

## Subdivided 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

### **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.

### The subject is divided into

Abbreviation	Module title	ECTS credits	Method of grading	page
Compulsory Courses (118	ECTS credits)			
Nanostructure Technolo	gy (27 ECTS credits)			
11-N-EIN-152-m01	Introduction to Nanoscience	7	NUM	119
11-N-IP-152-m01	Industrial Internship	10	NUM	121
o8-AC-ExChem-152-mo	1 Experimental Chemistry	5	NUM	22
08-ACP-NF-152-m01	General and Analytical Chemistry for students of natural sciences (lab)	2	B/NB	27
08-OC-NF-152-m01	Organic Chemistry for students of medicine, biomedicine, den- tal medicine and natural sciences	3	NUM	39
Classical Physics (16 EC	TS credits)			
11-E-M-152-m01	Classical Physics 1 (Mechanics)	8	NUM	87
11-E-E-152-m01	Classical Physics 2 (Heat and Electromagnetism)	8	NUM	80
Optics and Quantum Ph	ysics I (6 ECTS credits)			<u>.</u>
11-E-OAV-152-m01	Optics and Quantum Physics	6	NUM	93
-	ysics II (10 ECTS credits)			
11-E-OA-152-m01	Optics and Waves - Exercises	5	NUM	92
11-E-AA-202-m01	Atoms and Molecules - Exercises	5	NUM	77
Solid State Physics (8 E		,	-	<u> </u>
11-E-F-152-m01	Introduction to Solid State Physics	8	NUM	83
Theoretical Physics I (6		0		
11-T-QS-152-m01	Quantum Mechanics and Statistical Physics	6	NUM	150
Theoretical Physics II (1		Ū	Nom	1)0
11-T-QA-152-m01	Quantum Mechanics - Exercises	г	NUM	148
11-T-SA-152-m01	Statistical Physics - Exercises	5	NUM	<u> </u>
		5	NOM	152
Mathematics (24 ECTS o				
10-M-PHY1-152-m01	Mathematics 1 for Students of Physics and Nanostructure Technology	8	NUM	57
10-M-PHY2-152-m01	Mathematics 2 for Students of Physics and Nanostructure Technology	8	NUM	58
11-M-D-152-m01	Mathematics 3 for Students of Physics and related Disciplines (Differential Equations)	8	NUM	110
Laboratory Course Phys	ics (11 ECTS credits)			
11-P-PA-152-m01	Laboratory Course Physics A (Mechanics, Heat, Electromagne- tism)	3	B/NB	131
11-P-NB-152-m01	Laboratory Course Physics B (Classical Physics, Electricity, Cir- cuits)	4	B/NB	129
11-P-NC-152-m01 Advanced Laboratory Course Physics C (Modern Physics, Com- puter Aided Experiments)		4	B/NB	130
Compulsory Electives (32				<u> </u>
Semiconductor Electron				é.
11-EL-152-mo1	Electronic Circuits	6	NUM	85
11-SPD-152-m01	Physics of Semiconductor Devices	6	NUM	
11-SPD-152-m01 11-HLF-152-m01	Semiconductor Lasers and Photonics	6	NUM	142 99
	DEDUCTION OF LASEIS AND PRODUCTS	0		1 00

damentals of Semiconductor Physics tal Growth, thin Layers and Lithography ent Topics in Semiconductor Electronics	6 6 6	NUM NUM NUM	101 103
	-		
ent Topics in Semiconductor Electronics	6	NUM	1-
			69
oanalytics	6	NUM	116
d State Physics 2	8	NUM	97
ciples of Energy Technologies	6	NUM	90
otechnology in Energy Research	6	NUM	122
oratory Course Physical Technology of Material Synthesis	8	B/NB	133
ting Technologies based on Vapour Deposition	5	NUM	66
ecular Materials (Lecture)	5	NUM	34
mically and bio-inspired Nanotechnology for Material Syn- is	5	NUM	36
oscale Materials	5	NUM	51
erial Science 1 (Basic introduction)	5	NUM	30
erial Science 2 (The Material Groups)	5	NUM	32
mical Nanotechnology: Analytics and Applications	5	NUM	38
hods of Non-Destructive Material Testing		NUM	155
			1
hbranebiology of Plants for Advanced Students	5	NUM	8
	-	NUM	10
		NUM	12
		NUM	16
	-	NUM	14
	-	NUM	18
	6	NUM	10/
	I		
	6	NUM	136
	6		138
			140
			54
			56
ramming course for students of Mathematics and other	3	B/NB	59
	4	B/NB	52
hematics 4 for Students of Physics and related Disciplines	8	NUM	112
	8	NUM	146
	-		14
			1
ciples of Two- and Three-Dimensional Röntgen Imaging	6	NUM	153
	-		64
			61
			78
			100
oduction to Labview	6	NUM	100
	U	NUM	1 100
	otechnology in Energy Research rratory Course Physical Technology of Material Synthesis ing Technologies based on Vapour Deposition recular Materials (Lecture) nically and bio-inspired Nanotechnology for Material Syn- is boscale Materials trial Science 1 (Basic introduction) trial Science 2 (The Material Groups) nical Nanotechnology: Analytics and Applications nods of Non-Destructive Material Testing thranebiology of Plants for Advanced Students nods in Biotechnology ects of Molecular Biotechnology ial Bioinformatics 1 cs in Light- and Electron-Microscopy ific Biotechnology 2 rratory and Measurement Technology in Biophysics <b>puter Aided Methods</b> duction to Quantum Computing and Quantum Information duction to Relativistic Physics and Classical Field Theory stics, Data Analysis and Computer Physics erical Mathematics 1 for students of other subjects ramming course for students of Mathematics and other ects putational Mathematics	technology in Energy Research6ratory Course Physical Technology of Material Synthesis8ing Technologies based on Vapour Deposition5icular Materials (Lecture)5nically and bio-inspired Nanotechnology for Material Syn- is5socale Materials5socale Materials5rrial Science 1 (Basic introduction)5irial Science 2 (The Material Groups)5nical Nanotechnology: Analytics and Applications5nods in Non-Destructive Material Testing4ubranebiology of Plants for Advanced Students5socas in Biotechnology5sial Bioinformatics 15sc sin Light- and Electron-Microscopy5puter Aided Methods10duction to Quantum Computing and Quantum Information6duction to Relativistic Physics and Classical Field Theory6stics, Data Analysis and Computer Physics10ramming course for students of other subjects10ramming course for students of Mathematics and other ects8stics 4 for Students of Physics and related Disciplines applex Analysis)8retical Mechanics8retical Mechanics8retical Mechanics8retical Mechanics8retical Mechanics8retical Mechanics8retical Mechanics8retical Mathematics8retical Mathematics8retical Mechanics8retical Mechanics8retical Mechanics <td< td=""><td>technology in Energy Research6NUMratory Course Physical Technology of Material Synthesis8B/NBing Technologies based on Vapour Deposition5NUMcular Materials (Lecture)5NUMnically and bio-inspired Nanotechnology for Material Syn- is5NUMsocale Materials5NUMrial Science 1 (Basic introduction)5NUMrial Science 2 (The Material Groups)5NUMnical Nanotechnology: Analytics and Applications5NUMbranebiology of Plants for Advanced Students5NUMords in Biotechnology5NUMcuds in Biotechnology5NUMcuds in Biotechnology 25NUMratory and Measurement Technology in Biophysics6NUMputer Aided Methods6NUMduction to Quantum Computing and Quantum Information6NUMetcal Mathematics 1 for students of other subjects10NUMratory and Measurement Technology in Biophysics4NUMerical Mathematics 1 for students of other subjects10NUMerical Mathematics 2 for students of other subjects10NUMerical Mathematics 1 for students of other subjects10NUMretical Mathematics8NUMretical Mathematics8NUMretical Mathematics8NUMretical Mathematics8NUMretical Mathematics8NUMretical Mathematics8NUMret</td></td<>	technology in Energy Research6NUMratory Course Physical Technology of Material Synthesis8B/NBing Technologies based on Vapour Deposition5NUMcular Materials (Lecture)5NUMnically and bio-inspired Nanotechnology for Material Syn- is5NUMsocale Materials5NUMrial Science 1 (Basic introduction)5NUMrial Science 2 (The Material Groups)5NUMnical Nanotechnology: Analytics and Applications5NUMbranebiology of Plants for Advanced Students5NUMords in Biotechnology5NUMcuds in Biotechnology5NUMcuds in Biotechnology 25NUMratory and Measurement Technology in Biophysics6NUMputer Aided Methods6NUMduction to Quantum Computing and Quantum Information6NUMetcal Mathematics 1 for students of other subjects10NUMratory and Measurement Technology in Biophysics4NUMerical Mathematics 1 for students of other subjects10NUMerical Mathematics 2 for students of other subjects10NUMerical Mathematics 1 for students of other subjects10NUMretical Mathematics8NUMretical Mathematics8NUMretical Mathematics8NUMretical Mathematics8NUMretical Mathematics8NUMretical Mathematics8NUMret

08-FU-EEW-152-m01	Electrochemical Energy Storage and Conversion	5	NUM	28	
Current Topics in Nanost	rucutre Technology				
11-BXN5-152-m01	Current Topics in Nanostructure Technology	5	NUM	67	
11-BXN6-152-m01	Current Topics in Nanostructure Technology	6	NUM	68	
11-BXN8-152-m01	Current Topics in Nanostructure Technology	8	NUM	70	
11-BXP5-152-m01	Current Topics Physics	5	NUM	71	
11-BXP6-152-m01	Current Topics in Physics	6	NUM	72	
11-BXP8-152-m01	Current Topics in Physics	8	NUM	73	
11-CSN6-152-m01	Selected Topics in Nanostructure Technology	6	NUM	76	
11-CSF6-152-m01	Selected Topics in Solid State Physics	6	NUM	75	
11-CSEM6-152-m01	Selected Topics in Energy and Material Science	6	NUM	74	
11-NTP-152-m01	Novel Transport Phenomena	6	NUM	124	
Key Skills Area (20 ECTS c	redits)				
transferable skills (ASQ). General Key Skills (sub	ect-specific)				
11-P-VKM-202-m01	MINT Preparatory Course Mathematical Methods of Physics	3	B/NB	134	
11-FFI-202-m01	Fit for Industry	3	B/NB	96	
11-PMP-152-m01	Project Management in Practice	3	B/NB	128	
07-SQF-BGA-152-m01	Biotechnology and Social Acceptance	3	NUM	20	
11-NASQ5-152-m01	General Competences for Students of Nanostructure Technolo- gy	5	NUM	118	
Subject-specific Key Skil	ls (15 ECTS credits)				
11-M-MR-202-m01	Mathematical Methods of Physics	6	B/NB	114	
11-N-HS-152-m01	Seminar Nanostructure Technology	5	NUM	120	
11-P-FR1-152-m01	Data and Error Analysis	2	B/NB	125	
11-P-FR2-152-m01	Advanced and Computational Data Analysis	2	B/NB	127	
Thesis (10 ECTS credits)					
11-BA-N-152-m01	Bachelor Thesis Nanostructure Technology	10	NUM	63	

Modul	e title				Abbreviation
Memb	ranebio	logy of Plants for Advan	ced Students		07-4BFPS2-152-m01
Modul	e coord	inator		Module offered by	
	holder of the Chair of Plant Physiology and Biophysics			Faculty of Biology	
ECTS	1	od of grading	Only after succ. con	· · · · · · · · · · · · · · · · · · ·	
5		rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	undergraduate			
Conter	nts				
metho	ds with		erised. For this purpos	e, students will be i	ane transport and the biophysica ntroduced to modern methods of
Intend	ed lear	ning outcomes			
		erstand basic membrane tact plants, isolated plan			experimental methods in experi- ems.
Course	<b>es</b> (type	, number of weekly conta	act hours, language –	- if other than Germa	an)
V (1) +	Ü (5)				
					ation offered — if not every seme
ster, in	offormat	ion on whether module c	an be chosen to earn	a bonus)	
Studer credita	nts will able for		ethod and length of t	he assessment prio	r to the course.
Alloca	tion of	places			
Studer siderat ted to nimum 60 ECT tik (Ma tential the nu there b form re ponen ve suc tial con	d the number of the students of the students of the students of one of one of the students of	the Bachelor's degree sub sould the module be used to of the Bachelor's degree place in total) will be all ts and to students of the tics), each with 180 ECTS udents of other 'importin f applications, the remain in one module compone on for the courses of one re concerned will be allow ly completed at least one tion.	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 ning places will be all nt, several courses wi module component. I cated in the same pro	) with 180 ECTS cred ere will be two quot 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 of cedure. In this proce onent of the respection	tes will be allocated as follows: dits will be given preferential con tas: 95% of places will be alloca- rS credits and 5% of places (a mi ree subject Biologie (Biology) wit hal Mathematics and Mathema- ed subject Biology (as well as po- s available in one quota exceed s from the other quota. Should ber of places, there will be a uni- tion all courses of a module com- edure, applicants who already have ive module will be given preferen
Selecti mic ac ve ach in the at the	ion pro- hievem ieved a subject time of	ents. For this purpose, a nd their average grade o of Biologie (Biology) (ex application. This will be	es will primarily be all pplicants will be rank f all assessments take cluding Chemie (Cher done as follows: First	ocated according to ed according to the en during their studi nistry), Physik (Phys , applicants will be r	ble. the applicants' previous acade- number of ECTS credits they ha- ies or of all module components sics), Mathematik (Mathematics) ranked, firstly, according to their nking) and, secondly, according

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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)

Modul	e title				Abbreviation	
Metho	ods in Bi	otechnology			07-4S1AMB-152-mc	)1
Module coordinator				Module offered by	<u> </u>	
holder of the Chair of Biotechnology and Biophys			nd Biophysics	Faculty of Biology		
ECTS         Method of grading         Only after succ. compl. of module(s)						
5	nume	rical grade				
Durati		Module level	Other prerequisites	6		
1 seme		undergraduate				
Conte	nts					
techno lysis o	ology an f biolog	lecture and seminar) wil d biomedicine and the u ical matter on the molec oscopy, electron micros	underlying physical pr cular and cellular leve	rinciples. It will discu l. These methods inc	iss modern methods lude light microscop	s for the ana- by, fluore-
Intend	led lear	ning outcomes				
		gain an overview of key Il learn to decide what n				d disadvan-
Course	<b>es</b> (type	, number of weekly cont	act hours, language –	– if other than Germa	ın)	
V (2) +	S (2)					
		<b>sessment</b> (type, scope, l on on whether module o			ition offered — if not	every seme-
	n examiı able for	nation (approx. 30 to 60 bonus	minutes)			
Alloca	tion of p	olaces				
sidera ted to nimum 60 ECT tik (Ma tential the nu there h form ro ponen ve suc tial co A wait Select mic ac ve ach in the at the average	tion. Sh student n of one IS credit athemat ly to stu mber of be, with egulatio t that an cessfull nsiderat ing list v ion proc hievem a subject time of ge grade	e Bachelor's degree sub ould the module be use is of the Bachelor's degr place in total) will be al ts and to students of the ics), each with 180 ECTS idents of other 'importin fapplications, the remai in one module compone n for the courses of one re concerned will be allo y completed at least one tion. will be maintained and p cess group 1 (95%): Plac ents. For this purpose, a nd their average grade o of Biologie (Biology) (ex application. This will be weighted according to to umber of ECTS credits a	d in other subjects, the ee subject Biologie (E located to students o e Bachelor's degree subjects). Should the rang places will be all ent, several courses w module component. cated in the same pro- e other module compo- places re-allocated as es will primarily be all applicants will be rank of all assessments tak caluding Chemie (Chemi- done as follows: First the number of ECTS com-	nere will be two quot Biology) with 180 ECT f the Bachelor's degr ubjects Computation e application-oriente the number of places located to applicants ith a restricted numb In this case, places of ocedure. In this proce onent of the respecti they become availab located according to the during their studi mistry), Physik (Phys t, applicants will be r redits (qualitative ran	as: 95% of places wi S credits and 5% of ree subject Biologie al Mathematics and d subject Biology (a available in one qu from the other quot our of places, there w on all courses of a m edure, applicants wh we module will be given the applicants' prev number of ECTS creates es or of all module of ics), Mathematik (M anked, firstly, accorn hking) and, secondly	ill be alloca- places (a mi- (Biology) with Mathema- is well as po- ota exceed ta. Should vill be a uni- odule com- no already ha- ven preferen- vious acade- dits they ha- components athematics)) ding to their y, according
will be Among se by l Select	e calcula g applic lot. ion proc	ited as the sum of these ants with the same rank cess group 2 (5%): Place nber of ECTS credits alre	two rankings, and plaing, places will be allocated ac	aces will be allocated ocated according to cording to the follow	d according to this th the qualitative ranki ing quotas: Quota 1	nird ranking. ng or otherwi (50 % of pla-
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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) 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	e title				Abbreviation
Aspect	Aspects of Molecular Biotechnology			07-4S1MOLB-152-m01	
Module coordinator				Module offered by	
holder of the Chair of Biotechnology ar			id Biophysics	Faculty of Biology	
ECTS		od of grading	Only after succ. com	npl. of module(s)	
5		rical grade			
Duratio		Module level	Other prerequisites		
1 seme		undergraduate			
Conten					
mes, p sor des	roducti sign, dr	on of biomolecules, mole	ecular biology, recom	binant DNA technolo	nobilisation of cells and enzy- ogy, protein engineering, biosen- ibodies, hybridoma technology,
Intend	ed lear	ning outcomes			
ges and Studen dently to inde <b>Course</b>	d disad its will review pender <b>s</b> (type	lvantages. They will learn acquire a knowledge of fu	to decide what meth undamental methods lition, they will becor with - relevant mech	od is most suitable in biotechnology th ne acquainted with - anisms.	ogy and their respective advanta- for addressing a particular issue. at will enable them to indepen- or, where necessary, will be able n)
V (2) +					
ster, in	format exami	ion on whether module ca nation (approx. 30 to 60 i	an be chosen to earn		tion offered — if not every seme-
Allocat					
25 plac Should Studen siderat ted to s nimum 60 ECT tik (Ma tentiall the nur there b form re ponent ve succ	ces. I the nunts of the cion. Sh student of one S credi themat by to stu mber of the, with egulation t that a cessful	imber of applications exc ne Bachelor's degree subj ould the module be used to of the Bachelor's degree place in total) will be allo ts and to students of the tics), each with 180 ECTS udents of other 'importing f applications, the remain in one module componer on for the courses of one r re concerned will be alloc ly completed at least one	ect Biologie (Biology I 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 module component. I tated in the same pro	) 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 cedure. In this proce	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- ve module will be given preferen-
A waiti Selecti mic ach ve achi in the s at the t averag to their	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 this third ranking.				

