 semes	ster	undergraduate				
Content	S					
Fundam Part I: fu 1.1 Linea 1.2 Metr 1.3 Linea 1.4 Fund 1.5 Linea 1.6 Matr 1.8 The I Part II: d 2. Partia 2.1 Linea 2.3 Heln	entals unction ar vect- ic, sta- ar oper- tion sp ar oper- ix repr Dirac c lifferer al differ ar part nd 3D nholtz	bace, completion, Lebes rators on the Hilbert spa esentation of operators lelta function and its dif ntial equations rential equations ial differential equation wave equation equation and potential	quations in physics ar sgue integral, Hilbert s ice ferent representation s of 2nd order	nd systems of differe space		
		lifferential equations ing outcomes	_			
The stuc as know techniqu	dent ha /ledge ues.	as basic knowledge of m of solution methods for	partial differential ec	quations and is profic		
		umber of weekly contact hours,	language — if other than Ge	rman)		
	taught	: in: Ü: German or Englis				
module is	creditab	essment (type, scope, langu e for bonus)		examination offered — if no	ot every semester, informa	tion on whether
		nation (approx. 120 mini ssessment: German and				
Allocati	on of p	laces				
Addition	nal info	ormation				
Workloa	ad					
240 h						
Bachologe	ith a mai	or Nanostructura Tachnalam	IAIL M// mbress	generated to Apr 2025 +	am reg da	page 120 / 18-
achelor's w 2020)	nui 1 maj	or Nanostructure Technology	-	• generated 19-Apr-2025 • exa lor (180 ECTS) Nanostrukturte	-	page 130 / 181

Teaching cycle

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

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Module appears in

Bachelor's degree (1 major) Physics (2015)

Bachelor's degree (1 major) Nanostructure Technology (2015)

Bachelor's degree (1 major) Physics (2020)

Bachelor's degree (1 major) Nanostructure Technology (2020)

Bachelor's degree (1 major) Functional Materials (2021)

Bachelor's degree (1 major) Quantum Technology (2021)

exchange program Physics (2023)

Bachelor's degree (1 major) Functional Materials (2025)

Modul	e title				Abbreviation	
Theoretical Mechanics					11-T-M-152-m01	
Module coordinator				Module offered by		
Manag		ector of the Institute of T	heoretical Physics	Faculty of Physics and Astronomy		
ECTS	T Ó	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 semester undergraduate Admission prerequisite to assessment: completion of exer 13 exercise sheets per semester). Students who successfu approx. 50% of exercises will qualify for admission to asse lecturer will inform students about the respective details a of the semester.		nts who successfully admission to asses	y completed sment. The			
Conter	nts					
ons, mechanical gauge transformation; symmetries, Noether theorem, cyclic coordinates; accelerated reference systems and apparent forces; 3. Hamiltonian formulation: Legendre transformation, phase space; Hamilton function, canonical equations; Poisson brackets, canonical transformations; generator of symmetries, conservation laws; minimal coupling; Liouville theorem; Hamilton-Jacobi formulation [optional]; 4. Applications: Central-force problems; mechanical similarity, Virial theorem; minor vibrations; particles in an electromagnetic field; rigid bodies, torque and inertia tensor, centrifugal and Euler equations [optional]; 5. Relativistic dynamics: Lorentz Transformation; Minkowski space; equations of motion; 6. Non-linear dyna-						
		y theory; KAM theory [op ning outcomes				
miliar v dently	with the apply t	have gained first experie e principles of theoretica he acquired mathematic e results. They have esp	Il mechanics and their al methods and techr	r different formulatio niques to simple pro	ons. They are able to blems of Theoretical	indepen-
_		number of weekly contact hours,			·	
V (4) +	Ü (2)	ıt in: Ü: German or Englis				
		sessment (type, scope, langu ble for bonus)	age — if other than German,	examination offered — if no	ot every semester, informat	ion on whether
		nation (approx. 120 min assessment: German and	-			
Allocat	tion of	places				
		ormation				
this wi 3 Sente find th gistrati ly regis	ll be co ence 4 at the s ion for ster for	If a student registers for onsidered a declaration of ASPO (general academic student has obtained the assessment into effect. (an assessment. Student	of will to seek admission and examination reg qualification for adm Dnly those students th	on to assessment pu ulations). If the mod ission to assessmen nat meet the respect	ursuant to Section 20 Jule coordinators sub nt, they will put the s ive prerequisites car	o Subsection osequently tudent's re- n successful-
sessm	ent to v	s not put into effect will r vhich he/she has not be vjor Nanostructure Technology	not be admitted to the en admitted, the grad	respective assessm	ent. If a student tak ssessment will not b	es an as-

Workload

240 h

Teaching cycle

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

Module appears in

Bachelor's degree (1 major) Mathematics (2015) Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Mathematical Physics (2015) Bachelor's degree (1 major) Computational Mathematics (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Mathematics (2023) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024)

Module title					Abbreviation		
Electro	Electrodynamics 11-T-E-152-m01						
Module	coord	inator		Module offered by			
Managing Director of the Institute of Theoretical Physics and Astrophysics			Theoretical Physics	Faculty of Physics and Astronomy			
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)			
8	nume	rical grade					
Duratio		Module level	Other prerequisites	;			
1 seme	ster	undergraduate					
Conten	ts		·				
tence; I 1. Maxv 2. Elect multipo ment ac 3. Magr analogi 4. Maxv 5. Dyna waves; on; tem 6. Spec effect, o 7. Cova ler effe Intende The stu retical o pender	 o. Mathematical tools: Gradient, divergence, curl; curve, surface, volume integrals; Stokes and Gaussian sentence; Delta function; Fourier transform; full functional systems; solving PDEs; 1. Maxwell equations; 2. Electrostatics: Coulomb's law; electrostatic potential; charged interface; electrostatic field energy (capacitor multipole expansion; Boundary value problems; numerical solution; Image charges; Green's functions; develo ment according to orthogonal functions; 3. Magnetostatics: Current density; continuity equation; vector potential; Biot-Savart law; magnetic moment; analogies to electrostatics; 4. Maxwell equations in matter: Electrical and magnetic susceptibility; interfaces; 5. Dynamics of electromagnetic fields: Faraday induction; RCL-circuits; field energy and pulse; potentials; plantwaves; wave packets; plane waves in matter; cavity resonators and wave guides; inhomogeneous wave equation; temporally oscillating sources and dipole radiation; accelerated point charges; 6. Special Theory of Relativity: Lorentz transform; simultaneity; length contraction and time dilation; light cone effect; nergy and momentum; co- and contra-variant tensors; covariant classical mechanics; 7. Covariant electrodynamics: Field strength tensor and Maxwell's equations; transformation of the fields; Dop ler effect; Lorentz force Intended learning outcomes The students have advanced knowledge of the methods of Theoretical Physics. They know the principles of the retical electrodynamics. They are familiar with the corresponding mathematical methods and are able to independently apply them to the description and solution of problems in this area.				y (capacitor); ons; develop- moment; ntials; plane vave equati- ; light cone; fields; Dopp- iples of theo-		
V (4) +	Ü (2)	umber of weekly contact hour t in: Ü: German or Engl		rman)			
	_	essment (type, scope, lang		examination offered — if no	t every semester, informat	ion on whether	
		le for bonus)					
		nation (approx. 120 mi					
		ssessment: German ar	iu/or English				
Allocat		Jiaces					
 Additio	nalinf	ormation					
Auuilio	IIat IIII						
Worklo							
Workload							
	240 h						
Teaching cycle							
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)						
L							
Bachelor's (2020)	with 1 maj	or Nanostructure Technology	-	• generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte	-	page 134 / 181	

Module appears in

Bachelor's degree (1 major) Mathematics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Computational Mathematics (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Mathematics (2023) exchange program Physics (2023)



Applied Physics (ECTS credits)

Module title					Abbreviation	
Principles of Two- and Three-Dimensional Röntgen Imaging			g	11-ZDR-152-m01		
Module	e coord	inator		Module offered by		
Manag	ing Dir	ector of the Institute of	Applied Physics	Faculty of Physics a	ind Astronomy	
ECTS Method of grading Only after succ.			Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	;		
1 seme	ster	graduate				
Conten	ts					
ton abs project tractior charact	sorptio ion, Fo n, visua terisati	n, scattering), physics urier reconstruction, it alisation,). Applicatio	bes, synchrotron). Phys of X-ray detection. Math erative methods). Imag ons of X-ray imaging in ,). Radiation protecti	nematics of reconstrue e processing (image the industrial sector	uction algorithms (fil data pre-processing (component testing,	tered rear , feature ex- material
			generating X-rays and o	of their interactions y	vith matter. They kno	w imaging
			ls of image processing			
Course	S (type, 1	number of weekly contact hou	rs, language — if other than Ge	rman)		
V (3) +						
	_	t in: German or English				
		sessment (type, scope, lang ole for bonus)	guage — if other than German,	examination offered — if no	ot every semester, informati	on on whether
 b) oral c) oral of d) projection e) pression lf a write stead to of assemination Langua 	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: Once a year, summer semester 					
Allocat	ion of	places				
Additio	nal inf	ormation				
Worklo	ad					
180 h						
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module	e appea	ars in				
Bachel	or's de	gree (1 major) Physics gree (1 major) Nanostru ee (1 major) Functional	ucture Technology (201	5)		
Bachelor's (2020)	with 1 ma	jor Nanostructure Technology	-	• generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte	-	page 137 / 181

Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Functional Materials (2022) exchange program Physics (2023) Master's degree (1 major) Functional Materials (2025)

Module title					Abbreviation		
Imagin	g Meth	ods at the Synchroton		-	11-BMS-152-m01		
Module	e coord	inator		Module offered by			
Managing Director of the Institute of Applied Physics Faculty of Physics and Astronomic			ind Astronomy				
ECTS Method of grading Only after succ. compl. of module(s)							
6	nume	rical grade					
Duratio	n	Module level	Other prerequisites	;			
1 seme	ster	undergraduate					
Conten	ts						
and im the con	age pro ivolutio tic aspo	periodic signals. Fund ocessing. Discretisatior on product. Tapering fu ects. Statistical signals	n of signals / sampling nctions and interpolati	theorem (Shannon). on of images. The Pa	Homogeneous and I arsival theorem, corre	linear filter, elation and	
Intende	ed lear	ning outcomes					
		know the principles of of different image proce				ctioning and	
Course	S (type, r	number of weekly contact hour	s, language — if other than Ge	rman)			
V (3) + Module		t in: German or English					
		Sessment (type, scope, lang le for bonus)	uage — if other than German,	examination offered — if no	ot every semester, informati	on on whether	
c) oral o d) proje e) prese If a writ stead ta of asse nation Langua	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 						
Allocat		ffered: Once a year, su					
Additio	nal inf	ormation					
Worklo	ad						
180 h							
Teachi	ng cvcl	e					
	<u> </u>	-					
Referre	d to in	LPO I (examination regulati	ons for teaching-degree progra	ammes)			
Module	e appea	urs in					
Bachel	or's de	gree (1 major) Physics (gree (1 major) Nanostru ee (1 major) Functional	icture Technology (201	5)			
Bachelor's (2020)	with 1 ma	or Nanostructure Technology		• generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte	-	page 139 / 181	

Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Functional Materials (2022) exchange program Physics (2023) Master's degree (1 major) Functional Materials (2025)

Module title					Abbreviation	
Imaging Sensors in Infrared					11-ASI-152-m01	
Module	coord	inator		Module offered by		
Managing Director of the Institute of Applied Physics		oplied Physics	Faculty of Physics a	nd Astronomy		
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
3	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
range o up to m from bo sical op types o of neuro	f infrar licrowa dies w otics of f sensc ophysi	ed ranges from the visibl ves and radiowaves with ith ambient temperature this spectral range and c ors (bolometer, quantum ological aspects.	e spectrum, where th artificial emitters. Th in the infrared spect liscusses: Peculiaritie	e Sun is dominating ere is distinct and so rum. The lecture prov es of infrared camera	ring temperatures. The spectral as the natural source of light, ometimes dominating emission vides an introduction to the phy- as and thermal images, different on of such sensors on the basis	
		ning outcomes				
		nave specific and advanc and detector structures a	-	•	ctral imaging. They know various	
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)		
V (2) Module	taugh	t in: German or English				
Method	l of ass	essment (type, scope, langua	ge — if other than German, e	examination offered — if no	t every semester, information on whether	
		le for bonus)				
b) oral of c) oral of d) proje e) prese If a writ stead ta of asse nation of Langua	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: Once a year, summer semester 					
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
90 h						
Teachir	ng cycl	e				
Referre	d to in	LPO I (examination regulations	s for teaching-degree progra	mmes)		
Module						
Bachelo	or's de	gree (1 major) Physics (20	015)			

(2020)

Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023)

Module title					Abbreviation	
Principles of Image Processing					11-EBV-152-m01	
Module coordinator				Module offered by		
Managing Director of the Institute of Applied Physics Faculty of Physics and Astronomy						
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
3	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
transfo tic imaន្	rm. His ge reco	o image processing. Pictu togram equalisation (e.g gnition: Segmentation, c ee-dimensional images.	. image brightening)	and pixel connectivi	ty (e.g. noise reducti	on). Automa-
Intende	ed lear	ning outcomes				
and the le to inc al softw	eory of depend vare an	have specific and advanc signal processing for ima lently work with literature d are able to process ima	ges and have corresp e, they understand th ages for the analysis o	oonding knowledge of e characteristics of i of experiments with	of image generation. mage processing wit	They are ab- th commerci-
V (2)	5 (type, r	number of weekly contact hours, l	anguage — If other than Ger	man)		
• •	e taugh	t in: German or English				
Method	d of ass	sessment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, informati	on on whether
b) oral e c) oral e d) proje e) prese If a writ stead ta of asse nation Langua	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: Once a year, winter semester 					
Allocat	ion of _l	olaces				
 Additio	nal inf	ormation				
Worklo	ad					
90 h						
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
		•				
Module			>			
		gree (1 major) Physics (20 gree (1 major) Nanostruct	-	5)		
Bachelor's	with 1 ma	or Nanostructure Technology	_	generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturter	_	page 143 / 181

Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023)

Module title					Abbreviation	
Laboratory and Measurement Technology					11-LMT-152-m01	
Module	e coord	inator		Module offered by		
Managi	ing Dire	ector of the Institute of	Applied Physics	Faculty of Physics a	lty of Physics and Astronomy	
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					
			l measuring methods o roscopic methods and			/ and cryoge-
Intende	ed learı	ning outcomes				
	n techn	•	he field of electronic an cryogenics, light source			
Course	S (type, n	umber of weekly contact hour	s, language — if other than Ge	rman)		
V (3) + I Module		t in: German or English				
Method	d of ass	essment (type, scope, lang	uage — if other than German,	examination offered — if no	t every semester, informati	on on whether
		le for bonus) nination (approx. 90 to				
c) oral e d) proje e) prese If a writ stead ta of asse nation Langua Assess	examin ect repo entatio ten exa ake the ssmen date at ge of a ment o	ation in groups (group ort (approx. 8 to 10 pag n/talk (approx. 30 min amination was chosen form of an oral examin t is changed, the lectur the latest. ssessment: German ar ffered: Once a year, win	utes). as method of assessm nation of one candidate er must inform student d/or English	tes per candidate) of ent, this may be char e each or an oral exar	nged and assessmer mination in groups.	If the method
Allocat	ion of p	Diaces				
 Additio	nalinf	ormation				
Auuitio						
Worklo						
180 h	<u></u>					
Teachir	ng cycl	2				
	15 cycl	-				
Referre	d to in	IPOI (examination regulation	ons for teaching-degree progra	mmec)		
Module	 Module appears in					
		gree (1 major) Physics (2015)			
Bachelo Bachelo Master'	or's de or's de 's degre		icture Technology (201 Physics (Minor, 2015) Materials (2016)	5)		
	with 1 maj	or Nanostructure Technology	-	generated 19-Apr-2025 • exa	-	page 145 / 181
(2020)			ta record Bachel	or (180 ECTS) Nanostrukturted	лник - 2020	