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 12 / 156
(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

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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)
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)

Bachelor's with 1 major Nanostructure Technology (2020)

Modul	le title				Abbreviation
Basics	s in Ligh	nt- and Electron-Microso	сору		07-4S1MZ1-152-m01
Modul	le coord	linator		Module offered by	I
head o	of the D	epartment of Electronm	icroscopy	Faculty of Biology	
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)	
5	nume	rical grade			
Durati	on	Module level	Other prerequisites	;	
1 seme	ester	undergraduate			
Conte	nts				
Funda	mental	principles of confocal la	aser scanning microsco	opy and electron mic	croscopy.
Intend	led lear	ning outcomes			
Stude	nts hav	e acquired theoretical k	nowledge and practica	al skills in the area o	f light and electron microscopy.
Course	es (type	, number of weekly con	tact hours, language –	- if other than Germa	an)
V (1) +	Ü (5)				
		sessment (type, scope, ion on whether module			ation offered — if not every seme-
	n exami able for	nation (approx. 30 to 60 bonus	o minutes)		
Alloca	tion of	places			
Studen sidera ted to nimum 60 ECT tik (Ma tential	d the nu nts of th tion. Sh studen n of one TS credi athema lly to stu	ne Bachelor's degree su nould the module be use ts of the Bachelor's deg place in total) will be a its and to students of th tics), each with 180 ECT udents of other 'importin	bject Biologie (Biology ed in other subjects, th ree subject Biologie (E llocated to students o e Bachelor's degree su S credits, as part of th ng' subjects). Should t	y) with 180 ECTS creation here will be two quot Biology) with 180 ECT f the Bachelor's degr ubjects Computation e application-oriente he number of places	tes 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 s 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 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.

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 14 / 156
(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 title					Abbreviation	
Special Bioinformatics 1					07-4S1MZ6-152-mo	1
Module	e coord	inator		Module offered by	<u>.</u>	
holder	of the (	Chair of Bioinformatics		Faculty of Biology		
ECTS		od of grading	Only after succ. con			
5		rical grade		, ,,		
Duratio	on	Module level	Other prerequisites	6		
1 seme	ster	undergraduate				
Conten	Its					
damen		orinciples of the tree of li ciples of evolutionary bio ion.				
Intend	ed learı	ning outcomes				
	nts are a econstr	ble to use software and uction.	databases for seque	nce analysis, RNA sti	ructure prediction ar	nd phyloge-
Course	<b>s</b> (type	number of weekly conta	act hours, language –	- if other than Germa	n)	
V (1) +	Ü (5)					
		essment (type, scope, la on on whether module c			tion offered — if not	every seme-
Langua		o to 20 pages) ssessment: German or E bonus	nglish			
	tion of p		-			
siderat ted to s nimum 60 ECT tik (Ma tentiall the nur there b form re ponent ve succ tial cor A waitin Selecti in the s at the t average to their will be Among se by lo Selecti	its of the ion. Sh student of one S credit themat by to stu- mber of e. with gulatio t that ar cessfull ng list w on proc hievem ieved a subject time of e grade r total n calcula g applict ot. on proc	e Bachelor's degree subjould the module be used s of the Bachelor's degree place in total) will be all s and to students of the ics), each with 180 ECTS dents of other 'importing applications, the remain n one module component n for the courses of one to e concerned will be alloc y completed at least one ion. will be maintained and pl ess group 1 (95%): Place ents. For this purpose, ap nd their average grade of of Biologie (Biology) (exc application. This will be a weighted according to th umber of ECTS credits ac ted as the sum of these to ants with the same rankit ess group 2 (5%): Places	d in other subjects, the es subject Biologie (B ocated to students of Bachelor's degree su credits, as part of the g' subjects). Should the ning places will be all nt, several courses w module component. In cated in the same pro- cated in the same pro-	here will be two quota biology) with 180 ECT of the Bachelor's degr ubjects Computation e application-oriente he number of places located to applicants ith a restricted numb in this case, places of ocedure. In this proce onent of the respection they become availab located according to the en during their studi mistry), Physik (Phys c, applicants will be re redits (qualitative rar ranking). The applic aces will be allocated ocated according to the cording to the follow	as: 95% of places wi S credits and 5% of ee subject Biologie ( al Mathematics and d subject Biology (a available in one qua from the other quan of rom the other quan er of places, there we on all courses of a me edure, applicants whe we module will be given ble. the applicants' prev number of ECTS created es or of all module of ics), Mathematik (M anked, firstly, accord hking) and, secondly ants' position in a the d according to this the the qualitative ranking ing quotas: Quota 1	Il be alloca- places (a mi- (Biology) with Mathema- s well as po- ota exceed ta. Should vill be a uni- odule com- to already ha ven preferen- tious acade- lits they ha- omponents athematics)) ding to their ty, according nird ranking. ing or otherwi (50 % of pla-
		or Nanostructure Technology	JMU Würzburg	generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte	am. reg. da-	page 16 / 156

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) 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, 2020) Bachelor's degree (1 major, 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				Abbreviation			
Specifi	Specific Biotechnology 2 07-5S2MZ4-152-m01						
Module	e coordinator		Module offered by				
holder	of the Chair of Biotechnology a	nd Biophysics	Faculty of Biology				
ECTS	Method of grading	Only after succ. con	npl. of module(s)				
10	numerical grade						
Duratio		Other prerequisites	i				
1 seme							
Under o lar biot scence	actical course provides student expert guidance, students will p technology, nano and microsyst microscopy, fluorescence spec	perform selected expe tems biotechnology, b	riments on the follow piomaterials and bios	wing topics: cellular and molecu- sensors, high-resolution fluore-			
	ed learning outcomes						
applica acquai chanisi tools. I	nted with - or, where necessary ms. Students will have acquired	ndependently review , will be able to indep d practical experience ve acquired detailed t	relevant literature. Ir endently acquaint the performing experim theoretical knowledg	n addition, they will have become nemselves with - biophysical me- ents, using a variety of scientific te on these experiments and will			
Course	<b>s</b> (type, number of weekly cont	act hours, language –	- if other than Germa	n)			
Ü (7) + Module	S (1) e taught in: German and/or Eng	lish					
Metho	<b>d of assessment</b> (type, scope, la	anguage — if other th	an German, examina	tion offered — if not every seme-			
ster, in	formation on whether module of	an be chosen to earn	a bonus)				
b) log ( c) oral d) oral e) pres f) pract not exc Studen Langua	<ul> <li>a) written examination (approx. 45 to 60 minutes) or</li> <li>b) log (approx. 10 to 20 pages) or</li> <li>c) oral examination of one candidate each (approx. 30 minutes) or</li> <li>d) oral examination in groups of up to 3 candidates (approx. 20 minutes per candidate) or</li> <li>e) presentation (approx. 20 to 30 minutes) or</li> <li>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).</li> <li>Students will be informed about the method and length of the assessment prior to the course.</li> <li>Language of assessment: German and/or English creditable for bonus</li> </ul>						
Allocat	tion of places						
Studen siderat ted to s nimum 60 ECT tik (Ma tentiall the nur there b form re ponent ve succ	I the number of applications exits of the Bachelor's degree sub- tion. Should the module be used students of the Bachelor's degree of one place in total) will be all 'S credits and to students of the athematics), each with 180 ECTS by to students of other 'importing the module component of applications, the remained within one module component that are concerned will be allo	ject Biologie (Biology d in other subjects, the ee subject Biologie (B located to students of Bachelor's degree sub credits, as part of the g' subjects). Should the ning places will be all nt, several courses w module component. cated in the same pro-	) with 180 ECTS cred here will be two quota sology) with 180 ECT f the Bachelor's degr ubjects Computation e application-oriente he number of places located to applicants ith a restricted numb In this case, places o becedure. In this proce	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 s from the other quota. Should per of places, there will be a uni-			

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 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

300 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) 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
Biotec	hnolog	y and Social Acceptance			07-SQF-BGA-152-m01
Modul	e coord	inator		Module offered by	<u></u>
holder	ofthe	Chair of Plant Physiology	and Biophysics	Faculty of Biology	
ECTS		od of grading	Only after succ. con		
3		rical grade		• • • •	
Duratio	on	Module level	Other prerequisites		
1 seme		undergraduate			
Conten	its				
		of green biotechnology; b	iological background	l, economic interests	s, ecological risks, social accepta
Intend	ed lear	ning outcomes			
search	and ar ced the	e able to critically review	scientific publication	ns as well as issues i	now how to conduct a literature raised by society. Students have present the data they have col-
Course	<b>s</b> (type	, number of weekly conta	ict hours, language –	- if other than Germa	an)
V (1) +	S (2)				
Module	e taugh	t in: German and/or Engl	ish		
		<b>sessment</b> (type, scope, la ion on whether module c			tion offered — if not every seme-
Langua		preparing educational m ssessment: German and bonus		10 pages)	
Allocat	ion of	olaces			
Studer siderat ted to s nimum 60 ECT tik (Ma tentiall the num there b form re ponent	I the nut its of the ion. Should be student of one S credi themat by to stu mber of be, with egulation t that a cessful	the Bachelor's degree subj ould the module be used is of the Bachelor's degree place in total) will be all ts and to students of the tics), each with 180 ECTS idents of other 'importing f applications, the remain in one module component of or the courses of one re concerned will be alloc by completed at least one	ject Biologie (Biology I in other subjects, the se subject Biologie (B ocated to students of Bachelor's degree su credits, as part of the g' subjects). Should t hing places will be all ht, several courses w module component. I cated in the same pro-	) with 180 ECTS cred here will be two quot iology) with 180 ECT f the Bachelor's degr bjects Computation e application-oriente he number of places ocated to applicants ith a restricted numb in this case, places of ocedure. In this proce	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 s 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 ve module will be given preferen-
A waiti	ng list v	will be maintained and p		-	ole. the applicants' previous acade-

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

Bachelor's with 1 major Nanostructure Technology (2020)

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)

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#### 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)

Bachelor's with 1 major Nanostructure Technology (2020)

Module	e title				Abbreviation	
Experir	mental	Chemistry			o8-AC-ExChem-152-	m01
		• •				
Module				Module offered by		
		ture "Experimentalchem	ie" (Experimental	Institute of Inorgani	c Chemistry	
Chemis	· · · ·					
ECTS		od of grading	Only after succ. con	npl. of module(s)		
5	I	rical grade				
Duratio		Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
The mo	odule p	rovides an overview of th	ne fundamental know	ledge of chemistry. E	mphasis is placed o	n the materi
al and	particle	e level, metals, acid-base	e reactions, the period	lic table, chemical e	quilibrium and comp	lexometry.
Intende	ed lear	ning outcomes				
The stu	ıdent u	nderstands the principle	es of the periodic table	e and can obtain info	rmation from it. He/	she is profi-
cient in	ı basic	models of the structure	of matter and can des	cribe them properly.	He/she can depict of	hemical re-
actions	s using	typical chemical formula	a language and interp	ret them by identifyir	ng the type of reaction	on.
Course	<b>s</b> (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (4)	_					
Metho	d of ass	sessment (type, scope, l	anguage — if other th	an German, examina	tion offered — if not	everv seme-
		ion on whether module of				,
written	exami	nation (approx. 90 minu	tes)			
		ssessment: German and				
Allocat						
Additio	nalinf	ormation				
Auunto						
Worklo			_			
	au					
150 h			_			
Teachi						
Teachi	ng cycl	e: every year, winter sem	ester			
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Module	e appea	ars in				
		gree (1 major) Biology (2	011)			
		gree (1 major) Psycholog				
Duchet						
	or's de	gree (1 major, 1 minor) P	edagogy (2013)			
Bachel				dies (2013)		
Bachel Bachel	or's de	gree (1 major, 1 minor) P	olitical and Social Stu			
Bachel Bachel Bachel Bachel	or's de or's de or's de	gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (1 major, 1 minor) R gree (2 majors) Special B	olitical and Social Stu ussian Language and Education (2009)			
Bachel Bachel Bachel Bachel Magist	or's de or's de or's de er Thec	gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (1 major, 1 minor) R gree (2 majors) Special B ologiae Catholic Theolog	olitical and Social Stu ussian Language and Education (2009) y (2013)	Culture (2008)		
Bachel Bachel Bachel Bachel Magiste Bachel	or's de or's de or's de er Thec or's de	gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (1 major, 1 minor) R gree (2 majors) Special B logiae Catholic Theolog gree (2 majors) English a	olitical and Social Stu ussian Language and Education (2009) y (2013) and American Studies	Culture (2008) (2009)		
Bachel Bachel Bachel Bachel Magist Bachel Bachel	or's de or's de or's de er Thec or's de or's de	gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (1 major, 1 minor) R gree (2 majors) Special B ologiae Catholic Theolog gree (2 majors) English a gree (2 majors) German	olitical and Social Stu ussian Language and Education (2009) y (2013) and American Studies Language and Literatu	Culture (2008) (2009)		
Bachel Bachel Bachel Bachel Magist Bachel Bachel Bachel	or's de or's de or's de er Thec or's de or's de or's de	gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (2 majors) Special B ologiae Catholic Theolog gree (2 majors) English a gree (2 majors) German gree (1 major) Geograph	olitical and Social Stu ussian Language and Education (2009) y (2013) and American Studies Language and Literatu y (2015)	Culture (2008) (2009)		
Bachel Bachel Bachel Magist Bachel Bachel Bachel Bachel	or's de or's de or's de er Thec or's de or's de or's de or's de	gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (2 majors) Special B ologiae Catholic Theolog gree (2 majors) English a gree (2 majors) German gree (1 major) Geograph gree (1 major) Mathemat	olitical and Social Stu ussian Language and Education (2009) y (2013) and American Studies Language and Literatu y (2015) cics (2015)	Culture (2008) (2009)		
Bachel Bachel Bachel Magist Bachel Bachel Bachel Bachel Bachel	or's de or's de or's de er Thec or's de or's de or's de or's de or's de	gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (1 major, 1 minor) R gree (2 majors) Special B logiae Catholic Theolog gree (2 majors) English a gree (2 majors) German gree (1 major) Geograph gree (1 major) Mathemat gree (1 major) Musicolog	olitical and Social Stu ussian Language and Education (2009) y (2013) and American Studies Language and Literatu y (2015) cics (2015) gy (2015)	Culture (2008) (2009)		
Bachel Bachel Bachel Magist Bachel Bachel Bachel Bachel Bachel Bachel	or's de or's de er Thec or's de or's de or's de or's de or's de or's de	gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (2 majors) Special B ologiae Catholic Theology gree (2 majors) English a gree (2 majors) German gree (1 major) Geograph gree (1 major) Mathemat gree (1 major) Musicolog gree (1 major) Physics (2	olitical and Social Stu ussian Language and Education (2009) y (2013) and American Studies Language and Literatu y (2015) tics (2015) gy (2015) 015)	Culture (2008) (2009)		
Bachel Bachel Bachel Magist Bachel Bachel Bachel Bachel Bachel Bachel Bachel	or's de or's de er Thec or's de or's de or's de or's de or's de or's de or's de	gree (1 major, 1 minor) P gree (1 major, 1 minor) P gree (1 major, 1 minor) R gree (2 majors) Special B logiae Catholic Theolog gree (2 majors) English a gree (2 majors) German gree (1 major) Geograph gree (1 major) Mathemat gree (1 major) Musicolog	olitical and Social Stu ussian Language and Education (2009) y (2013) and American Studies Language and Literatu y (2015) cics (2015) gy (2015) o15) gy (2015)	Culture (2008) (2009)		page 22 / 156