Julius-Maximilians-UNIVERSITÄT WÜRZBURG

Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Functional Materials (2022) exchange program Physics (2023) Master's degree (1 major) Functional Materials (2025)

Module title Abbreviation						
Introdu	uction to La	bview			11-LVW-152-m01	
Module	e coordinat	or	Module offered by			
Managi	ing Director	of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Method of	grading	Only after succ. con	npl. of module(s)		
6	numerical	grade				
Duratio	on Mo	dule level	Other prerequisites	5		
1 seme	ster gra	duate				
Conten	its					
each La on field ming an on field and me hensive upon La to enab fields. (through comput VIEW fu ment.	The module comprises basic and advanced courses. The basic course "NI LabVIEW Basic 1" is the first level of each LabVIEW learning phase. LabVIEW Basic provides a systematic introduction to the functions and application fields of the development environment of LabVIEW. The students become acquainted with dataflow programming and with common LabVIEW architectures. They learn to develop LabVIEW applications for various application fields, from assessment and measurement applications up to data collection, device control, data recording and measurement analysis. In the advanced course "NI LabVIEW Core 2", the students learn to develop compre- nensive standalone applications, including the graphical development environment LabVIEW. The course builds upon LabVIEW Basic 1 and provides an introduction to the most common development technologies, in order to enable the students to successfully implement and distribute LabVIEW applications for different application fields. Course topics include techniques and procedures for the optimisation of application performance, e.g. through an optimised reuse of existing codes, usage of file I/O functions, principles of data management, event computing and methods of error handling. After finishing the course, the students have the ability to apply Lab-VIEW functions according to individual requirements, which enables a fast and productive application development.					
ta.			s, language — if other than Ge	-		
V (1) + I Module		German or English				
	d of assessi s creditable for		uage — if other than German,	examination offered — if no	t every semester, informat	ion on whether
 b) oral c) oral of d) projection e) pressent lf a write stead ta of assent Langua Assess 	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: Once a year, winter semester 					
Allocat	ion of place	25				
Additio	onal informa	ation				
Worklo	ad					
180 h						
Bachelor's (2020)	with 1 major Nar	nostructure Technology		• generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturtee		page 147 / 181

Teaching cycle

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

Module appears in

Bachelor's degree (1 major) Physics (2015)

Bachelor's degree (1 major) Nanostructure Technology (2015)

Bachelor's degree (1 major) Physics (2020)

Bachelor's degree (1 major) Nanostructure Technology (2020)

Bachelor's degree (1 major) Quantum Technology (2021)

exchange program Physics (2023)

Electro	e title				Abbreviation
Electrochemical Energy Storage and Conversion					08-FU-EEW-152-m01
Module coordinator				Module offered by	
		Chair of Chemical Techr	nology of Material Syn-		echnology of Material Synthesis
thesis					
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
5	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ester	undergraduate			
Conten	nts				
um and cal dou	d nicke uble lay	l metal hydride, sodium	n sulphur, sodium nick w batteries, fuel cell sy	el chloride, lithium i ystems (AFC, PEMFC,	ems such as lead, nickel cadmi- on accumulators), electrochemi- , DMFC, PAFC, SOFC), solar cells
Intend	ed lear	ning outcomes			
		e developed a knowledg ge to research problems		energy storage and c	onversion and are able to apply
Course	es (type, i	number of weekly contact hours	s, language — if other than Ge	rman)	
V (2) +	P (1) +	E (1)			
			uage — if other than German,	examination offered — if no	ot every semester, information on whether
		ole for bonus)			ation talks approx. 15 minutes
-	age of a		d/or English		
		ffered: Once a year, su	nd/or English mmer semester		
Allocat	tion of	ffered: Once a year, su	-		
Allocat Additic	tion of onal inf	ffered: Once a year, sui places	-		
Allocat Additic Worklo	tion of onal inf	ffered: Once a year, sui places	-		
Allocat Additic	tion of onal inf oad	offered: Once a year, sum places formation	-		
Allocat Additic Worklo 150 h	tion of onal inf oad	offered: Once a year, sum places formation	-		
Allocat Additio Worklo 150 h Teachin 	tion of pnal inf pad	offered: Once a year, sup places formation	mmer semester	ammes)	
Allocat Additio Worklo 150 h Teachin 	tion of pnal inf pad	offered: Once a year, sum places formation	mmer semester	ammes)	
Allocat Additic 150 h Teachin Referre	tion of onal inf oad ng cycl	offered: Once a year, sur places formation e LPO I (examination regulation	mmer semester	ammes)	
Allocat Additio Worklo 150 h Teachi Referre Modulo	tion of onal inf oad ng cycl ed to in	offered: Once a year, sur places formation e LPO I (examination regulation ars in	mmer semester		
Allocat Additio 150 h Teachin Referre Bachel	tion of onal inf oad ng cycl ed to in e appea	offered: Once a year, sur places formation e LPO I (examination regulation	ons for teaching-degree progra		
Allocat Additic Worklo 150 h Teachin Referre Modulo Bachel Master Master	tion of onal inf oad ang cycl ed to in e appea lor's degr r's degr	e EPOI (examination regulation gree (1 major) Nanostruct ee (1 major) Nanostruct ee (1 major) Nanostruct ee (1 major) Nanostruct	ons for teaching-degree progra icture Technology (201) cure Technology (2016)	5)	
Allocat Additio Worklo 150 h Teachin Referre Modulo Bachel Master Master Master	tion of onal inf oad ing cycl ed to in e appea lor's degr r's degr r's degr	e EPOI (examination regulated ars in gree (1 major) Nanostruct ee (1 major) Nanostruct ee (1 major) Functional	mmer semester	5)	
Allocat Additio Worklo 150 h Teachin Referre Bachel Master Master Master Master Master	tion of onal inf oad ng cycl ed to in e appea lor's degr r's degr r's degr r's degr	e LPO I (examination regulation gree (1 major) Nanostruct ee (1 major) Nanostruct ee (1 major) Functional ee (1 major) Nanostruct	mmer semester ons for teaching-degree progra acture Technology (201 5016) cure Technology (2016) Materials (2016) cure Technology (2020)	5)	
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Bachelor's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Quantum Technology (2021)



Current Topics in Nanostrucutre Technology

(ECTS credits)