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 degree (1 major) Games Engineering (2016) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 23 / 156 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

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 degree (2 majors) English and American Studies (2021) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-

page 24 / 156 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

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 degree (1 major) Human-Computer-Interaction (2024) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 25 / 156 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

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)

Julius-Maxi

UNIVERSITÄT

WÜRZBURG

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)

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)

Module	e title				Abbreviation
Genera	l and A	nalytical Chemistry for s	tudents of natural sc	iences (lab)	08-ACP-NF-152-m01
Module	e coord	inator		Module offere	ed by
holder	of the (	Chair of Anorganic Chemi	stry	Institute of Inc	organic Chemistry
ECTS	Metho	od of grading	Only after succ. com	pl. of module(	s)
2	(not) s	successfully completed	o8-AC-ExChem		
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
lated le course	ecture(s focuse	s). After a safety briefing,	the students autonor	mously conduc	edge they have gained through the re- it experiments in the laboratory. The of simple substances and analyses of
Intende	ed lear	ning outcomes			
have d	evelope		he necessary stoichi	ometric calcula	orm experiments to solve them. They ations and describe the chemical pro-
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	if other than G	Serman)
P (4)					
ster, in	formati	on on whether module c	an be chosen to earn	a bonus)	amination offered — if not every seme-
pages ( Langua	each) a Ige of a	chtestate (pre and post-on nd assessment of praction ssessment: German and, ffered: Once a year, sum	al performance (2 to /or English		x. 15 minutes each, log approx. 5 to 10 ninations)
Allocat		· · · ·			
Additio	nal inf	ormation			
Worklo	ad				
60 h					
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-c	legree program	ımes)
				<u> </u>	
Module	e appea	urs in			
Bachel	or's de	gree (1 major) Physics (20 gree (1 major) Nanostruct gree (1 major) Physics (20	ture Technology (201	5)	

Modul					Abbreviation	
Electro	chemica	al Energy Storage and	Conversion		08-FU-EEW-152-m0	1
Module	e coordi	nator		Module offered by	<u> </u>	
			nology of Material Syn-		echnology of Matori	al Synthosic
thesis	of the C		nology of Material Syn-		echnology of Malen	al Synthesis
ECTS	Metho	d of grading	Only after succ. con	pl. of module(s)		
5		ical grade				
Duratio	on [	Module level	Other prerequisites			
1 seme		undergraduate				
Conten	nts		<b>I</b>			
um and cal dou	d nickel uble laye	metal hydride, sodiun er capacitors, redox-flo	/ systems (aqueous and n sulphur, sodium nicko w batteries, fuel cell sy e solar cell), thermoelec	el chloride, lithium io vstems (AFC, PEMFC,	on accumulators), el	ectrochemi-
Intend	ed learn	ing outcomes				
		developed a knowled e to research problem	ge of electrochemical e s.	nergy storage and co	onversion and are al	ble to apply
Course	es (type,	number of weekly cor	itact hours, language –	· if other than Germa	in)	
V (2) +	P (1) + E	(1)				
Metho	d of ass	essment (type, scope,	language — if other that can be chosen to earn		tion offered — if not	every seme-
Allocat	tion of p					
Additio	onal info	rmation				
Worklo	ad					
150 h						
	ng cycle	1				
	ed to in I	<b>POI</b> (examination re	gulations for teaching-o	legree programmes)		
		re in				
	e appea		aturo Toshashara (-	-)		
	-	ree (1 major) Nanostri e (1 major) Physics (2	icture Technology (201)	5)		
	-		ture Technology (2016)			
	-	e (1 major) Functional				
	-		ture Technology (2020)			
	-	e (1 major) Physics (2				
Master	-	e (1 major) Physics Int	ernational (2020)			
Master Master Master	r's degre r's degre	e (1 major) Quantum I	Engineering (2020)			
Master Master Master Bachel	r's degre r's degre lor's deg	e (1 major) Quantum I ree (1 major) Nanostri	Engineering (2020) Icture Technology (202	o)		
Master Master Master Bachel	r's degre r's degre lor's deg	e (1 major) Quantum I	Engineering (2020) Icture Technology (202	0)		
Master Master Master Bachel Bachel	r's degre r's degre lor's deg lor's deg	e (1 major) Quantum I ree (1 major) Nanostri	Engineering (2020) acture Technology (202 n Technology (2021)	0) generated 19-Apr-2025 • exa	am. reg. da-	page 28 / 156



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

Module	e title				Abbreviation	
Materia	al Scien	ce 1 (Basic introduction	ı)		08-FU-MaWi1-152-m	101
Module	e coordi	nator		Module offered by		
		hair of Chemical Techn	ology of Matorial Syn-	•	achnology of Matoria	l Synthosis
thesis	or the c		ology of Material Syn-		echnology of Materia	at Synthesis
ECTS	Metho	d of grading	Only after succ. con	pl. of module(s)		
5		ical grade				
Duratio	on [	Module level	Other prerequisites			
1 seme		undergraduate				
Conten	ts					
		alysis, process enginee		ition agglomeration	separation drying	conveying
		ology, coating processe			, separation, drying,	conveying.
		ing outcomes				
		ossess comprehensive	knowledge about var	ous techniques form	n different areas of th	ne field of
		ess engineering. For a g				
		suggest ways of fabrica				
		measurement data as v				
		lature, significance as v				
Course	<b>s</b> (type,	number of weekly cont	act hours, language –	if other than Germa	n)	
V (3) +	Ü (1)					
		essment (type, scope, l	anguage — if other the	an German, examina	tion offered — if not	everv seme
		on on whether module				
a) writt	en exar	nination (approx. 90 to	180 minutes) or			
		ation of one candidate		s) or		
		ation in groups of up to		-	didate) or	
		20 pages) or				
		n (approx. 30 minutes)				
		ssessment: German and	l/or English			
Allocat	ion of p	laces				
Additio	onal info	ormation				
Worklo	ad					
150 h						
-	ng cycle	•				
	-5 cyck	•	_			
Doforro	d to in	<b>DOL</b> (avamination rag		lagraa programmac)		
		LPOI (examination reg		iegree programmes)		
	e appea		· • · · · · ·	<b>`</b>		
	-	ree (1 major) Nanostrue		5)		
	-	ree (1 major) Functiona				
	-	e (1 major) Chemistry (				
		ing degree Gymnasium				)16)
		y course MINT Teacher I		vetwork Bavaria (EN	В) (2016)	
		e (1 major) Chemistry (			and Devenie (END) (	
		ing degree Gymnasium				)20)
Supple	mentar	y course MINT Teacher I	Equivation PLUS, Elite I	vetwork Bavaria (EN	ы (2020)	
					_, (,	
achelor's	with 1 mai	or Nanostructure Technology		generated 19-Apr-2025 • exa		page 30 / 156



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

Module	e title				Abbreviation	
Materia	al Scier	ice 2 (The Material Gro	oups)		08-FU-MaWi2-152-r	n01
Module	e coord	inator		Module offered by	<u> </u>	
			nology of Material Syn-		echnology of Materi	al Synthesis
thesis					echnology of Materia	
ECTS		od of grading	Only after succ. com	pl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
and pro loys. Co	operties eramics	; thermo-mechanical t : oxidic and non-oxidic	in material groups. Met reatment; Martensitic t c structural ceramics; e noplasts, duromers, ela	ransitions; ductility lectric and magnetic	and strength; form n properties of function	nemory al-
Intend	ed learı	ning outcomes				
		e developed a knowledg nowledge to research	ge of the fabrication an problems.	d properties of the n	nain material groups	and are able
Course	<b>s</b> (type	, number of weekly con	itact hours, language –	- if other than Germa	n)	
V (3) +	Ü (1)					
Metho	d of ass		language — if other tha can be chosen to earn		tion offered — if not	every seme-
	ige of a	n (approx. 30 minutes) ssessment: German an <b>Jlaces</b>				
Additio	nal inf	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	9				
		IDOL (avamination to				
Referre			gulations for teaching-o	iegree programmes)		
Module	e appea	irs in				
Bachel	or's de	gree (1 major) Nanostru	ucture Technology (201	5)		
Bachel	or's de	gree (1 major) Function	al Materials (2015)			
	-	ee (1 major) Chemistry				
			n MINT Teacher Educat			016)
			Education PLUS, Elite I	Network Bavaria (EN	B) (2016)	
	-	ee (1 major) Chemistry				,
			n MINT Teacher Educat			020)
		•	Education PLUS, Elite I Icture Technology (202		B) (2020)	
) a challent		or Nanostructure Technology	IAALI VA79	generated 19-Apr-2025 • exa	m rog da	page 32 / 156

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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)

Module title				Abbreviation		
Molecu	ular Ma	terials (Lecture)			08-FU-MoMaV-152-	mo1
Module coordinator				Module offered by	<u> </u>	
		mme coordinator Funk	tionswerkstoffe (Func-	· · · · ·	echnology of Materi	al Synthesis
-	Matrieri				echnology of Materia	at Synthesis
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	ester	undergraduate				
Conten	nts					
	cal bon thin filr		actions, supramolecula	r chemistry, molecu	lar materials, colloid	s, nanopar-
Intend	ed lear	ning outcomes				
cal pro teractio themse feedba	perties ons and elves w ack.	of materials and their I how they determine the ith a topic in the field,	tanding of the relations structure. They know th he properties of molect deliver a presentation o	e significance of var ular materials. They h on that topic, discuss	ious inter and intran have learned how to s it as well as to give	nolecular in- familiarise
Course	<b>es</b> (type	, number of weekly cor	itact hours, language –	- if other than Germa	n)	
V (3) +	S (1)					
ster, in	Iformati	ion on whether module	language — if other the can be chosen to earn	a bonus)		
tes) or 20 pag	c) oral ges) or e	examination in groups	o 180 minutes) or b) or of up to 3 candidates ( 30 minutes)] as well a nd/or English	approx. 15 minutes p	oer candidate) or d) l	og (approx.
Allocat	tion of <sub>l</sub>	olaces				
Additio	onal inf	ormation				
Worklo	bad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	legree programmes)		
Module	e appea	ars in				
			ucture Technology (201	5)		
		gree (1 major) Function	•, •			
1		ee (1 major) Chemistry	-			
	-		n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (20	016)
Supple	ementa	ry course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	r's degr	ee (1 major) Chemistry	(2018)			
			n MINT Teacher Educat			020)
		•	Education PLUS, Elite		B) (2020)	
			ucture Technology (202	o)		
Bachel	lor's de	gree (1 major) Quantun	1 Iechnology (2021)			
Bachelor's (2020)	with 1 ma	jor Nanostructure Technology		generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte		page 34 / 156



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					Abbreviation	
Chemic	ally an	d bio-inspired Nanote	chnology for Material S	Synthesis	08-FU-NT-152-mc	01
Module	coord	inator		Module offer	red by	
		mme coordinator Funk	tionsworkstoffo (Func-	1	nical Technology of Mate	orial Synthosis
tional N	Aatrieri	als)				
ECTS		od of grading	Only after succ. con	n <mark>pl. of modul</mark> e	e(s)	
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
ted mat	terials.				terisation and application of biomaterials, introduc	
Intende	ed learr	ning outcomes				
Studen	ts have	e developed a sound kr	nowledge of sol-gel che	mistry and bi	omineralisation.	
		·	tact hours, language –			
V (4)						
Method			language — if other the can be chosen to earn		amination offered — if n	ot every seme
c) oral e d) log (a e) prese	examin approx entatio				er candidate) or	
Allocat	ion of p	olaces				
Additio	nal info	ormation				
Worklo	ad					
150 h						
Teachir	ig cycl	e				
Referre	d to in	LPOI (examination re	gulations for teaching-	degree progra	mmes)	
Module	e appea	irs in				
			cture Technology (201	5)		
Bachel	or's deg	gree (1 major) Function	al Materials (2015)			
	-	ee (1 major) Chemistry				
					e Network Bavaria (ENB)	(2016)
		•	Education PLUS, Elite	Network Bava	ria (ENB) (2016)	
	-	ee (1 major) Chemistry				< >
					e Network Bavaria (ENB)	(2020)
		•	Education PLUS, Elite		ria (ENB) (2020)	
Jun ahal.		gree (1 major) Nanostru	cture Technology (202	0)		
	ا - اسم					
Bachelo		gree (1 major) Quantun				
Bachelo		gree (1 major) Quantun ee (1 major) Chemistry				



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)

Modul	e title				Abbreviation
Chemi	cal Nan	otechnology: Analytics a	and Applications		08-FU-NT-AA-152-m01
Modul	e coord	inator		Module offered by	
degree programme coordinator Funktionswerkstoffe (Func- tional Matrierials)			onswerkstoffe (Func-	Chair of Chemical 1	Fechnology of Material Synthesis
ECTS Method of grading Only after succ. compl. of module(s)					
5	nume	rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conte	nts				
					echnology. Thermoanalysis, industry and technology.
Intend	led lear	ning outcomes			
Stude	nts hav	e developed an advanced	knowledge of the ch	aracterisation and a	application of nanomaterials.
Course	es (type	, number of weekly conta	act hours, language –	- if other than Germa	an)
V (4)		· · · · ·			
a) writ b) oral c) oral d) log e) pres Langu Alloca	ten exa examir (approx sentatic age of a <b>tion of</b>		80 minutes) or ach (20 to 30 minute 3 candidates (approx	s) or	didate) or
Additi	onal inf	ormation			
Workl	oad				
150 h					
	ing cycl	e			
Referr	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	)
Modul	e appea	ars in			
Maste Bache Bache Maste	r's degr lor's de lor's de r's degr	gree (1 major) Nanostruct ee (1 major) Functional M gree (1 major) Nanostruct gree (1 major) Quantum T ee (1 major) Functional M ee (1 major) Functional M	laterials (2016) ture Technology (202 Fechnology (2021) laterials (2022)	-	

Module	title			Abbreviation		
Organic	Chemistry for students of m	edicine, biomedicine, c	lental medicine and	08-0C-NF-152-m01		
natural	sciences					
Module	coordinator		Module offered by			
lecturer	of lecture "Organische Chem	ie für Studierende der	Institute of Organic	Chemistry		
	, Biomedizin, Zahnmedizin, I		institute of organic	chemistry		
wissens						
ECTS	Method of grading	Only after succ. com	pl. of module(s)			
	numerical grade		• • • •			
Duration	n Module level	Other prerequisites				
	1 semester undergraduate					
Contents						
This mo	dule provides students with a	an overview of the theo	retical principles of	organic chemistry.		
Intende	d learning outcomes					
Student	s have become familiar with	the fundamental princi	ples of organic chem	istry.		
Courses	(type, number of weekly con	tact hours, language –	if other than Germa	n)		
V (2)						
	of according to the second	languago if other the	an Corman ovamina	tion offered if not	01/01/ 5020	
	of assessment (type, scope, ormation on whether module			uon onereu — II not	every seme-	
	examination (approx. 60 min ge of assessment: German an					
Allocatio	on of places					
Addition	nal information					
Workloa	ad					
90 h						
Teaching	a cuclo					
Teaching	g cycle					
		_				
Referred	d to in LPO I (examination reg	gulations for teaching-o	legree programmes)			
Module	appears in					
	r's degree (1 major) Psycholo	gy (2010)				
	r's degree (1 major, 1 minor)					
	r's degree (1 major, 1 minor)		dies (2013)			
Bachelo	r's degree (1 major, 1 minor)	Russian Language and	Culture (2008)			
Bachelo	r's degree (2 majors) Special	Education (2009)				
Magiste	r Theologiae Catholic Theolog	gy (2013)				
First stat	te examination for the teachi	ng degree Grundschule	English (2009)			
	te examination for the teachi					
First state examination for the teaching degree Grundschule Chemistry (2009)						
First state examination for the teaching degree Grundschule Geography (2009)						
First state examination for the teaching degree Grundschule Protestant Theology (2009)						
First state examination for the teaching degree Grundschule German (2009)						
	First state examination for the teaching degree Grundschule History (2009)					
	te examination for the teachi		• -	<b>、</b>		
	te examination for the teachi			-		
FIRST STAT	te examination for the teachi		e Mathematics (2009 generated 19-Apr-2025 • exa			
	ith 1 major Nanostructure Technology		generated 10-Apr-2026 • Ava	m reg da-	page 39 / 156	