Module	e title				Abbreviation
Curren	t Topics	s in Nanostructure Techn	ology		11-BXN5-152-m01
Module coordinator Module offered by					
chairpe	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
5	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate	Approval from exam	ination committee r	equired.
Conten	ts				
Curren or stud			. Accredited academi	c achievements, e.g	. in case of change of university
Intend	ed lear	ning outcomes			
Techno nology ledge.	logy of or nan They ar	the Bachelor's program	ne. They have knowle nd the measuring and ject-specific contexts	edge of a current sub d evaluation method s and know the appli	of a module of Nanostructure odiscipline of nanostructure tech- s necessary to acquire this know- ication areas.
V (2) +				inany	
written or oral pages) If a wri stead t of asse nation	examin examin or pres tten exa ake the essmen date at	ation in groups (groups o entation/talk (approx. 30 amination was chosen as form of an oral examina	of 2, approx. 30 minu o minutes). method of assessme tion of one candidate must inform student	tes per candidate) o ent, this may be cha e each or an oral exa	didate each (approx. 30 minutes) r project report (approx. 8 to 10 nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
Allocat					
Additio	onal inf	ormation			
Worklo	ad				
150 h					
Teachi	Teaching cycle				
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
Module	e appea	irs in			
		gree (1 major) Nanostruct gree (1 major) Nanostruct			

Module	e title				Abbreviation
Curren	t Topics	s in Nanostructure Techn	ology		11-BXN6-152-m01
Module	e coord	inator		Module offered by	
chairpe	erson o	f examination committee		Faculty of Physics a	and Astronomy
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	Approval from exam	ination committee r	equired.
Conten	Its				
	t topics ly abroa		. Accredited academi	c achievements, e.g	. in case of change of university
Intend	ed learı	ning outcomes			
Techno nology ledge.	ology of or nand They ar	the Bachelor's program	ne. They have knowle nd the measuring and ject-specific contexts	edge of a current sub d evaluation method s and know the appli	of a module of Nanostructure odiscipline of nanostructure tech- s necessary to acquire this know- ication areas.
V (3) +		umber of weekly contact nours, t	anguage — II other than Ger	llidil)	
module is written or oral pages) If a writ stead t of asse nation	s creditab examin examin or pres tten exa take the essmen date at	le for bonus) nation (approx. 90 to 120 ation in groups (groups of centation/talk (approx. 30 amination was chosen as e form of an oral examina	minutes) or oral exa of 2, approx. 30 minu o minutes). method of assessme tion of one candidate must inform student	mination of one can tes per candidate) o ent, this may be cha e each or an oral exa	didate each (approx. 30 minutes) r project report (approx. 8 to 10 nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
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Additio	onal inf	ormation			
Worklo	ad				
180 h					
Teachi	ng cycl	e			
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
Modul	e appea	in in			
		gree (1 major) Nanostruct gree (1 major) Nanostruct	•, .		

Modul	e title				Abbreviation
Curren	t Topic	s in Nanostructure Techn	ology		11-BXN8-152-m01
Module	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. con	npl. of module(s)	
8	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate	Approval from exam	ination committee r	equired.
Conten	Its				
Curren or stud			. Accredited academi	c achievements, e.g	, in case of change of university
Intend	ed lear	ning outcomes			
Techno nology ledge.	ology of or nan They ar	the Bachelor's program	ne. They have knowle nd the measuring and ject-specific contexts	edge of a current sub d evaluation method s and know the appl	of a module of Nanostructure odiscipline of nanostructure tech- ls necessary to acquire this know- ication areas.
V (4) +	_	,			
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Additio	onal inf	ormation			
Worklo	ad				
240 h					
Teachi	ng cycl	e			
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Referre	ed to in	LPOI (examination regulation	s for teaching-degree progra	ummes)	
Module	e appea	ars in			
		gree (1 major) Nanostruc gree (1 major) Nanostruc		-	

Module title					Abbreviation	
Current	Topics	s Physics			11-BXP5-152-m01	
Module	coord	inator		Module offered by		
chairpe	rson of	f examination committee		Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 semes	ster	undergraduate	Approval from exam	ination committee re	equired.	
Conten	ts					
		of Experimental and The /ersity or study abroad.	oretical Physics. Acci	edited academic acl	hievements, e.g. in case of	
Intende	ed learn	ning outcomes				
Theoret subdisc knowle	ical Ph cipline dge. Th	ysics of the Bachelor's p of Physics and understar ney are able to classify th	rogramme of Nanostr nd the measuring and e subject-specific con	ucture Technology. T I/or calculation meth ntexts and know the	of a module of Experimental or They have knowledge of a current nods necessary to acquire this application areas.	
		umber of weekly contact hours, l	anguage — if other than Ger	man)		
V (2) +						
		e essment (type, scope, langua; le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether	
or oral e pages) If a writ stead ta of asses nation o	examin or pres ten exa ake the ssmen date at	ation in groups (groups o entation/talk (approx. 30 amination was chosen as form of an oral examination	of 2, approx. 30 minu o minutes). method of assessme tion of one candidate must inform student	tes per candidate) of ent, this may be char e each or an oral exar	didate each (approx. 30 minutes) r project report (approx. 8 to 10 nged and assessment may in- mination in groups. If the method weeks prior to the original exami-	
Allocati	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
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Teachir	ng cycl	9				
Referre	d to in	LPOI (examination regulations	s for teaching-degree progra	mmes)		
Module	appea	irs in				
Bachelo Bachelo	Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) Module studies (Bachelor) Quantum Technology (2021)					

Module title Abbreviation					Abbreviation	
Current Topics in Physics 11-BXP6-152-m01					11-BXP6-152-m01	
Module	e coord	inator		Module offered by		
chairpe	erson o	f examination committee		Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
6	nume	rical grade		-		
Duratio		Module level	Other prerequisites			
1 seme	ster	undergraduate	Approval from exam	ination committee re	equired.	
Conten	ts					
Current	topics	of Experimental and The versity or study abroad.	oretical Physics. Acci	redited academic ac	hievements, e.g. in case of	
		ning outcomes				
The stu Theoret subdise	dents l tical Ph cipline	nave advanced competer ysics of the Bachelor's p	rogramme of Nanostr nd the measuring and	ucture Technology. ⁻ I/or calculation meth	of a module of Experimental or They have knowledge of a current nods necessary to acquire this application areas.	
Course	S (type, r	umber of weekly contact hours, l	anguage — if other than Ger	man)		
V (3) +	R (1)					
		essment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether	
pages) If a writ stead ta of asse nation Langua	or pres ten exa ake the ssmen date at ge of a	entation/talk (approx. 30 amination was chosen as form of an oral examina- t is changed, the lecturer the latest. ssessment: German and	o minutes). method of assessme tion of one candidate must inform student	ent, this may be char each or an oral exa	r project report (approx. 8 to 10 nged and assessment may in- mination in groups. If the method weeks prior to the original exami-	
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
180 h						
Teachi	ng cycl	e				
Referre	d to in	LPO I (examination regulations	s for teaching-degree progra	mmes)		
Module	e appea	ars in				
Bachelo Bachelo Bachelo Bachelo	Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021) Module studies (Bachelor) Quantum Technology (2021)					

Current Topics in Physics 11-BXP8-152-m01 Module coordinator Module offered by chairperson of examination committee Faculty of Physics and Astronomy ECTS Method of grading Only after succ. compl. of module(s) an umerical grade Duration Module level Other prerequisites i semester undergraduate Approval from examination committee required. Contents Contents Intended learning outcomes The students have advanced competencies corresponding to the requirements of a module of Experimental or Theoretical Physics and understand the measuring and/or calculation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas. Courses (yze, number of weeky context hours, language – if other than Geman) V (Q) + R (2) Method of assessment (yze, scope, language – if other than Geman, examination offered – if not every semester, information on whether module is creditable to hours) written examination (approx, 90 to 120 minutes) or oral examination of one candidate each (approx, 30 minutes) or oral examination of assessment, this may be changed and assessment may insteed take the form of an oral examination of one candidate each ora noral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date date the atom is. Language of assessmen	Module title					Abbreviation
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The students have advanced competencies corresponding to the requirements of a module of Experimental or Theoretical Physics of the Bachelor's programme of Nanostructure Technology. They have knowledge of a current subdiscipline of Physics and understand the measuring and/or calculation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas. Courses (type, number of weekly contact hours, language – if other than German) V (<i>q</i>) + R (2) 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 in groups (groups of 2, approx. 30 minutes per candidate) or project report (approx. 8 to to pages) or presentation/talk (approx. 30 minutes). If a written examination numbers (approx. 30 minutes). If a written examination in groups (groups of 2, approx. 30 minutes per candidate) or project report (approx. 8 to to pages) or presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Allocation of places	Intende	ed lear	ning outcomes			
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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. 90 to 120 minutes) or oral examination of one candidate each (approx. 30 minutes) or oral examination in groups (groups of 2, approx. 30 minutes per candidate) or project report (approx. 8 to 10 pages) or presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Allocation of places Workload 240 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree programmes) Module appears in Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major), 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major), 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major), 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major), 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major), 2000 Bachelor's degree (1 major) Quantum T	Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	man)	
module is creditable for bonus) written examination (approx. 90 to 120 minutes) or oral examination of one candidate each (approx. 30 minutes) or oral examination in groups (groups of 2, approx. 30 minutes per candidate) or project report (approx. 8 to 10 pages) or presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Allocation of places Additional information Workload 240 h Teaching cycle Module appears in Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Anostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021)	V (4) +	R (2)				
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Additional information Workload 240 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree programmes) Module appears in Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021)	pages) If a writ stead ta of asse nation	or pres ten exa ake the ssmen date at	sentation/talk (approx. 30 amination was chosen as e form of an oral examina t is changed, the lecturer the latest.	o minutes). method of assessme tion of one candidate must inform student	ent, this may be char each or an oral exa	nged and assessment may in- mination in groups. If the method
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240 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree programmes) Module appears in Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major, 0 Quantum Technology (2021)	Additio	nal inf	ormation			
240 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree programmes) Module appears in Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major, 0 Quantum Technology (2021)						
Teaching cycle Referred to in LPO I (examination regulations for teaching-degree programmes) Module appears in Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021)	Worklo	ad				
 Referred to in LPO I (examination regulations for teaching-degree programmes) Module appears in Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021)	240 h					
Module appears in Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021)	Teachir	ıg cycl	e			
 Module appears in Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021)						
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Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021)						
Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021)	Module	appea	ars in			
	Bachelo Bachelo Bachelo Bachelo Bachelo	Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Quantum Technology (2021)				

Module title Abbreviation					Abbreviation
Selecte	ed Topi	cs in Nanostructure Tech	nology		11-CSN6-152-m01
Module	e coord	inator		Module offered by	
chairpe	erson o	f examination committee		Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate	Approval from exam	ination committee re	equired.
Conten	ts				
Selecte	d topic	s of nanostructure techn	ology.		
Intende	ed leari	ning outcomes			
technic	al metl				nnology and of the scientific or y the subject-specific contexts
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)	
V (3) +	R (1)				
		e essment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether
or oral pages) If a writ stead ta of asse nation	examin or pres tten exa ake the ssmen date at	ation in groups (groups of entation/talk (approx. 30 amination was chosen as form of an oral examina	of 2, approx. 30 minu o minutes). method of assessme tion of one candidate must inform student	tes per candidate) o ent, this may be char e each or an oral exar	didate each (approx. 30 minutes) r project report (approx. 8 to 10 nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
Allocat					
	·				
Additio	nal inf	ormation			
Worklo	ad				
180 h					
Teaching cycle					
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
Module	e appea	irs in			
		gree (1 major) Nanostruct			
Bachelor's degree (1 major) Nanostructure Technology (2020)					

Module title					Abbreviation
Selected Topics in Solid State Physics					11-CSF6-152-m01
Module	e coord	inator		Module offered by	
chairpe	erson o	f examination committee		Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate	Approval from exam	ination committee re	equired.
Conten	ts				
Selecte	d topic	s of Solid-State Physics.			
Intende	ed leari	ning outcomes			
and eva	aluatio				nd understand the measuring classify the subject-specific con-
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)	
V (3) +	R (1)				
		e essment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether
If a writ stead ta of asse nation	ten exa ake the ssmen date at	form of an oral examinat	method of assessme tion of one candidate must inform student	each or an oral exa	nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
180 h					
Teachi	ng cycl	e			
Referre	d to in	LPO I (examination regulations	s for teaching-degree progra	mmes)	
Module	e appea	irs in			
Bachele Module Bachele Bachele Bachele	Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Module studies (Bachelor) Physics (2019) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) Module studies (Bachelor) Quantum Technology (2021)				

Module	e title				Abbreviation
Selecte	ed Topi	cs in Energy and Materia	Il Science		11-CSEM6-152-m01
Module	e coord	inator		Module offered by	
chairpe	erson o	f examination committee	2	Faculty of Physics a	and Astronomy
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	Approval from exam	ination committee r	equired.
Conten	Its		-		
Selecte	ed topic	s of energy and material	s research.		
Intend	ed lear	ning outcomes			
tion me	ethods				stand the measuring and evalua- subject-specific contexts and
Course	S (type, r	number of weekly contact hours,	language — if other than Ger	rman)	
V (3) +	R (1)		-		
		sessment (type, scope, langua le for bonus)	age — if other than German,	examination offered — if no	ot every semester, information on whether
or oral pages) If a writ stead t	examir or pres tten exa ake the	ation in groups (groups sentation/talk (approx. 3 amination was chosen as a form of an oral examina	of 2, approx. 30 minu o minutes). s method of assessme ttion of one candidate	tes per candidate) o ent, this may be cha e each or an oral exa	didate each (approx. 30 minutes) or project report (approx. 8 to 10 nged and assessment may in- mination in groups. If the method weeks prior to the original exami
nation	date at	the latest.			
	. –	ssessment: German and	/or English		
Allocat	ion of j	Dlaces			
		4!			
Additio	onat inf	ormation			
Worklo	ad				
180 h					
Teachi	ng cycl	ρ			
	-5 cycl	•			
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	immes)	
Module	e appea	ars in			
Bachel Bachel Bachel	or's de or's de or's de	gree (1 major) Nanostruc gree (1 major) Nanostruc gree (1 major) Quantum ⁻ es (Bachelor) Quantum T	ture Technology (202 Technology (2021)		

Module title					Abbreviation		
Novel Transport Phenomena					11-NTP-152-m01		
Module coordinator				Module offered by			
Managi	ng Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy		
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)			
6	nume	rical grade					
Duratio	n	Module level	Other prerequisites				
1 semes	ster	undergraduate					
Conten	Contents						
Current	resear	ch topics and application	ns of novel transport	phenomena.			
Intende	ed learn	ning outcomes					
ly in the	e field o	of novel transport phenor	nena, and understan	d the measuring and	blogy or nano sciences, especial- l evaluation methods necessary s and know the application areas.		
Courses	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)			
V (3) + I Module		t in: German or English					
		e essment (type, scope, langua) le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether		
b) oral o c) oral o d) proje If a writ stead ta of asses	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. 						
Allocati							
Additio	nal info	ormation					
Worklo	ad						
180 h							
Teachir	ng cycl	e					
Referre	d to in	LPO I (examination regulations	s for teaching-degree progra	mmes)			
Module	appea	irs in					
Bachelo	or's deg	gree (1 major) Nanostruct	ure Technology (201	5)			
		gree (1 major) Nanostruct		0)			
Bachelo	Bachelor's degree (1 major) Quantum Technology (2021)						



Key Skills Area (20 ECTS credits)



General Key Skills

(5 ECTS credits)

In addition to the modules listed below, students may also take modules offered by JMU as part of the pool of general transferable skills (ASQ).