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

### UNIVERSITÄT WÜRZBURG

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) 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) Bachelor's with 1 major Nanostructure Technology IMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 40 / 156 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

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 degree (2 majors) Political and Social Studies (2015) Bachelor's degree (2 majors) Russian Language and Culture (2015) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 41 / 156 (2020) ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020

(2020)

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) First state examination for the teaching degree Gymnasium Catholic Theology (2015) First state examination for the teaching degree Gymnasium Latin Philology (2015) Bachelor's with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 42 / 156

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

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) 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)

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 43 / 156
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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 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)

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)

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 44 / 156
(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	

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)) 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))

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 45 / 156
(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	

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))

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 46 / 156
(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	

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 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)

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 47 / 156
(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	

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 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 with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 48 / 156 ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020 (2020)

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

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) 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 with 1 major Nanostructure Technology JMU Würzburg • generated 19-Apr-2025 • exam. reg. dapage 49 / 156 ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020 (2020)



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) 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)

Modul	Module title Abbreviation					
Nanos	cale Ma	iterials			08-PCM3-152-m01	
Modul	e coord	inator		Module offered by		
		seminar "Nanoskalige N	laterialien"		l and Theoretical Chemistry	
ECTS				npl. of module(s)		
5 numerical grade						
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Contents						
		liscusses advanced topic naracterisation methods			e structure, properties, fabricati- rials.	
Intend	ed lear	ning outcomes				
		able to characterise nano noscale materials.	scale materials. They	/ are able to name ar	nalytical methods and applicati-	
Course	<b>es</b> (type	, number of weekly conta	ict hours, language –	- if other than Germa	in)	
S (2) +	Ü (1)					
		sessment (type, scope, la ion on whether module ca			tion offered — if not every seme-	
(appro Langua	x. 30 m	inutes) ssessment: German and		on of one candidate	each (approx. 20 minutes) or talk	
Alloca	tion of <sub>l</sub>	olaces				
Additi	onal inf	ormation				
			,			
Workle	oad		-			
150 h						
Teachi	ing cycl	e				
Referre	<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Modul	e appea	ars in				
Bache	Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Nanostructure Technology (2020)					

Module title					Abbreviation		
Compu	Itationa	l Mathematics			10-M-COM-152-m01		
Modul	e coord	inator		Module offered by			
			atian)	Institute of Mathematics			
		es Mathematik (Mathema	<u>í í í í í í í í í í í í í í í í í í í </u>		latics		
ECTS	·	od of grading successfully completed	Only after succ. con	ipl. of module(s)			
4	<u> </u>	, ,					
Duration	-	Module level undergraduate	Other prerequisites				
Conter		undergraduate	<u> </u>				
Introdu	uction to	o modern mathematical s utation (e. g. Matlab) to s					
and 10	-M-LNA	-G). Computer-based sol egral calculus; visualisat	ution of problems in				
Intend	Intended learning outcomes						
The student learns the use of advanced modern mathematical software packages, and is able to assess their fields of application to solve mathematical problems.							
<b>Courses</b> (type, number of weekly contact hours, language — if other than German)							
V (1) + Ü (2)							
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)						every seme-	
		form of programming exe ssessment: German and		25 hours)			
-	-	ffered: Once a year, wint	-				
Alloca	tion of p	olaces					
Additio	onal inf	ormation					
Worklo	oad						
120 h							
Teachi	ng cycl	e					
Referre	ed to in	LPOI (examination regu	lations for teaching-	legree programmes)			
§ 22	Nr. 3 f)						
_	e appea	ars in					
		gree (1 major) Mathemat	ics (2015)				
		gree (1 major) Physics (2)	-				
		gree (1 major) Nanostruc		5)			
		gree (1 major) Economatl	•, •	,			
		gree (1 major) Mathemat					
Bachelor's degree (1 major) Computational Mathematics (2015)							
Bachelor's degree (1 major) Functional Materials (2015)							
First state examination for the teaching degree Gymnasium Mathematics (2015)							
Bachelor's degree (1 major) Mathematical Physics (2016)							
Bachelor's degree (1 major) Economathematics (2017)							
First state examination for the teaching degree Gymnasium Mathematics (2019)							
		gree (1 major) Physics (2					
		gree (1 major) Nanostruc		o)			
Bachelor's (2020)	s with 1 maj	or Nanostructure Technology	-	generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturtee	-	page 52 / 156	

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 (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) Mathematics (2023) Bachelor's degree (1 major) Economathematics (2023) Bachelor's degree (1 major) Economathematics (2024) Bachelor's degree (1 major) Functional Materials (2025) Bachelor's degree (1 major) Economathematics (2025)

Module title Abbreviation						
Numer	ical Mathematics 1 for student	s of other subjects		10-M-NUM1af-152-n	n01	
Module	e coordinator		Module offered by			
	of Studies Mathematik (Mathem	natice)	Institute of Mathem			
	· · · · · · · · · · · · · · · · · · ·	-		Idlics		
<b>ECTS</b> 10	Method of grading numerical grade	Only after succ. con	ipt. of module(s)			
-						
Duratio		Other prerequisites				
1 seme						
Conten						
	on of systems of linear equation terpolation with polynomials,				s of equati-	
Intended learning outcomes						
The stu	udent is acquainted with the fu	ndamental concepts a	nd methods in nume	erical mathematics,	applies them	
to prac	tical problems and knows abo	ut their typical fields o	f application.			
Course	s (type, number of weekly con	tact hours, language –	- if other than Germa	in)		
V (4) +	Ü (2)					
	d of assessment (type, scope,	language — if other th	an German, examina	tion offered — if not	everv seme-	
	formation on whether module					
a) writt	en examination (approx. 90 to	180 minutes, usually	chosen) or			
	examination of one candidate					
	examination in groups (groups		per candidate)			
	age of assessment: German an	d/or English				
	ble for bonus	_				
Allocat	ion of places					
Additio	onal information					
Worklo	ad					
300 h						
Teachi	ng cycle					
Roforro	ed to in LPO I (examination reg	ulations for teaching.	legree programmes)			
Kelent						
 Marit (	!					
	e appears in					
	or's degree (1 major) Compute					
	or's degree (1 major) Physics (2	-	-)			
	or's degree (1 major) Nanostru or's degree (1 major) Aerospac					
	or's degree (1 major) Functiona	•	.015)			
	or's degree (1 major) Aerospac		2017)			
Bachelor's degree (1 major) Computer Science (2017)						
Bachelor's degree (1 major) Computer Science (2019)						
Bachelor's degree (1 major) Physics (2020)						
Bachelor's degree (1 major) Nanostructure Technology (2020)						
Bachelor's degree (1 major) Aerospace Computer Science (2020)						
	or's degree (1 major) Functiona					
Bachel	or's degree (1 major) Compute	r Science und Sustaina	ability (2021)			
Bachelor's	with 1 major Nanostructure Technology		generated 19-Apr-2025 • exa		page 54 / 156	
2020)		ta record Bachel	or (180 ECTS) Nanostrukturte	chnik - 2020		

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)

Module	e title				Abbreviation	
Numeri	ical Ma	thematics 2 for stude	ents of other subjects		10-M-NUM2af-152-m01	
Module	e coord	inator		Module offered	d by	
		es Mathematik (Math	ematics)	Institute of Mathematics		
ECTS	1	od of grading	Only after succ. con			
10		rical grade			9	
Duratio	I	Module level	Othor proroquisitos			
1 seme		undergraduate	Other prerequisites			
Conten		undergraduate				
		1.1 1.	·		c 1: 1:cc /· 1 /·	
bounda	ary valu	ie problems.	imming, methods for initi	al value problei	ms for ordinary differential equation	
Intend	ed lear	ning outcomes				
about t	heir ac		ions concerning the poss		numerical mathematics and knows ication in different fields of natural	
Course	<b>s</b> (type	, number of weekly c	ontact hours, language –	- if other than G	erman)	
V (4) +	Ü (2)					
Metho	d of as	sessment (type, scop	e, language — if other tha	an German, exa	mination offered — if not every seme	
ster, in	format	ion on whether modu	le can be chosen to earn	a bonus)		
credita	ble for					
Additio	nal inf	ormation				
Worklo	ad					
300 h	au					
Teachi	ng cycl	Δ				
reaction	is cyci	с				
 Doform-	d to in	IDO L (oversingtion	regulations for tooching		mac	
Referre			regulations for teaching-o	regree program	11103)	
 Madul		are in				
Module			s (2015)			
		gree (1 major) Physic		-)		
			tructure Technology (2019 bace Computer Science (2	-		
			-	.015)		
Bachelor's degree (1 major) Functional Materials (2015) Bachelor's degree (1 major) Agrospace Computer Science (2017)						
	Bachelor's degree (1 major) Aerospace Computer Science (2017) Bachelor's degree (1 major) Physics (2020)					
			s (2020) tructure Technology (202	O)		
			ace Computer Science (2			
		gree (1 major) Aerosp gree (1 major) Functio		.020)		
			um Technology (2021)			
			onal Materials (2025)			
		area (± major) i unclit	//////////////////////////////////////			

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 by	
Dean o	f Studi	es Mathematik (Mathema	atics)	Institute of Mather	natics
ECTS	Î	od of grading	Only after succ. com	npl. of module(s)	
8 numerical grade					
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Contents					
		on numbers and functio aces, simple differential e		eries, differential ar	nd integral calculus in one varia-
Intende	ed lear	ning outcomes			
ple pro	blems		g sciences, in particu		ns to apply these methods to sim- physics and nanostructure techno-
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	- if other than Germa	an)
V (5) + Module	• •	t in: Ü: German or Englisł	1		
		s <b>essment</b> (type, scope, la on on whether module ca			ation offered — if not every seme-
b) oral c) oral	examir examin Ige of a	nination (approx. 90 to 1 ation of one candidate e ation in groups (groups c ssessment: German and, bonus	ach (approx. 20 minu of 2, 15 minutes per c	ites) or	
Allocat	ion of p	olaces			
	-				
Additio	nal inf	ormation			
Worklo	ad				
240 h					
Teachi	ng cycl	6			
Referre	<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)				
Module	e appea	irs in			
		gree (1 major) Physics (20	015)		
	Bachelor's degree (1 major) Nanostructure Technology (2015)				
		gree (1 major) Physics (20			
Bachel	or's de	gree (1 major) Nanostruct	ure Technology (202	o)	

Module	e title				Abbreviation	
Mathematics 2 for Students of Physics and Nanostructure					10-M-PHY2-152-m01	
Module coordinator				Module offered by	·	
Dean o	f Studi	es Mathematik (Mathema	atics)	Institute of Mathem	natics	
ECTS	Methe	od of grading	Only after succ. com	pl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
		nd systems of linear equ variables, differential equ			y, differential and integral calcu-	
Intende	ed lear	ning outcomes				
se met	hods to		Iral and engineering		tics. He/She learns to apply the- ar in the field of physics and na-	
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	if other than Germa	in)	
V (5) + Module	• •	t in: Ü: German or Englisł	1			
		<b>sessment</b> (type, scope, la ion on whether module ca			tion offered — if not every seme-	
b) oral c) oral	examir examin Ige of a	mination (approx. 90 to 1 nation of one candidate e nation in groups (groups o ssessment: German and, bonus	ach (approx. 20 minu of 2, 15 minutes per c	ites) or		
Allocat	ion of <sub>l</sub>	olaces				
Additio	onal inf	ormation				
Worklo	ad					
240 h						
Teachi	ng cycl	e				
Referre	<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module	e appea	ars in				
		gree (1 major) Physics (20	015)			
		gree (1 major) Nanostruct	-	5)		
		• • • •	•, •			
	achelor's degree (1 major) Physics (2020) achelor's degree (1 major) Nanostructure Technology (2020)					

Progra	e title			Abbreviation	
-	mming course for students of M	Mathematics and othe	r subjects	10-M-PRG-152-m01	
Module	- coordinator		Module offered by		
Module coordinator		- +:)			
Dean of Studies Mathematik (Mathematics)       Institute of Mathematics         ECTS       Method of grading       Only after succ. compl. of module(s)			natics		
ECTS	Method of grading (not) successfully completed	Only after succ. con	ipi. of module(s)		
3					
Duratio		Other prerequisites			
1 seme					
Conten	its				
Basics	of a modern programming lang	uage (e.g.C).			
Intend	ed learning outcomes				
The stu	Ident is able to work independe	ently on small program	nming exercises and	l standard programm	ing problems
in math	nematics.			, -	
Course	s (type, number of weekly cont	act hours, language –	if other than Germ	an)	
P (2)					
	<b>d of assessment</b> (type, scope, l	 anguage — if other th	an German, examin	ation offered — if not	everv seme-
	formation on whether module of				every serife
-	in the form of programming ex		•		
	age of assessment: German and		25110013)		
-	ment offered: Once a year, sum				
Allocat	tion of places				
	<b>*</b>				
Additio	onal information	_			
Additio		_			
Worklo	bad				
90 h		_			
Teachi	ng cycle				
 Referre	ed to in LPO I (examination reg	ulations for teaching-o	legree programmes	)	
	ed to in LPO I (examination reg	ulations for teaching-o	legree programmes	)	
§ 22	Nr. 3 f)	ulations for teaching-o	legree programmes	)	
§ 22    Module	Nr. 3 f) e appears in		legree programmes	)	
§ 22    <b>Module</b> Bachel	Nr. 3 f) <b>e appears in</b> or's degree (1 major) Mathemat	tics (2015)	legree programmes	)	
§ 22 II <b>Module</b> Bachel Bachel	Nr. 3 f) <b>e appears in</b> or's degree (1 major) Mathemat or's degree (1 major) Physics (2	tics (2015) 2015)		)	
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Module title			Abbreviation				
Imagin	Imaging Sensors in Infrared 11-ASI-152-m01						
Module coordinator				Module offered by			
Manag	Aanaging Director of the Institute of Applied Physics		Applied Physics	Faculty of Physics a	and Astronomy		
ECTS	<u> </u>	od of grading	Only after succ. cor	npl. of module(s)			
3	·	rical grade					
Duratio		Module level	Other prerequisites	5			
1 seme		undergraduate					
Conten					-		
range o up to n from bo sical o types o of neur	of infrar nicrowa odies w ptics of of sensc rophysi	ras are important expended ranges from the vision ves and radiowaves with ambient temperature this spectral range and the spectral range	ble spectrum, where th th artificial emitters. Th re in the infrared spect I discusses: Peculiariti	he Sun is dominating here is distinct and s trum. The lecture pro les of infrared camer	as the natural sour ometimes dominatin vides an introduction as and thermal imag	ce of light, ng emission n to the phy- ges, different	
		ning outcomes					
		nave specific and adva and detector structures			ctral imaging. They k	now various	
Course	<b>s</b> (type	, number of weekly con	tact hours, language -	– if other than Germa	ın)		
V (2) Module	e taugh	t in: German or English					
		essment (type, scope,	language — if other th	an German, examina	ition offered — if not	every seme-	
		on on whether module				,	
b) oral c) oral d) proju- e) pres If a wri- stead t of asse nation Langua Assess	examin examin ect repo entatio tten exa cake the essmen date at age of a sment o	nination (approx. 90 to ation of one candidate ation in groups (groups 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 an ffered: Once a year, su	each (approx. 30 min s of 2, approx. 30 minues) or utes). as method of assessm nation of one candidat er must inform studen d/or English	ites per candidate) o ent, this may be cha e each or an oral exa	nged and assessme mination in groups.	If the method	
Allocat	tion of p	olaces					
Additio	onal info	ormation	_				
Worklo	ad						
90 h							
Teaching cycle							
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)			
	e appea						
		gree (1 major) Physics ( gree (1 major) Nanostru	-	5)			
Bachelor's (2020)	with 1 maj	or Nanostructure Technology	-	• generated 19-Apr-2025 • ex lor (180 ECTS) Nanostrukturte	-	page 61 / 156	

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
Bachelor Thesis Nanostructure Technology			ology		11-BA-N-152-m01
Module coordinator				Module offered by	
chairp	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS		od of grading	Only after succ. con	npl. of module(s)	
10	nume	rical grade			
Durati	on	Module level	Other prerequisites	i i i i i i i i i i i i i i i i i i i	
1 sem	ester	undergraduate			
Conte	nts				
					ask in the field of nanostructure rriting of the Bachelor's thesis.
Intend	led lear	ning outcomes			
struct	ure tech		ce of a supervisor, es	pecially in accordan	d engineering task from nano- ce with known methods and
Cours	<b>es</b> (type	, number of weekly conta	act hours, language –	- if other than Germa	an)
No co	urses as	signed to module			
		sessment (type, scope, la ion on whether module c			tion offered — if not every seme-
		esis (approx. 25 pages) ssessment: German or E	nglish		
Alloca	tion of <sub>l</sub>	olaces			
Additi	onal inf	ormation			
Time t	o comp	ete: 12 weeks.			
Workl	-				
300 h					
-	ing cycl	e			
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module appears in					
Bachelor's degree (1 major) Nanostructure Technology (2015) Bachelor's degree (1 major) Nanostructure Technology (2020)					