General Key Skills (subject-specific)

(ECTS credits)

Module	e title				Abbreviation	
MINT P	repara	ory Course Mathemat	ical Methods of Physic	S	11-P-VKM-202-m01	
Module	coord	inator		Module offered by		
Managi	ing Dire		of Applied Physics and nd Astrophysics	Faculty of Physics and Astronomy		
ECTS		od of grading	Only after succ. con	npl. of module(s)		
3		successfully completed	-			
<u> </u>		Module level	Other prerequisites			
1 seme:		undergraduate				
introdu 1. Basic quantit	ction a geom ies, 5.	nd preparation for the etry and algebra, 2. dif coordinate systems, 6	modules of experiment ferential calculus and s	tal and theoretical pl	dge from school, especially as an hysics. culus, 4. vectors – directional	
		ning outcomes				
			dge of basic mathemat ne studies of experimer		s in elementary calculus as re- hysics.	
Course	S (type, n	umber of weekly contact hou	rs, language — if other than Ge	rman)		
V (1) + Ü Module		t in: German or English	1			
		essment (type, scope, lang	guage — if other than German,	examination offered — if no	ot every semester, information on whether	
	ment o	k. 15 minutes) ffered: Once a year, wi Jlaces	nter semester			
Additio	nal inf	ormation				
Worklo	ad					
90 h						
Teachir	ng cycl	9				
Teachir	ng cycle	e: every year, winter se	mester			
			ions for teaching-degree progra	ammes)		
§ 22 § 22 § 22	Nr. 1 h) Nr. 2 f)					
3 44 11 1						
	annea	rs in				
Module			(2020)			
Module Bachele	or's deg	gree (1 major) Physics		o)		
Module Bachele Bachele	or's de or's de	gree (1 major) Physics	ucture Technology (202	o)		
Module Bachele Bachele Bachele	or's deg or's deg or's deg	gree (1 major) Physics gree (1 major) Nanostr gree (1 major) Mathem	ucture Technology (202	o)		
Module Bachelo Bachelo Bachelo First sta	or's deg or's deg or's deg or's deg ate exa	gree (1 major) Physics gree (1 major) Nanostr gree (1 major) Mathem gree (1 major, 1 minor) mination for the teach	ucture Technology (202 atical Physics (2020) Physics (Minor, 2020) ing degree Grundschule	e Didactics in Physics	s (Primary School) (2020)	
Module Bachele Bachele Bachele First sta First sta	or's deg or's deg or's deg or's deg ate exa	gree (1 major) Physics gree (1 major) Nanostr gree (1 major) Mathem gree (1 major, 1 minor) mination for the teach mination for the teach	ucture Technology (202 atical Physics (2020) Physics (Minor, 2020) ing degree Grundschule ing degree Grundschule	e Didactics in Physics e Physics (2020)	s (Primary School) (2020)	
Module Bachelo Bachelo Bachelo First sta First sta First sta	or's deg or's deg or's deg or's deg ate exa ate exa ate exa	gree (1 major) Physics gree (1 major) Nanostru gree (1 major) Mathem gree (1 major, 1 minor) mination for the teach mination for the teach mination for the teach	ucture Technology (202 atical Physics (2020) Physics (Minor, 2020) ing degree Grundschule ing degree Grundschule ing degree Gymnasium	e Didactics in Physics e Physics (2020) Physics (2020)	s (Primary School) (2020)	
Module Bachelo Bachelo Bachelo First sta First sta First sta First sta	or's deg or's deg or's deg or's deg ate exa ate exa ate exa ate exa	gree (1 major) Physics gree (1 major) Nanostr gree (1 major) Mathem gree (1 major, 1 minor) mination for the teach mination for the teach mination for the teach mination for the teach	ucture Technology (202 atical Physics (2020) Physics (Minor, 2020) ing degree Grundschule ing degree Grundschule ing degree Gymnasium ing degree Realschule F	e Didactics in Physics e Physics (2020) Physics (2020) Physics (2020)		
Module Bachelo Bachelo Bachelo First sta First sta First sta First sta First sta	or's des or's des or's des or's des ate exa ate exa ate exa ate exa ate exa ate exa	gree (1 major) Physics gree (1 major) Nanostr gree (1 major) Mathem gree (1 major, 1 minor) mination for the teach mination for the teach mination for the teach mination for the teach	ucture Technology (202 atical Physics (2020) Physics (Minor, 2020) ing degree Grundschule ing degree Grundschule ing degree Gymnasium ing degree Realschule F ing degree Sonderpäda	e Didactics in Physics e Physics (2020) Physics (2020) Physics (2020)	nysics (Middle School) (2020)	



First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020) First state examination for the teaching degree Mittelschule Physics (2020) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Mathematical Physics (2024)

Module title Abbreviation							
Fit for lı	ndustr	y .			11-FFI-202-m01		
Module	coord	inator		Module offered by			
Managi	ng Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy		
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)			
3	(not) s	successfully completed					
Duration Module level Other prerequisites							
1 semes	ster	undergraduate					
Content	Contents						
duct de	velopn				he industrial environment. Pro- strategy and management. Lea-		
Intende	d lear	ning outcomes					
		are aware of the requirem out their own profession		ndustry and can ma	ke a decision based on their		
Courses	5 (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)			
V (1) + R Module		t in: German or English					
		s essment (type, scope, langua; le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether		
b) oral e c) oral e d) proje e) prese If a writt stead ta of asses nation o Languag	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: Once a year, summer semester 						
Allocati	on of p	olaces					
Additio	nal inf	ormation					
Worklo	ad						
90 h							
Teachin	ig cycl	e					
Referre	d to in	LPO I (examination regulations	s for teaching-degree progra	mmes)			
Module	appea	nrs in					
Bachelo Bachelo	Module appears in Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023)						

Project Management in Practice 11-PMP-152-m01						
Project Management in Practice 11-PMP-152-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)						
3 (not) successfully completed						
Duration Module level Other prerequisites						
1 semester graduate						
Contents						
Technical project management in practice, contents: Definitions, terms, cardinal errors in project management, project schedule, kick-off and stakeholder, teams and resources, milestones and planning, visualisation and re- porting, conflicts, success factors, technical and economic controlling, target agreement, balanced score cards, solving exemplary cases						
Intended learning outcomes						
The students have knowledge of technical project management. They are familiar with different method success factors and are able to define, plan and successfully conduct a project.						
Courses (type, number of weekly contact hours, language – if other than German)						
V (1) + R (1) Module taught in: German or English						
Method of assessment (type, scope, language – if other than German, examination offered – if not every semester, information o module is creditable for bonus)						
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
Allocation of places						
Additional information						
Workload						
90 h						
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
-						
Module appears in						
Bachelor's degree (1 major) Physics (2015) Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020)						
Bachelor's with 1 major Nanostructure TechnologyJMU Würzburg • generated 19-Apr-2025 • exam. reg. da- ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020pa						



Bachelor's degree (1 major) Quantum Technology (2021)



Among applicants with the same ranking, places will be allocated according to the qualitative ranking or otherwise by lot.

Selection process group 2 (5%): Places will be allocated according to the following quotas: Quota 1 (50 % of places): total number of ECTS credits already achieved in modules/module components of the Faculty of Biology; among applicants with the same number of ECTS credits achieved, places will be allocated by lot. Quota 2 (25 % of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. Quota 3 (25 % of places): lottery.

Should the module be used only in the Bachelor's degree subject Biologie (Biology) with 180 ECTS credits, places will be allocated according to the selection process of group 1.

Additional information

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Workload

90 h

Teaching cycle

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

Module appears in

Bachelor's degree (1 major) Biology (2015)

Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Quantum Technology (2021)

Module	e title			1	Abbreviation	
Genera	l Comp	etences for Students of	Nanostructure Techn	ology	11-NASQ5-152-m01	
Module	e coord	inator		Module offered by		
chairpe	erson o	f examination committee		Faculty of Physics and Astronomy		
ECTS	Method of grading Only after succ. compl. of module(s)					
5	nume	rical grade				
Duratio	on	Module level Other prerequisites				
1 semester undergraduate Approval from examination committee required.						
Contents						
Genera	ıl qualif	ications for students of r	anostructure techno	logy.		
Intend	ed learı	ning outcomes	·			
gy and the app	the req plicatio		his topic. They are ab	le to classify the sul	ipline of nanostructure technolo- bject-specific contexts and know	
V (2) +						
Metho	d of ass	t essment (type, scope, langua le for bonus)	ge — if other than German, d	examination offered — if no	ot every semester, information on whether	
 c) oral d) projetion e) press lf a write stead t of asset nation 	examin ect repo entatio tten exa ake the essmen date at	form of an oral examina	of 2, approx. 30 minu s) or es) method of assessme tion of one candidate must inform student	tes per candidate) o ent, this may be cha e each or an oral exa	r nged and assessment may in- mination in groups. If the method weeks prior to the original exami-	
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	mmes)		
Module	e appea	in in				
		gree (1 major) Nanostruct gree (1 major) Nanostruct				



Subject-specific Key Skills

(15 ECTS credits)

Module	e title			-	Abbreviation		
Mather	natical	Methods of Physics			11-M-MR-202-m01		
Module		instar		Madula offered by			
			1 .: I DI .:	Module offered by			
Managi and As		ector of the Institute of T sics	neoretical Physics	Faculty of Physics and Astronomy			
ECTS	Meth	od of grading	Only after succ. con	Only after succ. compl. of module(s)			
6	(not) s	successfully completed					
Duratio	on	Module level	Other prerequisites	rerequisites			
2 seme	ster	undergraduate					
Conten	ts						
Germar	n conte	nts available but not tra	inslated yet.				
		er Mathematik und elem ⁄orbereitung auf die Moo					
	ed lear	ning outcomes	_				
		ded learning outcomes	available but not trans	slated vet.			
		erende verfügt über die Iche in der Theoretische				aren Rechen-	
Course	S (type, r	number of weekly contact hours	, language — if other than Ge	rman)			
		V (2) + Ü (2) t in: German or English					
Method	d of ass	sessment (type, scope, langu	age — if other than German,	examination offered — if no	ot every semester, informa	tion on whether	
		le for bonus)			·		
		successful completion o x. 15 minutes)	f approx. 50% of appr	ox. 13 exercise sheet	ts) or		
Allocat	ion of	places					
Additio	nal inf	ormation					
Worklo	ad						
180 h							
Teachi	ig cyci	e					
		LPO I (examination regulatio	ns for teaching-degree progra	ammes)			
§ 53 N § 77 N							
Module	e appea	ars in					
Bachel	or's de	gree (1 major) Physics (2	2020)				
		gree (1 major) Nanostru		o)			
		gree (1 major) Mathema	•				
		gree (1 major, 1 minor) F					
		mination for the teachir		•			
		mination for the teachir		•			
		mination for the teachir mination for the teachir		-			
		jor Nanostructure Technology		generated 19-Apr-2025 • exa	am. reg. da-	page 174 / 181	
(2020)				or (180 ECTS) Nanostrukturte			



Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024)

Module title Abbreviation						
Semina	ar Nanc	structure Technology			11-N-HS-152-m01	
Module	e coord	inator		Module offered by		
Managing Directors of the Institute of Applied Physics and the Institute of Theoretical Physics and Astrophysics				Faculty of Physics a	and Astronomy	
ECTS	Methe	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duration Module level Other prerequisites						
1 seme	ster	undergraduate	Admission prerequi 85% of sessions).	site to assessment:	regular attendance (minimum	
Conten	Its					
Current	t quest	ions on advanced topics	of nanostructure tech	nnology.		
Intend	ed lear	ning outcomes				
		have in-depth knowledg ntly acquire this knowled			ructure technology. They are able ation.	
Course	S (type, r	number of weekly contact hours,	language — if other than Ge	rman)		
S (2) Module	e taugh	t in: German or English				
		Sessment (type, scope, langu le for bonus)	age — if other than German,	examination offered — if no	ot every semester, information on whether	
a) talk	(30 to 4	45 minutes) with discuss	ion and b) written exa	amination (approx. 1	20 minutes)	
Allocat	ion of _l	olaces				
Additio	onal inf	ormation				
this wil 3 Sente find tha gistrati ly regis sessme	II be co ence 4 at the s ion for a ster for ent was	nsidered a declaration of ASPO (general academic tudent has obtained the assessment into effect. (an assessment. Student s not put into effect will r	f will to seek admissi and examination reg qualification for adm Only those students th s who did not register not be admitted to the	on to assessment pu ulations). If the mod ission to assessmen nat meet the respect for an assessment of respective assessm	n for admission to assessment, ursuant to Section 20 Subsection ule coordinators subsequently nt, they will put the student's re- ive prerequisites can successful- or whose registration for an as- ment. If a student takes an as- ssessment will not be considered	
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination regulation	ns for teaching-degree progra	immes)		
Module	e appea	ars in				
		gree (1 major) Nanostruc				
Bachel	or's de	gree (1 major) Nanostruc	ture Technology (202	o)		

Module title Abbreviation								
Data ar	nd Erro	r Analysis			11-P-FR1-152-m01			
Module	e coord	inator		Module offered by	Module offered by			
Managi	ing Dire	ector of the Institute of	Applied Physics	plied Physics Faculty of Physics and Astronomy				
ECTS	Metho	od of grading	Only after succ. con	Only after succ. compl. of module(s)				
2	(not) s	successfully completed						
Duratio	n	Module level	Other prerequisites					
1 seme	ster	undergraduate	13 exercise sheets p approx. 50% of exer	site to assessment: o per semester). Stude rcises will qualify for students about the re	nts who successfully admission to assess	completed sment. The		
Conten	ts							
		s, error approximation deviation.	and propagation, graph	nic representations, l	inear regression, me	an values		
Intende	ed lear	ning outcomes						
			easuring results on the iscuss the conclusions		ation and of the prin	nciples of		
Course	S (type, r	number of weekly contact hour	s, language — if other than Ge	rman)				
V (1) + Í Module		t in: Ü: German or Engl	ish					
Method	d of ass	sessment (type, scope, lang	guage — if other than German,	examination offered — if no	t every semester, informati	on on whether		
		le for bonus)						
		nation (approx. 120 mi ssessment: German ar						
Allocat	ion of p	olaces						
Additio	nal inf	ormation						
Registration: If a student registers for the exercises and obtains the qualification for admission to assessment, this will be considered a declaration of will to seek admission to assessment pursuant to Section 20 Subsection 3 Sentence 4 ASPO (general academic and examination regulations). If the module coordinators subsequently find that the student has obtained the qualification for admission to assessment, they will put the student's registration for assessment into effect. Only those students that meet the respective prerequisites can successfully register for an assessment. Students who did not register for an assessment or whose registration for an assessment was not put into effect will not be admitted to the respective assessment. If a student takes an assessment to which he/she has not been admitted, the grade achieved in this assessment will not be considered						Subsection osequently tudent's re- o successful- o for an as- es an as-		
Worklo	ad							
60 h								
Teachi	ng cycl	e						
Referre	d to in	LPO I (examination regulati	ons for teaching-degree progra	ammes)				
§ 53 N § 77 N								
Module	e appea	urs in						
Bachel	or's de	gree (1 major) Mathem gree (1 major) Physics gree (1 major) Nanostri	-	5)				
		or Nanostructure Technology	JMU Würzburg •	generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturted	-	page 177 / 181		