Module title			Abbreviation			
Imaging Methods at the Synchroton		11-BMS-152-m01				
Module coordinator		Module offered by				
Managing Director of the Institute of Applied PhysicsFaculty of Physics and Astronomy						
ECTS Method of grading	Only after succ. compl. of module(s)					
6 numerical grade						
Duration Module level	Other prerequisites					
1 semester undergraduate						
Contents						
Periodic and aperiodic signals. Fundar and image processing. Discretisation of the convolution product. Tapering fund energetic aspects. Statistical signals, transform.	of signals / sampling ctions and interpolation	theorem (Shannon). on of images. The Pa	Homogeneous and rsival theorem, corre	linear filter, elation and		
Intended learning outcomes						
The students know the principles of di applications of different image proces				ctioning and		
Courses (type, number of weekly conta	act hours, language –	- if other than Germa	n)			
V (3) + R (1) Module taught in: German or English						
Method of assessment (type, scope, la ster, information on whether module c			tion offered — if not	every seme-		
a) written examination (approx. 90 to a b) oral examination of one candidate of c) oral examination in groups (groups d) project report (approx. 8 to 10 page e) presentation/talk (approx. 30 minut If a written examination was chosen as stead take the form of an oral examinat of assessment is changed, the lecture nation date at the latest. Language of assessment: German and Assessment offered: Once a year, sum	each (approx. 30 minu of 2, approx. 30 minu s) or tes). s method of assessme ation of one candidate r 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		
Allocation of places						
Additional information						
Workload						
180 h						
Teaching cycle						
Referred to in LPO I (examination regu	lations for teaching-	legree programmes)				
Bachelor's degree (1 major) Physics (2	015)					
Bachelor's degree (1 major) Nanostruc		5)				
Master's degree (1 major) Functional M Bachelor's degree (1 major) Physics (2						
Bachelor's with 1 major Nanostructure Technology (2020)	-	generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturted	-	page 64 / 156		

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		
Coating Technologies based on Vapour Deposition			our Deposition		11-BVG-202-mc	01
Module coordinator			Module offered by			
Managing Director of the Institute of Applied Physics		Faculty of Physic	s and Astronomy			
				ompl. of module(s)	,	
5	numerical g			•		
Duratio	n Mod	lule level	Other prerequisit	es		
1 semes	ster und	ergraduate				
Conten	ts					
			and CVD systems ar		deposition and lay	er characterizati-
Intende	ed learning o	outcomes				
		depth knowledge nce and diversity.	in the field of gas-p	hase deposition pro	cesses and gains ir	nsights into their
Courses	<b>s</b> (type, num	ber of weekly con	tact hours, language	e — if other than Gei	man)	
V (3) + I	R (1)	German or English	, 0, 0		,	
Method	d of assessn	nent (type, scope,	language — if other can be chosen to ea		ination offered — if	f not every seme-
c) oral e d) proje e) prese	examination ect report (a entation/tal	i in groups (groups pprox. 8 to 10 page k (approx. 30 minu	utes).	nutes per candidate		
c) oral e d) proje e) prese If a writ stead ta of asses nation o Langua Assessi	examination ect report (a entation/tal tten examina ake the form ssment is ch date at the l ge of assess	in groups (groups pprox. 8 to 10 page k (approx. 30 minu ation was chosen a of an oral examin nanged, the lecture atest. sment: German an d: Once a year, sur	each (approx. 30 m s of 2, approx. 30 mi es) or utes). as method of assess ation of one candid er must inform stude d/or English	nutes per candidate ment, this may be c ate each or an oral o	hanged and assess examination in grou	ips. If the method
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c) oral e d) proje e) prese If a writ stead ta of asses nation o Langua Assessi credital Allocati	examination ect report (a entation/tal tten examina ake the form ssment is ch date at the l ge of assess ment offered ble for bonu	in groups (groups pprox. 8 to 10 page k (approx. 30 minu ation was chosen a n of an oral examin hanged, the lecture atest. sment: German an d: Once a year, sur s <b>s</b>	each (approx. 30 m s of 2, approx. 30 mi es) or utes). as method of assess ation of one candid er must inform stude d/or English	nutes per candidate ment, this may be c ate each or an oral o	hanged and assess examination in grou	ips. If the method
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c) oral e d) project e) prese lf a writ stead ta of asses nation of Langua Assess credital Allocati  Morklo 150 h Teachir  Referre Bachelo Bachelo Master' exchan	examination ect report (a entation/tal tten examina ake the form ssment is ch date at the l ge of assess ment offered ble for bonu ion of place mal informa ad ad ad ad ad ad ad ad ad ad ag cycle e appears in or's degree (a ge program	in groups (groups pprox. 8 to 10 page k (approx. 30 minu ation was chosen a n of an oral examin hanged, the lecture atest. sment: German and d: Once a year, sur s s tion I (examination reg (1 major) Physics (2 (1 major) Functional Physics (2023)	each (approx. 30 m s of 2, approx. 30 mi es) or utes). as method of assess nation of one candid er must inform stude d/or English nmer semester 	nutes per candidate sment, this may be c ate each or an oral e ents about this by fo g-degree programm	hanged and assess examination in grou our weeks prior to th	ips. If the method
c) oral e d) proje e) prese If a writ stead ta of asses nation o Langua Assessi credital Allocati  Worklo 150 h Teachir  Referre Bachelo Bachelo Bachelo Master'	examination ect report (a) entation/tal tten examina ake the form ssment is ch date at the l ge of assess ment offered ble for bonu ion of places mal informa ad ad ad ad ad ad ad ad ad ad ad ad ad	in groups (groups pprox. 8 to 10 page k (approx. 30 minu ation was chosen a n of an oral examin hanged, the lecture atest. sment: German an d: Once a year, sur s s tion I (examination reg (1 major) Physics (2 (1 major) Nanostru (1 major) Quantum major) Functional	each (approx. 30 m s of 2, approx. 30 mi es) or utes). as method of assess vation of one candid er must inform stude d/or English nmer semester gulations for teachin 2020) cture Technology (2 Technology (2021) Materials (2022)	nutes per candidate sment, this may be c ate each or an oral e ents about this by fo g-degree programm	hanged and assess examination in grou our weeks prior to the solution es)	ips. If the metho

Module title					Abbreviation	
Current Topics in Nanostructure Technology			ology		11-BXN5-152-m01	
Module coordinator				Module offered by		
chairpe	erson of	f examination committee		Faculty of Physics a	and 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 seme	ster	undergraduate	Approval from exam	ination committee re	equired.	
Conten	ts					
Current or stud	•		Accredited academi	c achievements, e.g	. in case of change of university	
Intende	ed learr	ning outcomes				
nology ledge. 1	or nand They ar		nd the measuring and ject-specific contexts	l evaluation method and know the appli		
V (2) +		,	, , , , , , , , , , , , , , , , , , , ,			
		essment (type, scope, la on on whether module ca			tion offered — if not every seme-	
pages) If a writ stead ta of asse nation	or pres ten exa ake the ssment date at	entation/talk (approx. 30 amination was chosen as form of an oral examina	o minutes). method of assessme tion of one candidate must inform student	ent, this may be chan e 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						
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Additio	nal inf	ormation				
Worklo	ad					
150 h						
Teachir	ng cycl	e				
Referre	d to in	LPOI (examination regu	lations for teaching-c	legree programmes)		
Module	e appea	in and a second s				
		gree (1 major) Nanostruct				
Bachel	or's deg	gree (1 major) Nanostruct	ure Technology (202	0)		

Module title					Abbreviation	
Current Topics in Nanostructure Technology			ology		11-BXN6-152-m01	
Module coordinator				Module offered by		
chairpe	erson o	f examination committee		Faculty of Physics a	and Astronomy	
ECTS		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					
	t topics y abroa		Accredited academi	c achievements, e.g.	. in case of change of university	
Intend	ed lear	ning outcomes				
nology ledge.	or nan They ar		nd the measuring and ject-specific contexts	l evaluation method and know the appli		
V (3) +	R (1)					
		s <b>essment</b> (type, scope, la on on whether module ca			tion offered — if not every seme-	
or oral pages) If a writ stead t of asse nation	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 chan 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			0.1			
Additio	onal inf	ormation				
Worklo	ad					
180 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination regu	lations for teaching-c	legree programmes)		
Module	e appea	irs in				
		gree (1 major) Nanostruct	ure Technology (201	5)		
Bachel	or's de	gree (1 major) Nanostruct	ure Technology (202	o)		

	e title			-	Abbreviation
Current Topics in Semiconductor Electronics			ronics		11-BXN6A-152-m01
Module coordinator				Module offered by	l
chairpe	erson of	examination committee	1	Faculty of Physics a	and Astronomy
ECTS	Metho	d of grading	Only after succ. con	npl. of module(s)	
6	numer	ical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	unknown	Approval by examin	ation committee req	uired.
Conten	ts				
No info	rmatior	n on contents available.	-		
Intend	ed learn	ing outcomes			
No info	rmatior	n on intended learning o	utcomes available.		
Course	<b>s</b> (type,	number of weekly conta	act hours, language –	- if other than Germa	an)
V (3) +	R (1)				
		<b>essment</b> (type, scope, la on on whether module c			ition offered — if not every seme-
sentati If a writ	examin on/talk tten exa	ation in groups (groups ( (approx. 30 minutes). mination was chosen as	of 2, approx. 30 minus method of assessm	ites) or project repor ent, this may be cha	t (approx. 8 to 10 pages) or pre- nged and assessment may in-
sentati If a writ stead t of asse nation	examin on/talk tten exa ake the ssment date at	ation in groups (groups ( (approx. 30 minutes). mination was chosen as form of an oral examina	of 2, approx. 30 minu s method of assessm tion of one candidate must inform student	ites) or project repor ent, this may be cha e each or an oral exa	t (approx. 8 to 10 pages) or pre- nged and assessment may in- mination in groups. If the metho
sentati If a writ stead t of asse nation Langua	examin on/talk tten exa ake the ssment date at	ation in groups (groups ( (approx. 30 minutes). mination was chosen as form of an oral examina is changed, the lecturer the latest. ssessment: German or E	of 2, approx. 30 minu s method of assessm tion of one candidate must inform student	ites) or project repor ent, this may be cha e each or an oral exa	t (approx. 8 to 10 pages) or pre- nged and assessment may in- mination in groups. If the metho
sentati If a writ stead t of asse nation Langua	examin on/talk tten exa ake the ssment date at ge of as	ation in groups (groups ( (approx. 30 minutes). mination was chosen as form of an oral examina is changed, the lecturer the latest. ssessment: German or E	of 2, approx. 30 minu s method of assessm tion of one candidate must inform student	ites) or project repor ent, this may be cha e each or an oral exa	t (approx. 8 to 10 pages) or pre- nged and assessment may in- mination in groups. If the metho
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sentati If a writ stead t of asse nation Langua Allocat  Additio  Worklo 180 h Teachin  Referre  Module	examin on/talk tten exa ake the ssment date at ge of as ion of p onal info ad ad ad ed to in	ation in groups (groups of (approx. 30 minutes). mination was chosen as form of an oral examina is changed, the lecturer the latest. ssessment: German or En laces ormation	of 2, approx. 30 minu s method of assessm tion of one candidate must inform student nglish	ites) or project repor ent, this may be cha e each or an oral exa ts about this by four degree programmes)	t (approx. 8 to 10 pages) or pre- nged and assessment may in- mination in groups. If the metho weeks prior to the original exam
sentati If a writ stead t of asse nation Langua Allocat  Modulto 180 h Teachin  Referre Bachel Bachel Bachel	examin on/talk tten exa ake the ssment date at ge of as <b>ion of p</b> <b>nal info</b> ad ad ad ad ad ad ad ad ad ad ad ad ad	ation in groups (groups of (approx. 30 minutes). mination was chosen as form of an oral examina is changed, the lecturer the latest. ssessment: German or En laces ormation	of 2, approx. 30 minu s method of assessm tion of one candidate must inform student nglish ulations for teaching- ture Technology (201 ture Technology (201	ites) or project repor ent, this may be cha e each or an oral exa ts about this by four degree programmes) 5)	t (approx. 8 to 10 pages) or pre- nged and assessment may in- mination in groups. If the metho weeks prior to the original exam

Module title					Abbreviation
Current Topics in Nanostructure Technology			ology		11-BXN8-152-m01
Module coordinator				Module offered by	
chairpe	erson of	f examination committee		Faculty of Physics a	and Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
8	nume	rical grade			
Duratio		Module level	Other prerequisites		
1 seme	ster	undergraduate	Approval from exam	ination committee re	equired.
Conten	ts				
Current or stud	•		Accredited academi	c achievements, e.g	. in case of change of university
Intende	ed learr	ning outcomes			
nology ledge. 1	or nand They ar		nd the measuring and ject-specific contexts	l evaluation method and know the appli	
V (4) +					
		e <b>ssment</b> (type, scope, la on on whether module ca			ition offered — if not every seme-
pages) If a writ stead ta of asse nation	or pres ten exa ake the ssment date at	entation/talk (approx. 30 amination was chosen as form of an oral examina	o minutes). method of assessme tion of one candidate must inform student	ent, this may be chan 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					
Additio	nal inf	ormation			
Worklo	ad				
240 h	240 h				
Teaching cycle					
Referre	d to in	LPOI (examination regu	lations for teaching-o	legree programmes)	
Module					
		gree (1 major) Nanostruct			
Bachel	or's deg	gree (1 major) Nanostruct	ure Technology (202	0)	

Modul	e title				Abbreviation
Current Topics Physics					11-BXP5-152-m01
Module coordinator				Module offered by	
		f examination committee		Faculty of Physics a	and Astronomy
ECTS	1	od of grading	Only after succ. com		
5	1	rical grade	'	1	
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate	Approval from exam	ination committee r	equired.
Conter	Its				
		of Experimental and The versity or study abroad.	oretical Physics. Acc	redited academic ac	hievements, e.g. in case of
Intend	ed lear	ning outcomes			
Theore subdis	tical Ph cipline	ysics of the Bachelor's p	rogramme of Nanostr nd the measuring and	ucture Technology. I/or calculation metl	of a module of Experimental or They have knowledge of a current hods necessary to acquire this application areas.
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	if other than Germa	an)
V (2) +	R (2)				
		<b>sessment</b> (type, scope, la on on whether module ca			tion offered — if not every seme-
If a wri stead t of asse nation	tten exa ake the ssmen date at	e form of an oral examina	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 methor weeks prior to the original exami
Allocat	ion of p	olaces			
Additio	onal inf	ormation			
Worklo	ad		,		
150 h					
Teachi	ng cycl	e			
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Modul	e appea	urs in			
		gree (1 major) Nanostruct	ure Technology (201	5)	
		gree (1 major) Nanostruct			
		gree (1 major) Quantum T	•, · ·		
Module	e studie	es (Bachelor) Quantum Te	echnology (2021)		

			Abbreviation		
	Topics in Physics			11-BXP6-152-m01	
Module	coordinator		Module offered by		
chairpe	rson of examination committee	1	Faculty of Physics a	nd Astronomy	
ECTS	Method of grading	Only after succ. con	npl. of module(s)		
6	numerical grade				
Duratio	n Module level	Other prerequisites			
1 semes	ster undergraduate	Approval from exam	ination committee re	equired.	
Content	ts				
	topics of Experimental and The of university or study abroad.	oretical Physics. Acc	redited academic acl	hievements, e.g. in case of	
Intende	ed learning outcomes				
Theoret subdisc knowled	cipline of Physics and understand ge. They are able to classify the	rogramme of Nanosti nd the measuring and e subject-specific co	ructure Technology. T I/or calculation meth ntexts and know the	They have knowledge of a current nods necessary to acquire this application areas.	
-	<b>s</b> (type, number of weekly conta	ict hours, language –	- if other than Germa	n)	
V (3) + F	R (1)				
	<b>l of assessment</b> (type, scope, la formation on whether module c			tion offered — if not every seme-	
or oral e pages) o If a writh stead ta of asses nation o Languag Allocati	examination in groups (groups) or presentation/talk (approx. 3) ten examination was chosen as ake the form of an oral examina	of 2, approx. 30 minu o minutes). o 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-	
Workloa	ad				
180 h					
Teachin	ng cycle				
Referre	d to in LPO I (examination regu	lations for teaching-o	degree programmes)		
Module appears in					
Bachelo Bachelo Bachelo Bachelo	or's degree (1 major) Nanostruct or's degree (1 major, 1 minor) Ph or's degree (1 major) Nanostruct or's degree (1 major, 1 minor) Ph or's degree (1 major) Quantum Te e studies (Bachelor) Quantum Te	nysics (Minor, 2015) ture Technology (202 nysics (Minor, 2020) Technology (2021)			