UNIVERSITÄT WÜRZBURG

Bachelor's degree (1 major) Mathematical Physics (2015) Bachelor's degree (1 major) Computational Mathematics (2015) Bachelor's degree (1 major) Aerospace Computer Science (2015) Bachelor's degree (1 major) Functional Materials (2015) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Realschule Physics (2015) First state examination for the teaching degree Gymnasium Physics (2015) First state examination for the teaching degree Mittelschule Physics (2015) Bachelor's degree (1 major) Mathematical Physics (2016) Bachelor's degree (1 major) Aerospace Computer Science (2017) First state examination for the teaching degree Grundschule Physics (2018) First state examination for the teaching degree Realschule Physics (2018) First state examination for the teaching degree Gymnasium Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020) Bachelor's degree (1 major) Aerospace Computer Science (2020) First state examination for the teaching degree Grundschule Physics (2020) First state examination for the teaching degree Gymnasium Physics (2020) First state examination for the teaching degree Realschule Physics (2020) First state examination for the teaching degree Mittelschule Physics (2020) Bachelor's degree (1 major) Functional Materials (2021) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Mathematics (2023) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024) Bachelor's degree (1 major) Functional Materials (2025)

Module	e title				Abbreviation
Advand	ed and C	omputational Data Ana	alysis		11-P-FR2-152-m01
Module	e coordin	ator		Module offered by	
		tor of the Institute of A	onlied Physics	Faculty of Physics a	and Astronomy
ECTS					
2	· · · · · ·	ccessfully completed			
Duratio	on A	Nodule level	Other prerequisites	;	
1 seme	ster u	ndergraduate	Students are highly completing module		mplete module 11-P-FR1 prior t
Conten	Its				
		ods of data analysis ar ata analysis.	nd error calculation. D	Distribution function,	significance tests, modelling.
Intend	ed learni	ng outcomes			
stered		of computerised data			error calculation. They have ma tained measuring data and to
Course	S (type, nur	nber of weekly contact hours,	language — if other than Ge	rman)	
V (1) +	Ü (1)				
module is	s creditable				t every semester, information on whethe
		ered: Once a year, sum			
Allocat	ion of pla	aces			
	•				
Additio	onal infor	mation	-		
Auunt		mation			
 Workla					
			-		
60 h					
	ng cycle				
Teachi	ng cycle	POI (examination regulation	s for teaching-degree progra	ammes)	
Teachi	ng cycle	POI (examination regulation	s for teaching-degree progra	ammes)	
Teachi Referre 	ng cycle		s for teaching-degree progra	ammes)	
Teachin Referre Module	ng cycle ed to in Ll e appears	s in		ammes)	
Teachin Referre Module Bachel	ng cycle ed to in Ll e appears or's degr	5 in ee (1 major) Physics (20	015)		
Teachin Referre Module Bachel Bachel	ng cycle ed to in Ll e appears or's degr or's degr	s in	015) ture Technology (201		
Teachi Referre Bachel Bachel Bachel Bachel	ng cycle ed to in Ll e appears or's degr or's degr or's degr	s in ee (1 major) Physics (2 ee (1 major) Nanostruc	015) ture Technology (201 ical Physics (2015)		
Teachii Referre Module Bachel Bachel Bachel Bachel	ng cycle ed to in Ll e appears or's degr or's degr or's degr or's degr	s in ee (1 major) Physics (20 ee (1 major) Nanostruc ee (1 major) Mathemat	015) ture Technology (201 ical Physics (2015) ical Physics (2016)		
Teachii Referre Bachel Bachel Bachel Bachel Bachel Bachel	ng cycle ed to in Ll e appears or's degr or's degr or's degr or's degr or's degr	5 in ee (1 major) Physics (20 ee (1 major) Nanostruc ee (1 major) Mathemat ee (1 major) Mathemat	015) ture Technology (201 ical Physics (2015) ical Physics (2016) 020)	5)	
Teachii Referrer Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	ng cycle ed to in Ll e appears or's degr or's degr or's degr or's degr or's degr or's degr	s in ee (1 major) Physics (20 ee (1 major) Nanostruc ee (1 major) Mathemat ee (1 major) Mathemat ee (1 major) Physics (20	015) ture Technology (201 ical Physics (2015) ical Physics (2016) 020) ture Technology (202	5)	
Teachin Referre Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	ng cycle ed to in Ll e appears or's degr or's degr or's degr or's degr or's degr or's degr or's degr	s in ee (1 major) Physics (20 ee (1 major) Nanostruc ee (1 major) Mathemat ee (1 major) Mathemat ee (1 major) Physics (20 ee (1 major) Nanostruc	015) ture Technology (201 ical Physics (2015) ical Physics (2016) 020) ture Technology (202 ical Physics (2020)	5)	
Teachi Referrer Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	ng cycle ed to in Ll e appears or's degr or's degr or's degr or's degr or's degr or's degr or's degr or's degr	s in ee (1 major) Physics (20 ee (1 major) Nanostruc ee (1 major) Mathemat ee (1 major) Mathemat ee (1 major) Physics (20 ee (1 major) Nanostruc ee (1 major) Mathemat	015) ture Technology (2015) ical Physics (2015) ical Physics (2016) 020) ture Technology (202 ical Physics (2020) Materials (2021)	5)	
Teachii Referre Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	ng cycle ed to in Ll e appears or's degr or's degr or's degr or's degr or's degr or's degr or's degr or's degr or's degr	s in ee (1 major) Physics (20 ee (1 major) Nanostruct ee (1 major) Mathemat ee (1 major) Mathemat ee (1 major) Physics (20 ee (1 major) Nanostruct ee (1 major) Mathemat ee (1 major) Functional	015) ture Technology (2015) ical Physics (2015) ical Physics (2016) 020) ture Technology (202 ical Physics (2020) Materials (2021)	5)	
Teachii Referrer Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	ng cycle ed to in Ll e appears or's degr or's degr or's degr or's degr or's degr or's degr or's degr or's degr or's degr or's degr	s in ee (1 major) Physics (20 ee (1 major) Nanostruc ee (1 major) Mathemat ee (1 major) Mathemat ee (1 major) Physics (20 ee (1 major) Nanostruc ee (1 major) Mathemat ee (1 major) Functional ee (1 major) Quantum T	015) ture Technology (201 ical Physics (2015) ical Physics (2016) 020) ture Technology (202 ical Physics (2020) Materials (2021) Fechnology (2021)	5)	



Thesis (10 ECTS credits)

Module title Abbreviation						
Bache	or The	sis Nanostructure Techno	ology		11-BA-N-152-m01	
Modul	e coord	inator		Module offered by		
chairperson of examination committee				Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duration Module level Other prerequisites						
1 semester undergraduate						
Conter	nts					
					ask in the field of nanostructure rriting of the Bachelor's thesis.	
Intend	ed lear	ning outcomes				
structu	ire tech		ce of a supervisor, es	pecially in accordan	d engineering task from nano- ce with known methods and	
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	man)		
No cou	irses as	signed to module				
		sessment (type, scope, langua le for bonus)	ge — if other than German, o	examination offered — if no	ot every semester, information on whether	
		esis (approx. 25 pages) ssessment: German or E	nglish			
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Time to	o comp	ete: 12 weeks.				
Worklo	ad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	mmes)		
Modul	e appea	ars in				
Bachel	or's de	gree (1 major) Nanostruc	ture Technology (201	5)		
Bachel	or's de	gree (1 major) Nanostruc	ture Technology (202	o)		