Module title				Abbreviation	
Current	t Topics in Physics				11-BXP8-152-m01
Module	e coordinator			Module offered by	
chairpe	erson of examination co	ommittee		Faculty of Physics a	nd Astronomy
ECTS	Method of grading		Only after succ. com	pl. of module(s)	
8	numerical grade				
Duratio	on Module level		Other prerequisites		
1 semester undergraduate Approval from examination committee required.			equired.		
Conten	ts				
	Current topics of Experimental and Theoretical Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.				
Intende	ed learning outcomes				
Theoret subdise knowle	tical Physics of the Bac	helor's p Inderstar lassify th	rogramme of Nanosti nd the measuring and e subject-specific co	ructure Technology. I/or calculation methet ntexts and know the	
		KIY COIILA	ict nours, language –	- II OLIIEI LIIAII GEIIIIA	11)
V (4) +					
	<b>d of assessment</b> (type, formation on whether n				tion offered — if not every seme-
or oral pages) If a writ stead ta of asse nation Langua	examination in groups or presentation/talk (a ten examination was c ake the form of an oral	(groups o pprox. 30 hosen as examina e lecturer	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 chan 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-
Additio	nal information				
Worklo	ad				
240 h					
Teachi	ng cycle				
Referre	<b>ed to in LPO I</b> (examina	tion regu	lations for teaching-o	degree programmes)	
Module	e appears in				
Bachel Bachel Bachel Bachel	or's degree (1 major) Na or's degree (1 major, 1 n or's degree (1 major) Na or's degree (1 major, 1 n or's degree (1 major) Qu e studies (Bachelor) Qu	minor) Ph anostruct minor) Ph uantum T	nysics (Minor, 2015) cure Technology (202 nysics (Minor, 2020) Fechnology (2021)		

Module	title				Abbreviation
Selecte	d Topi	cs in Energy and Materia	l Science		11-CSEM6-152-m01
Module	coord	inator		Module offered by	
		f examination committee		Faculty of Physics a	nd Astronomy
ECTS					
6		rical grade		1 (7	
Duratio	n	Module level	Other prerequisites		
1 semester undergraduate Approval from examination committee required.			equired.		
Conten	ts				
Selecte	d topic	s of energy and material	s research.		
Intende	ed leari	ning outcomes			
tion me	ethods				tand the measuring and evalua- subject-specific contexts and
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	· if other than Germa	n)
V (3) +	R (1)				
		e <b>ssment</b> (type, scope, la on on whether module ca			tion offered — if not every seme-
If a writ stead ta of asse nation	ten exa ake the ssmen date at	form of an oral examina	method of assessme tion of one candidate must inform student	e 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	ıg cycl	e			
			-		
Referre	d to in	LPOI (examination regu	lations for teaching-o	legree programmes)	
Module	e appea	irs in			
		gree (1 major) Nanostruct	ure Technology (201	5)	
		gree (1 major) Nanostruct		o)	
		gree (1 major) Quantum T			
Module	e studie	es (Bachelor) Quantum Te	echnology (2021)		

Module	e title				Abbreviation
Selecte	ed Topi	cs in Solid State Physics	;		11-CSF6-152-m01
Module	coord	instor		Module offered by	
				•	
chairperson of examination committee ECTS Method of grading 0		r	Faculty of Physics a	ind Astronomy	
<b>ECTS</b> 6		rical grade	Only after succ. com		
Duratio	I	Module level	Other prevenuisites		
1 semes		undergraduate	Other prerequisites Approval from exam		aquired
Conten				mation committee n	equired.
		cs of Solid-State Physics.			
		ning outcomes			
and eva	aluatio				nd understand the measuring classify the subject-specific con-
Courses	<b>s</b> (type	, number of weekly conta	act hours, language —	if other than Germa	n)
V (3) + I	R (1)				
		sessment (type, scope, la ion on whether module c			tion offered — if not every seme-
of asse nation o	ssmen date at		r must inform student		mination in groups. If the method weeks prior to the original exami-
Allocati	ion of <sub>l</sub>	places			
Additio	nal inf	ormation			
			-		
Worklo	ad				
180 h					
Teachir		Δ			
Teachir	ng cycl	e			
			lations for teaching-c	legree programmes)	
		e LPOI (examination regu	llations for teaching-c	legree programmes)	
 Referre 	d to in	LPOI (examination regu	llations for teaching-c	legree programmes)	
 Referre  Module	ed to in e appea	LPOI (examination regu		legree programmes)	
 Referre  Module Bachelo	ed to in e appea or's de	LPOI (examination regu ars in gree (1 major) Physics (2	015)		
 Referre  Module Bachelo Bachelo	ed to in e appea or's de or's de	<b>LPO I</b> (examination regunars in gree (1 major) Physics (2) gree (1 major) Nanostruc	015) ture Technology (201 <u>9</u>		
 Referre  Bachelo Bachelo Module	ed to in e appea or's de or's de e studio	LPOI (examination regu ars in gree (1 major) Physics (2	015) ture Technology (2015 19)		
 Referre  Bachelo Bachelo Module Bachelo	e appea or's de or's de or's de e studie or's de	LPO I (examination regu ars in gree (1 major) Physics (2 gree (1 major) Nanostruc es (Bachelor) Physics (20	015) ture Technology (201 <u>9</u> 119) 020)	5)	
 Referre Bachelo Bachelo Module Bachelo Bachelo Bachelo	ed to in e appea or's de or's de e studie or's de or's de or's de or's de	LPO I (examination regu ars in gree (1 major) Physics (2 gree (1 major) Nanostruc es (Bachelor) Physics (20 gree (1 major) Physics (20	015) ture Technology (2019 19) 020) ture Technology (2021)	5)	

				Abbreviation				
Selected Top	ics in Nanostructure Tech	nology		11-CSN6-152-m01				
Module coor	dinator		Module offered by					
chairperson of examination committee			Faculty of Physics a	nd Astronomy				
	od of grading	Only after succ. compl. of module(s)						
6 numerical grade								
Duration	Module level	Other prerequisites						
1 semester	undergraduate	Approval from exam	ination committee r	equired.				
Contents								
Selected top	cs of nanostructure techn	ology.						
Intended lea	rning outcomes							
technical me				nnology and of the scientific or y the subject-specific contexts				
Courses (type	e, number of weekly conta	ect hours, language —	· if other than Germa	n)				
V (3) + R (1)								
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a 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 in- stead 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 exami- nation date at the latest. Language of assessment: German and/or English								
	-	-	Allocation of places					
Additional in	formation							
Additional information								
 Workload								
 Workload 180 h								
 Workload								
 Workload 180 h Teaching cyc		lations for teaching-o	legree programmes)					
 Workload 180 h Teaching cyc	le	llations for teaching-c	legree programmes)					
 Workload 180 h Teaching cyc	le 1 LPO I (examination regu	llations for teaching-c	legree programmes)					
 Workload 180 h Teaching cyc  Referred to in  Module appe	le 1 LPO I (examination regu							

Module	title				Abbreviation
Atoms	and Mo	olecules - Exercises			11-E-AA-202-m01
Module	coord	inator		Module offered by	
Managing Director of the Institute of Ap			plied Physics	Faculty of Physics a	and Astronomy
ECTS		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	ts				
ture of a nics of laser, m	atoms, the hyd nolecul	Experimental fundament	al laws of quantum p ternal fields, multi-el	physics, the Schrödi ectron atoms, optica	by 11-E-OAV. Among others Struc- nger equation, quantum mecha- al transitions and spectroscopy,
Studen phenon	ts have nena, a antum	e an understanding of the atomic and molecular phy	sics. they will be abl	e to formulate physi	fundamental laws of quantum cal interrelationships of atomic hematical-physical tasks autono-
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	· if other than Germa	ın)
Ü (2) Module	taugh	t in: German or English			
		sessment (type, scope, la on on whether module ca			tion offered — if not every seme-
		nation (approx. 120 minu ssessment: German and/			
Allocati	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
150 h					
Teachir	ng cvcl	e			
		-			
Referre	d to in	LPOI (examination regu	lations for teaching.	legree programmes)	
	<u>a to m</u>				
Module	annes	urs in			
		gree (1 major) Physics (20	120)		
		gree (1 major) Nanostruct		o)	
		gree (1 major) Quantum T			
exchan	ge prog	gram Physics (2023)			

Principles of Image Processing       11-EBV-152-m01         Module offered by         Module offered by         Module of grading       Only after succ. compl. of module(s)         Duration       Module level         Other prerequisites         Module level         Other prerequisites         Module level         Other prerequisites					
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     numerical grade        Duration     Module level     Other prerequisites					
ECTS       Method of grading       Only after succ. compl. of module(s)         3       numerical grade          Duration       Module level       Other prerequisites					
3     numerical grade        Duration     Module level     Other prerequisites					
Duration Module level Other prerequisites					
Contents					
Introduction to image processing. Pictures as two-dimensional signals; digitalisation. Two-dimensional Fourier transform. Histogram equalisation (e.g. image brightening) and pixel connectivity (e.g. noise reduction). Automa- tic image recognition: Segmentation, classification. Technological image generation. Applications (e.g. motion tracking). Three-dimensional images.					
Intended learning outcomes					
The students have specific and advanced knowledge in the field of image processing. They know the pri and theory of signal processing for images and have corresponding knowledge of image generation. The le to independently work with literature, they understand the characteristics of image processing with co al software and are able to process images for the analysis of experiments with imaging measuring meth <b>Courses</b> (type, number of weekly contact hours, language — if other than German)	ey are ab- commerci-				
V (2) Module taught in: German or English					
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not eve ster, information on whether module can be chosen to earn a bonus)	ery seme-				
<ul> <li>a) written examination (approx. 90 to 120 minutes) or</li> <li>b) oral examination of one candidate each (approx. 30 minutes) or</li> <li>c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or</li> <li>d) project report (approx. 8 to 10 pages) or</li> <li>e) presentation/talk (approx. 30 minutes).</li> <li>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.</li> <li>Language of assessment: German and/or English</li> <li>Assessment offered: Once a year, winter semester</li> </ul>					
Allocation of places					
Additional information					
Workload					
90 h					
Teaching cycle					
<b>Referred to in LPO I</b> (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 with 1 major Nanostructure Technology       JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-       page (2020)         ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020       ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	age 78 / 156				



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

				Abbreviation			
Classical Phy	sics 2 (Heat and Elect	romagnetism)		11-E-E-152-m01			
Module coord	linator		Module offered by				
		Applied Dhysics		and Actronomy			
	ector of the Institute of	í l	Faculty of Physics a	and Astronomy			
	od of grading erical grade	Only after succ. co	mpl. of module(s)				
Duration	Module level			annulation of annual (annual)			
1 semester	undergraduate						
		-	•				
			students about the r	espective details at the beginning			
		of the semester.					
Contents							
Duration         Module level         Other prerequisites           1 semester         undergraduate         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 beginnin of the semester.           Contents							

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 80 / 156
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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 can be chosen to earn a 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)

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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) 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) 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)

Module	Module title				Abbreviation
Introduc	ction to	o Solid State Physics			11-E-F-152-m01
Module	coordi	inator		Module offered by	
Managir	ng Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
8	numer	rical grade			
Duratior	n	Module level	Other prerequisites		
1 semes	ster	undergraduate			
Content	S				
Sommer demann 2. Crysta tice defe tronic pr 3. The re theory: S 4. Struct electron 5. lattice branch; example 6. Therm thermal 7. Electron strongly on	<ol> <li>The free-electron gas (FEG), free electrons; density of states; Pauli principle; Fermi-Dirac statistics; spec. heat, Sommerfeld coefficient; electrons in fields: Drude-Lorentz-Sommerfeld; electrical and thermal conductivity, Wie- demann-Franz law; Hall effect; limitations of the model</li> <li>Crystal structure, periodic lattice; types of lattices; Bravais lattice; Miller indices; simple crystal structures; lat- tice defects; polycrystals; amorphous solids; group theoretical approaches, the importance of symmetry for elec- tronic properties</li> <li>The reciprocal lattice (RG), motivation: Diffraction; Bragg condition; definition; Brillouin zones; diffraction theory: Scattering; Ewald construction; Bragg equation; Laue's equation; structure and form factor</li> <li>Structure determination, probes: X-ray, electron, neutron; methods: Laue, Debye-Scherrer, rotating crystal; electron diffraction, LEED</li> <li>lattice vibrations (phonons), equations of motion; dispersion; group velocity; diatomic base: optical, acoustic branch; quantisation: Phonon momentum; optical properties in the infrared; dielectric function (Lorentz model); examples of dispersion curves (occ. Kramers-Kronig), measurement methods</li> <li>Thermal properties of insulators, Einstein and Debye model; phonon density of states; anharmonicity and thermal expansion; thermal conductivity; Umklapp processes; crystal defects</li> <li>Electrons in a periodic potential, Bloch theorem; band structure; approximation of nearly free electrons (NFE); strongly bound electrons (tight binding, LCAO); examples of band structures, Fermi surfaces, spin-orbit interacti-</li> </ol>				
		ning outcomes			
dynamic ture of s Solid-Sta autonon	cs, the solids a ate Ph nously	rmal properties, principle and know the experiment ysics. They are able to ap apply their knowledge to	es of electronic prope tal methods and theo oply mathematical m o the solution of mat	erties (free electron g pretical models for th ethods to the formul hematical-physical t	
		number of weekly conta	ct hours, language –	- if other than Germa	in)
V (4) + Ü Module	• •	t in: Ü: German or Englisł	1		
		essment (type, scope, la on on whether module ca			tion offered — if not every seme-
		nation (approx. 120 minu ssessment: German and,			
Allocatio	on of p	olaces			
Addition	nal info	ormation			
Workloa	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, 1 minor) 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	nic Circ	uits			11-EL-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	î	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
coils ar	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 f			practical setup of elect	ronic circuits from th	e field of analogous	and digital
Course	<b>s</b> (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
V (3) + Module		t in: German or English				
			language — if other th can be chosen to earn		tion offered — if not	every seme-
e) pres If a writ stead t of asse nation Langua	entatio tten exa ake the ssment date at ge of a	form of an oral examin	utes). as method of assessme nation of one candidate er must inform student nd/or English	e each or an oral exa	mination in groups.	If the method
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
180 h						
Teachi	ng cycle	9				
Referre	d to in	LPOI (examination re-	gulations for teaching-	legree programmes)		
			<u><u>Janacione foi teacining</u> (</u>	<u></u>		
Module	e appea	rs in				
Bachel Bachel Bachel Bachel	Module appears inBachelor'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 degree (1 major, 1 minor) Physics (Minor, 2020)					
Bachelor's		or Nanostructure Technology	JMU Würzburg •	generated 19-Apr-2025 • exa		page 85 / 156
(2020)			ta record Bachel	or (180 ECTS) Nanostrukturteo	chnik - 2020	<u> </u>



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

<b>~</b> 1 ·	e title				Abbreviation
Classic	al Phys	sics 1 (Mechanics)			11-E-M-152-m01
		•			
	e coord			Module offered by	
		ector of the Institute of		Faculty of Physics	and Astronomy
ECTS	<u> </u>	od of grading	Only after succ. co	ompl. of module(s)	
8	nume	rical grade			
Duratio	on	Module level	Other prerequisite	25	
1 seme	ster	undergraduate	Admission prerequ	uisite to assessment:	completion of exercises (approx.
			13 exercise sheets	per semester). Stude	ents who successfully completed
			approx. 50% of ex	ercises will qualify fo	r admission to assessment. The
			lecturer will inform	students about the	respective details at the beginning
			of the semester.		
Conten	its				
		Dhysical quantities n	refectors derived quar	titios dimonsional a	nalusis time / langth / mass (da
			SI), importance of met		nalysis, time / length / mass (de-
					Uniform and constant accelerated
			r motion in polar coord		
					the pendulum, forces on an ato-
mic sca	ale, isot	tropic and anisotropi	c friction. Preparation o	f the equations of mo	otion and solutions;
		nergy: (Kinetic) perfo			
				momentum conserva	ation, surges in centre of mass
		ystem, rocket equati			
				al, potential energy; I	aw, weight scale, field strength
		of gravity (general rel		, torque rotational e	nergy, moment of inertia, analo-
					r), escape velocities, trajectories
-		potential;	sins, saterines (Seostari	onary and interstend	
			erence systems, appare	nt forces, Foucault pe	endulum, Coriolis force, centrifu-
gal for					
					nelson interferometer, Einstein's
	ates, pr	oblem of simultaneit	y, Lorentz transformatio	on, time dilation and	length contraction, relativistic im-
pulse;					
					nd -ellipsoid, principal axes and
		th as a spinning top;		or, physics of the bik	e; gyroscope: Precession and nu-
				rolling friction visco	us friction, laminar flow, eddy for-
mation		alle and dynamic me			
		Representation by m	eans of complex e-func	tion, equation of mot	ion (DGL) on forces, torque and
					ılum, physical pendulum, damped
vibratio	on (reso	onant case, Kriechfall	, aperiodic limit), force	d vibration, Fourier ar	nalysis;
-	•	_	s and eigenfunctions, c	louble pendulum, det	terministic vs. chaotic motion,
		namics and chaos;			
					nciple of superposition, reflection
at the o relatio	•	iu ciosea end, speed	or sound; interference,	, poppier effect; phas	e and group velocity, dispersion
		ormation of solid box	lies: Elastic modulus, g	eneral Hooke's law	alastic wayes.
					gle, capillary forces, steady flows,
					essure, compressibility and com-
	ve modi	-		J	,
•			nd real gas averages d	istribution functions.	equipartition theorem, Brownian
1/. KIII		,	ia ical 545, avelages, a	istribution functions,	equipartition theorem, 21011141

### 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.

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 can be chosen to earn a 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 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

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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

module appears in					
Bachelor's degree (1 major) Physics	(2015)				
Bachelor's degree (1 major) Nanostri	ucture 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 teach	ing degree Grundschule Physics (2015)				
First state examination for the teach	ing degree Realschule Physics (2015)				
First state examination for the teach	ing degree Gymnasium Physics (2015)				
First state examination for the teach	ing degree Mittelschule Physics (2015)				
Bachelor's degree (1 major) Mathem	atical Physics (2016)				
First state examination for the teach	ing degree Grundschule Physics (2018)				
First state examination for the teach	ing degree Realschule Physics (2018)				
First state examination for the teach	ing degree Gymnasium Physics (2018)				
First state examination for the teach	ing degree Mittelschule Physics (2018)				
Bachelor's degree (1 major) Physics	(2020)				
Bachelor's degree (1 major) Nanostr	ucture Technology (2020)				
Bachelor's degree (1 major) Mathem	atical 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 teach	First state examination for the teaching degree Gymnasium Physics (2020)				
First state examination for the teach	ing degree Realschule Physics (2020)				
Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 88 / 156			
(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 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)

Module	e title			Abbreviation
-	les of Energy Technologies			11-ENT-152-m01
Module	e coordinator		Module offered by	
	ing Director of the Institute of A		Faculty of Physics a	nd Astronomy
ECTS	Method of grading	Only after succ. con	pl. of module(s)	
6	numerical grade			
Duratio		Other prerequisites		
1 seme				
as rene ting ma studen verters Electric	al principles of energy conserva ewable resources of energy. We aterials, selective layers, highly ts. Energy conservation via ther	also discuss aspects activated carbons). T mal insulation. Therm ectricity. Wind turbing	of optimising materi he course is especial odynamic energy eff es. Photovoltaics. So	als (e.g. nanostructured insula-
	dents know the principles of di d storage. They understand the			pecially energy conversion, trans- and are able to compare them.
Course	<b>s</b> (type, number of weekly conta	act hours, language —	if other than Germa	n)
V (3) + Module	R (1) e taught in: German or English			
	<b>d of assessment</b> (type, scope, la formation on whether module c			tion offered — if not every seme-
<ul> <li>b) oral</li> <li>c) oral</li> <li>d) projetion</li> <li>e) pression</li> <li>lf a write stead to fassed to fassed nation</li> <li>Languation</li> </ul>		each (approx. 30 minu of 2, approx. 30 minu s) or es) s method of assessme tion of one candidate r must inform student /or English	tes per candidate) or ent, this may be char e each or an oral exar	
	ion of places			
Additio	onal information			
Worklo	ad			
180 h				
Teachi	ng cycle			
Referre	d to in LPO I (examination regu	llations for teaching-o	legree programmes)	
§ 22      § 22      § 22	Nr. 2 f)			
_	e appears in			
	or's degree (1 major) Physics (2	015)		

(2020)

# UNIVERSITÄT WÜRZBURG

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	e title				Abbreviation
Optics	and Wa	aves - Exercises			11-E-OA-152-m01
Madul		lund nu		Madula offered by	
Module				Module offered by	
_		ector of the Institute of A	1	Faculty of Physics a	ind Astronomy
ECTS		od of grading rical grade	Only after succ. cor	npl. of module(s)	
5 Duratio	L	Module level		-	
1 seme		undergraduate	Other prerequisites		
Conten					
tical pa films, i	ath, ligh nterfero	t in matter, polarization	, Geometrical Optics, raction optical grating	Optical instruments g, Fresnel diffraction,	ncepts, Fermat's principle, op- , wave optics, interference, thin holography, wave packets, wave
Intende	ed learı	ning outcomes			
to appl	y math		e formulation of physi		nd quantum optics. They are able onomously apply their knowledge
Course	<b>s</b> (type	, number of weekly cont	act hours, language -	– if other than Germa	ın)
Ü (2) Module	e taugh	t in: Ü: German or Englis	sh		
		essment (type, scope, l on on whether module			tion offered — if not every seme-
written	exami	nation (approx. 120 min	utes)		
		ssessment: German and			
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Additio	onal info	ormation			
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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	
Managi	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
2 seme	ster	undergraduate			
Conten	ts				
A. optic	s 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

 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
 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 can be chosen to earn a 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

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Workload

180 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 (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)

Module	e title				Abbreviation
Fit for I	ndustr	У			11-FFI-202-m01
Module	e coord	linator		Module offered by	l
		ector of the Institute of Ap	oplied Physics	Faculty of Physics	and Astronomy
ECTS	-	od of grading	Only after succ. con		
3		successfully completed			
_ Duratio		Module level	Other prerequisites		
1 seme		undergraduate			
Conten					
Physici duct de	st at w evelopi				the industrial environment. Pro- strategy and management. Lea-
		ning outcomes	-		
			ants for a job in the	inductry and can ma	ake a decision based on their
		bout their own profession		industry and can ma	ike a decision based on their
Course	<b>s</b> (type	, number of weekly conta	act hours, language –	- if other than Germa	an)
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Module	e title				Abbreviation
Solid S	itate Ph	ysics 2			11-FK2B-202-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	its				
a. Elect b. Bloc c. Elect 2. Sem a. Elect b. Ferm c. Elect d. Boltz 3. The c a. Macı b. Pola plasmo c. Ferro 4. Sem a. Char b. Intrir c. Dope d. Phys e. Hete 5. Magı a. Atom b. Dia- c. Ferro 6. Supe a. Pher b. Mod	trical ar h theor crons i-classi trical tra i surfac crical tra crical tra crical tra crical tra croscopi rizabilito ons, into omagne iconduc racterist nsic ser ed semi sics and rostruc netism nic dia- and pa omagne ercondu omena els of s	cal models of dynamic pr ansport in partially and co ces; measurement techni ansport in external magne equations of transport ic function and ferroelect c electrodynamics and m cy of solids, of lattices, of er-band transitions, Wann tism ctors tics niconductors conductors applications of p-n junct tures and paramagnetism ramagnetism in metals tism uctivity	rocesses ompletely filled band ques etic fields trics icroscopic theory valence electrons ar nier-Mott excitons		ns; optical phonons, polaritons,
Intende	ed learr	ning outcomes			
		effects, concepts and mo h applications of experim		lid state physics. Far	niliarity with the theoretical prin-
Course	s (type	number of weekly conta	ct hours, language –	- if other than Germa	n)
V (4) + Module		t in: German or English			
		<b>essment</b> (type, scope, la on on whether module ca			tion offered — if not every seme-
b) oral c) oral d) proje e) pres If a writ	examin examin ect repo entatio tten exa		ach (approx. 30 minu of 2, approx. 30 minu o) or es). method of assessme	tes per candidate) or ent, this may be char	r nged and assessment may in- mination in groups. If the method

Bachelor's with 1 major Nanostructure Technology	JMU Würzburg • generated 19-Apr-2025 • exam. reg. da-	page 97 / 156
(2020)	ta record Bachelor (180 ECTS) Nanostrukturtechnik - 2020	

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)

Bachelor's with 1 major Nanostructure Technology (2020)

Module	e title				Abbreviation
		r Lasers and Photonics			11-HLF-152-m01
Module	e coordi	nator		Module offered by	
Manag	ing Dire	ctor of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy
ECTS		od of grading	Only after succ. com	pl. of module(s)	
6	numer	rical grade			
Duratio	i	Module level	Other prerequisites		
1 seme	I	graduate			
rent de model, hold co riers ar des, las ductor cade la <b>Intendo</b> The stu knowle <b>Course</b> V (3) + Module	cture di velopm which ondition ad photo ser resc lasers, te ed learr idents h idge to s (type, R (1) e taught	ents regarding compone will then be extended to a, characteristic curve and ons. Other topics of the le onators, mode selection, The lecture closes with c erahertz lasers or high-pe <b>hing outcomes</b> have advanced knowledg modern questions and knowledg number of weekly conta	nts. The principles of special aspects of se d laser efficiency are ecture are optical pro dynamic properties a urrent topics of laser formance lasers. e of the principles of now the applications ct hours, language —	lasers are described miconductor lasers. derived from couple ocesses in semicond as well as technology research such as qu semiconductor-lase in the current develo	
ster, in	formati	on on whether module ca	an be chosen to earn		tion onered — It not every senie-
b) oral c) oral d) proje e) pres lf a writ stead t of asse nation Langua Assess	examin examin ect repo entation tten exa ake the essment date at age of a ment of	form of an oral examinate is changed, the lecturer the latest. ssessment: German and/ ffered: Once a year, summ	ach (approx. 30 minu of 2, approx. 30 minu of or es). method of assessme tion of one candidate must inform student /or English	tes per candidate) or ent, this may be char e each or an oral exar	r nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
Allocat	ion of p	laces			
Additio	onal info	ormation			
Worklo	ad				
180 h					
Teachi	ng cycle	9			
Referre	ed to in	LPOI (examination regu	lations for teaching-o	legree programmes)	
 Modul		rc in			
	e appea	rs m gree (1 major) Physics (20	215)		
Dacinel	UI S UP	sice (I major) Frigsics (20	<u>)</u> /		I

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	
Fundan	nentals	of Semiconductor Phys	ics		11-HLP-152-m01	
Module	e coord	inator		Module offered by		
		ector of the Institute of A		Faculty of Physics a	nd Astronomy	
ECTS		od of grading	Only after succ. con	npl. of module(s)		
6	L	rical grade				
Duratio		Module level	Other prerequisites			
1 seme		undergraduate	]			
2. Cryst 3. Optio 4. Elect 5. Temp	metry p tal form cal exci tron-pho perature	roperties ation and electronic ba tations and their coupli onon coupling e-dependent transport p netic semiconductors	ng effects			
-		ning outcomes	_			
The stu	dents a	are familiar with the prin d know their physical p				re of semi-
Course	<b>s</b> (type,	number of weekly cont	act hours, language –	- if other than Germa	n)	
V (3) + Module		t in: German or English				
ster, in	formati	essment (type, scope, l on on whether module o	can be chosen to earn		tion offered — if not	every seme-
<ul> <li>b) oral</li> <li>c) oral</li> <li>d) projetion</li> <li>e) pression</li> <li>lf a write stead to fassed to fassed nation</li> <li>Languation</li> </ul>	examin examin ect repo entatio tten exa ake the ssment date at ge of a	nination (approx. 90 to ation of one candidate ation in groups (groups ort (approx. 8 to 10 page n/talk (approx. 30 minu amination was chosen a form of an oral examina t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sum	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) o ent, this may be char e each or an oral exa	nged and assessmer mination in groups. I	If the method
Allocat	ion of p	olaces				
 Additio	onal info	ormation				
Worklo	ad					
180 h						
Teachi	ng cycle	9				
Referre	d to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Module	e appea	rs in				
Bachel	or's deg	gree (1 major) Physics (2 gree (1 major) Nanostruc gree (1 major) Physics (2	ture Technology (201	5)		
Bachelor's (2020)	with 1 maj	or Nanostructure Technology	-	generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturtee	-	page 101 / 156



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

Module	title			Abbreviation
Crystal (	Growth, thin Layers and Litho	graphy		11-KDS-152-m01
Madula	coordinator		Madula offered by	
			Module offered by	
	g Director of the Institute of A	<u> </u>	Faculty of Physics a	and Astronomy
	Method of grading	Only after succ. cor	npl. of module(s)	
	numerical grade			
Duration		Other prerequisites		
1 semes				
Contents	-			
Crystal g	rowth, thin films, lithography	•		
Intended	l learning outcomes			
laborato		knowledge of the pro		s to control crystal growth in the ation of thin layers and know
Courses	(type, number of weekly cont	act hours, language –	- if other than Germa	in)
V (3) + R	(1)			
Module	taught in: German or English			
	of assessment (type, scope, l prmation on whether module			tion offered — if not every seme-
stead ta of asses nation d Languag Assessm	ke the form of an oral examin sment is changed, the lecture ate at the latest. e of assessment: German and nent offered: Once a year, win	ation of one candidate er must inform studen d/or English	e each or an oral exa	nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
Allocatio	on of places	_		
Addition	al information			
Workloa	d			
180 h				
Teaching	g cycle			
Referred	to in LPO I (examination reg	ulations for teaching-	degree programmes)	
Module	appears in			
Bachelo	r's degree (1 major) Physics (2	2015)		
	r's degree (1 major) Nanostru	-	5)	
	r's degree (1 major) Physics (2			
	r's degree (1 major) Nanostru		o)	
	r's degree (1 major) Quantum	Technology (2021)		
exchang	e program Physics (2023)			

Module	-				Abbreviation
Labora	tory an	d Measurement Techr	ology in Biophysics		11-LMB-152-m01
Module	e coord	inator		Module offered by	,
		ector of the Institute of	Applied Physics	Faculty of Physics	
ECTS	1	od of grading	Only after succ. co	mpl. of module(s)	
6	nume	rical grade			
Duratio		Module level	Other prerequisites	5	
1 seme	ester	graduate			
Conten	nts				
physica measu	al proce ring tec	edures for the examination	ation and manipulation methods of single-par	of biological system	as the physical principles of bio- is. The main topics are optical ial microscoping techniques and
Intend	ed lear	ning outcomes			
sical pı measu	rocedu	res for the examination hniques and their app	n and manipulation of l	piological systems. T	ne physical principles of biophy- They have knowledge of optical of structure elucidation to simple
Course	<b>es</b> (type	, number of weekly co	ntact hours, language -	<ul> <li>if other than Germa</li> </ul>	an)
V (3) + Module		t in: German or Englisl	1		
			, language — if other th e can be chosen to earr		ation offered — if not every seme-
e) pres If a writ stead t of asse nation Langua	entatio tten exa take the essmen date at age of a	e form of an oral exami	nutes). as method of assessm nation of one candidat rer must inform studen nd/or English	e each or an oral exa	anged and assessment may in- amination in groups. If the methor weeks prior to the original exami
	tion of p				
Additio	onal inf	ormation			
Worklo	bad				
180 h					
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes	)
Module	e appea	nrs in			
Bachel	lor's de	gree (1 major) Physics gree (1 major) Nanostr ee (1 major) Functiona	ucture Technology (201	15)	
Bachelor's	with 1 ma	jor Nanostructure Technology	JMU Würzburg	• generated 19-Apr-2025 • ex	xam. reg. da- page 104 / 156

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)

Labora	e title			Abbreviation	
	tory and Measurement Te	chnology		11-LMT-152-m01	
Modul	e coordinator		Module offered by		
	ing Director of the Institute	of Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Method of grading	Only after succ. co		ind /istronomy	
6	numerical grade				
Duratio	· · · · ·	Other prerequisite	6		
1 seme			5		
Conten					
	uction to electronic and op	tical maacuring mathada	of physical matrology	vacuum tachnalaa	nu and chuogo
	ryogenics, light sources, s				sy and cryoge-
	ed learning outcomes	<u> </u>			
	udents have competencies	in the field of electronic a	and ontical maacuring	mathada of physic	almotrology
	n technology and cryogeni				
Course	es (type, number of weekly	contact hours, language	— if other than Germa	n)	
V (3) +					
	e taught in: German or Eng				
	<b>d of assessment</b> (type, sco formation on whether mod			tion offered — if no	t every seme-
	sentation/talk (approx. 30				
If a writ stead t of asse nation Langua Assess	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English	te each or an oral exar	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English	te each or an oral exar	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English	te each or an oral exar	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English	te each or an oral exar	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Additic	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English	te each or an oral exar	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Additic	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English	te each or an oral exar	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Additio  Worklo 180 h	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English	te each or an oral exar	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Additio  Worklo 180 h	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English	te each or an oral exar	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Worklo 180 h Teachin 	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English , winter semester	te each or an oral exam nts about this by four v	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Worklo 180 h Teachin 	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English , winter semester	te each or an oral exam nts about this by four v	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Worklo 180 h Teachi  Referre	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places	minutes). sen as method of assessm amination of one candidat cturer must inform studer n and/or English , winter semester	te each or an oral exam nts about this by four v	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Worklo 180 h Teachin  Referre	tten examination was chos take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places onal information oad ad ad ad (examination)	minutes). Sen as method of assessm amination of one candidat cturer must inform studer n and/or English , winter semester	te each or an oral exam nts about this by four v	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Morklo 180 h Teachi  Referre Bachel Bachel Bachel	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places onal information oad ad ad age cycle ed to in LPO I (examination e appears in lor's degree (1 major) Phys lor's degree (1 major) Nanc	minutes). Sen as method of assessm amination of one candidat cturer must inform studer n and/or English , winter semester 	te each or an oral exam nts about this by four v -degree programmes)	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Worklo 180 h Teachi  Referre Bachel Bachel Bachel Bachel	tten examination was chost take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places onal information oad age cycle ed to in LPO I (examination e appears in lor's degree (1 major) Phys lor's degree (1 major, 1 mir lor's degree (1 major, 1 mir	minutes). Sen as method of assessm amination of one candidat cturer must inform studer n and/or English , winter semester 	te each or an oral exam nts about this by four v -degree programmes)	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Worklo 180 h Teachin  Referre  Bachel Bachel Bachel Master	tten examination was chos take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places onal information oad a bad a bad bad bad bad bage e (1 major) Phys lor's degree (1 major) Function of s degree (1 major) Function of s degree (1 major) Function	minutes). Sen as method of assessm amination of one candidat cturer must inform studer n and/or English , winter semester n regulations for teaching ics (2015) ostructure Technology (2010) ostructure Technology (2010) onal Materials (2016)	te each or an oral exam nts about this by four v -degree programmes)	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Worklo 180 h Teachin  Referre Bachel Bachel Bachel Bachel Bachel Bachel Bachel	tten examination was chos take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places onal information oad ad ag cycle ed to in LPO I (examination e appears in lor's degree (1 major) Phys lor's degree (1 major) Nanc lor's degree (1 major, 1 mir r's degree (1 major) Functio lor's degree (1 major) Phys	n regulations for teaching ics (2015) pstructure Technology (20- ior) Physics (Minor, 2015) onal Materials (2016) ics (2020)	te each or an oral exam nts about this by four v -degree programmes) 15)	mination in groups.	If the method
If a writ stead t of asse nation Langua Assess Allocat  Worklo 180 h Teachi  Referre  Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel Bachel	tten examination was chos take the form of an oral exa essment is changed, the le date at the latest. age of assessment: Germa sment offered: Once a year tion of places onal information oad a bad a bad bad bad bad bage e (1 major) Phys lor's degree (1 major) Function of s degree (1 major) Function of s degree (1 major) Function	minutes). Sen as method of assessm amination of one candidat cturer must inform studer n and/or English , winter semester n regulations for teaching ics (2015) postructure Technology (2016) postructure Technology (2016) postructure Technology (2016) postructure Technology (2016) postructure Technology (2016)	te each or an oral exam nts about this by four v -degree programmes) 15)	mination in groups. weeks prior to the o	If the method

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
Introduction to Labview				11-LVW-152-m01
Module coordinator			Module offered by	
Managing Director of the Institute of Ap				
ECTS Method of grading Only after succ. compl. of module(s)				
6 numerical grade				
		Other prerequisites		
1 semester graduate				
Contents				
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 comprehensive 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.  Intended learning outcomes The students have specific and advanced knowledge in the application field of LabVIEW. They know the principles of working with LabVIEW and are able to develop applications, e.g. for recording and analysing measuring data				
ta. <b>Courses</b> (type, number of weekly contact hours, language — if other than German)				
V (1) + R (3) Module taught in: German or English				
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)				
<ul> <li>a) written examination (approx. 90 to 120 minutes) or</li> <li>b) oral examination of one candidate each (approx. 30 minutes) or</li> <li>c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or</li> <li>d) project report (approx. 8 to 10 pages) or</li> <li>e) presentation/talk (approx. 30 minutes).</li> <li>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.</li> <li>Language of assessment: German and/or English Assessment offered: Once a year, winter semester</li> </ul>				
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)

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	
Mathe	matics	3 for Students of Physi	cs and related Discipli	nes (Differential	11-M-D-152-m01	
Equation	ons)					
Module	e coord	inator		Module offered by		
Manag and As	-	ector of the Institute of sics	Theoretical Physics	Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites	5		
1 seme	ster	undergraduate				
Conten	Its					
Ordina Fundar	ry diffe nentals	nary differential equations and s rential equations and s s of function theory.		equations.		
1.1 Solu 1.2 Exis 1.3 Sys 1.4 Gre	ution m stence a tems o ens fur mitsch	ferential equations ethods and uniqueness theore f differential equations action for inhomogeneo e DGL, Legendre DGL				
2.1 Cor 2.2 Diff 2.3 Sin 2.4 Cor 2.5 Lau 2.6 Ana 2.7 gar 2.8 Diff	nplex fi ferentia gulariti nplex i urent se alytical nma, b ferentia	unctions Ition, holomorphic func- es in the complex Integration and the Cau- ries, residual theorem, continuation, meromo- eta, hypergeometric fur al equations in the com int method	chy integral theorem Fourier transformatior phic functions, whole actions, sets of Weiers	functions trasse and Mittag-Le	ffler	
		ar differential equation	s of 1st order			
		ning outcomes				
on met	hods fo	as basic knowledge of or ordinary differential e ne required computing	equations as well as th			
Course	<b>s</b> (type	, number of weekly con	tact hours, language –	- if other than Germa	an)	
V (4) + Module	• •	t in: Ü: German or Engli	sh			
		essment (type, scope, on on whether module			ation offered — if no	t every seme-
		nation (approx. 120 mir ssessment: German an				
Allocat		-				
Additio	onal inf	ormation				
 Workla	ad					
	au		_			
240 h	with a mo	or Nanostructure Technology	IMIT Without the	• generated 19-Apr-2025 • ex	am reg da	nago 110 / 45(
Jacinetor S	with 1 md	ion nanostructure recimology		or (180 ECTS) Nanostrukturte	-	page 110 / 156

## 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)

Module title				Abbreviation			
Mathematics lysis)	4 for Students of Physics	and related Discipli	nes (Complex Ana-	11-M-F-152-m01			
Module coord	inator		Module offered by				
Managing Dire and Astrophys	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)				
8 nume	rical grade						
Duration	Duration Module level Other prerequisites						
1 semester	undergraduate						
Contents		·					
quantum mec ment of the fo Fundamentals Part I: function 1.1 Linear vect 1.2 Metric, sta 1.3 Linear ope 1.4 Function s 1.5 Linear ope 1.6 Matrix rep 1.8 The Dirac of Part II: differen 2. Partial diffe 2.1 Linear part 2.2 1D and 3D 2.3 Helmholtz	hanics and the represent rmal framework of quant of partial differential eq nal analysis or spaces ndardized spaces	ation as a wave func um mechanics with t uations in physics an gue integral, Hilbert s ce ferent representation	tion generated by ba he so-called bracket nd systems of differe				
•	ning outcomes						
The student h	as basic knowledge of m			ert space mathematics, as well cient in the necessary computing			
Courses (type	, number of weekly conta	ict hours, language –	- if other than Germa	an)			
V (4) + Ü (2) Module taugh	t in: Ü: German or Englisł	1					
	<b>sessment</b> (type, scope, la on on whether module ca			ation offered — if not every seme-			
	nation (approx. 120 minu ssessment: German and,	-					
Allocation of p	olaces						
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) 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)

Module	e title				Abbreviation
Mathe	matical	Methods of Physics			11-M-MR-202-m01
Module coordinator				Module offered by	
		ector of the Institute of Th	peoretical Physics	Faculty of Physics a	nd Astronomy
-	trophys		reoreticat i fiysics		na Astronomy
ECTS	<u> </u>	od of grading	Only after succ. cor	npl. of module(s)	
6		successfully completed		• • • •	
Duratio	on	Module level	Other prerequisites	5	
2 seme	ester	undergraduate			
Conten	its				
Germa	n conte	nts available but not trar	nslated yet.		
			·		
					ulstoffes, insbesondere zur Ein
führun: Physik	g und V	ordereitung auf die Mod	uie der Theoretische	n Physik und der Klas	ssischen bzw. Experimentellen
	ad laar	ning outcomes			
	-		vailable but not tran	clated yet	
Germai	initen	ded learning outcomes a	valiable but not trans	sialeu yet.	
Der/Di	e Studi	erende verfügt über die K	enntnisse der Grund	llagen der Mathemati	k und der elementaren Rechen
		lche in der Theoretischer			
Course	<b>s</b> (type	, number of weekly conta	act hours, language -	– if other than Germa	n)
V (2) +	Ü (2) +	V (2) + Ü (2)			
Module	e taugh	t in: German or English			
					tion offered — if not every sem
ster, in	formati	on on whether module c	an be chosen to earn	ı a bonus)	
		successful completion of	approx. 50% of appr	ox. 13 exercise sheet	s) or
		x. 15 minutes)			
Allocat	ion of p	olaces			
Additio	onal inf	ormation			
			-		
Worklo	ad				
180 h					
Teachi	ng cycl	e	-		
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	
§ 53   N					
\$ 77   N					
	e appea	ars in			
		gree (1 major) Physics (20	020)		
		gree (1 major) Nanostruc		20)	
		gree (1 major) Mathemati			
		gree (1 major, 1 minor) Pł	•		
		mination for the teaching		•	
		mination for the teaching			
		mination for the teaching		•	
rirst st	ate exa	mination for the teaching	g aegree Mittelschule	e Physics (2020)	
) a ch a la Ma		jor Nanostructure Technology	IAILIA/Combrosom	• generated 19-Apr-2025 • exa	ım. reg. da- page 114 / 15

(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			
Nanoai	Nanoanalytics 11-NAN-152-mo1							
Module coordinator				Module offered by				
Manag	ing Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy			
ECTS	·	od of grading	Only after succ. con	pl. of module(s)				
6	L	rical grade						
Duratio		Module level	Other prerequisites					
1 semester graduate								
Conten								
Principles of analytic procedures in the field of nanostructure physics, imaging techniques from a microscopic level up to an atomic level, examination of chemical composition, spectroscopy of electronic properties, usage of X-ray methods Physics and material systems on the nanoscale Scanning probes: Atomic force microscopy. Scanning tunneling microscopy Electron probes: Scanning electron microscope. Transmission electron microscope Secondary ions - mass spectrometry - X-ray methods: Synchrotron spectroscopy. Photoemission. X-ray absorption								
Intend	ed learı	ning outcomes						
vel. The pic me	The students have basic knowledge of modern research methods for different nanostructures up to an atomic level. They know microscoping procedures that are used in practice in labs and the industry as well as spectroscopic methods for the determination of electronic properties. They are able to evaluate the efficiency of different research methods.							
Course	<b>Courses</b> (type, number of weekly contact hours, language — if other than German)							
V (3) + Module		t in: German or English						
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme-								
ster, in	ster, information on whether module can be chosen to earn a bonus)							
<ul> <li>b) oral</li> <li>c) oral</li> <li>d) proje</li> <li>e) pressification</li> <li>stead t</li> <li>of assession</li> <li>nation</li> <li>Langua</li> </ul>	examin examin ect repo entatio tten exa ake the essmen date at age of a	form of an oral examinat	ach (approx. 30 minu of 2, approx. 30 minu ) or es). method of assessme tion of one candidate must inform student for English	tes per candidate) o ent, this may be char e each or an oral exa	r nged and assessment may in- mination in groups. If the method weeks prior to the original exami-			
	ion of p	· · · · ·						
Additio	onal info	ormation						
Worklo	ad							
180 h								
Teachi	ng cvcl	9						
Referre	ed to in	LPOI (examination regu	lations for teaching-	legree programmes)				
		Ŭ.,	U					
Module	e appea	irs in						
		gree (1 major) Physics (20	015)					

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	e title				Abbreviation
Genera	al Comp	etences for Students of	Nanostructure Techno	ology	11-NASQ5-152-m01
Modul	e coord	inator		Module offered by	
chairp	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS	1	od of grading	Only after succ. com		
5		rical grade		1	
Duratio	on	Module level	Other prerequisites		
1 seme	ester	undergraduate	Approval from exam	ination committee r	equired.
Conten	nts				
Genera	al qualif	ications for students of r	anostructure techno	logy.	
Intend	ed lear	ning outcomes			
nology gy and the app	of the l the req plicatio	Bachelor's programme. T Juired understanding of t n areas.	hey have knowledge his topic. They are ab	of a current subdisc le to classify the su	a module of Nanostructure Tech- ipline of nanostructure technolo- bject-specific contexts and know
		, number of weekly conta	ict hours, language –	- if other than Germa	an)
V (2) +	R (2)				
a) writt b) oral c) oral d) proj e) pres If a wri	ten exan examir examin ect repo sentatio tten exa		20 minutes) or ach (approx. 30 minu of 2, approx. 30 minu s) or es) s method of assessme	utes) or tes per candidate) o ent, this may be cha	nged and assessment may in-
of asse nation	essmen date at		must inform student		mination in groups. If the metho weeks prior to the original exami
Allocat	tion of p	olaces			
Additic	onal inf	ormation			
Worklo	bad				
150 h					
	ng cycl				
Teachi		e			
Teachi 		e			
		e LPOI (examination regu	lations for teaching-o	degree programmes)	)
			lations for teaching-c	degree programmes)	)
 Referre	ed to in	LPOI (examination regu	lations for teaching-o	degree programmes)	)
 Referre  Module	ed to in e appea	LPOI (examination regu			)

Module	e title				Abbreviation
Introdu	ction t	o Nanoscience			11-N-EIN-152-m01
Module	o coord	inator		Module offered by	
		ector of the Institute of Ap	onlied Physics	Faculty of Physics a	and Astronomy
ECTS	1	od of grading	Only after succ. con		
7		rical grade		<u> </u>	
Duratio	n	Module level	Other prerequisites		
2 seme	ester	undergraduate	Admission prerequi 85% of sessions).	site to assessment:	regular attendance (minimum
Conten	ts				
Introdu	iction to	o the principles of produ	cing, characterising a	nd applying nanostr	ructures.
Intende	ed lear	ning outcomes			
		nave knowledge of the fu ructures.	ndamental propertie	s, technologies, cha	racterising methods and functi-
Course	<b>s</b> (type	, number of weekly conta	ict hours, language –	- if other than Germa	in)
V (2) + Module	• •	t in: German or English			
		s <b>essment</b> (type, scope, la on on whether module c			tion offered — if not every seme-
	-	5 minutes) with discussi ssessment: German and		amination (approx. 1	20 minutes)
Allocat	ion of p	olaces			
Additio	onal inf	ormation			
this wil 3 Sente find tha gistrati ly regis sessme	Il be co ence 47 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 n	f will to seek admission and examination reg qualification for adm only those students the who did not register ot be admitted to the	on to assessment pu ulations). If the mod ission to assessmen at meet the respect for an assessment of respective assessment	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- sessment will not be considered.
Worklo	ad				
210 h			<u>.</u>		
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-o	legree programmes)	
Module	e appea	urs in			
Bachel Bachel Bachel	or's de or's de or's de	gree (1 major) Nanostruct gree (1 major) Functional gree (1 major, 1 minor) Ph gree (1 major) Nanostruct	Materials (2015) nysics (Minor, 2015) ture Technology (202		
		gree (1 major, 1 minor) Pł			
Bachel	or's de	gree (1 major) Functional	Materials (2021)		

Modul	e title				Abbreviation
Semina	ar Nano	structure Technology			11-N-HS-152-m01
Modul	e coord	inator		Module offered by	
-	-	ectors of the Institute of A f Theoretical Physics and	,	Faculty of Physics a	nd 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 semesterundergraduateAdmission prerequisite to assessment: regular attendance (minimum 85% of sessions).					
Conter	nts				
Curren	t questi	ons on advanced topics	of nanostructure tech	nnology.	
Intend	ed learı	ning outcomes			
		have in-depth knowledge ntly acquire this knowled			ucture technology. They are able ation.
Course	<b>s</b> (type	, number of weekly conta	ct hours, language –	- if other than Germa	in)
S (2) Module	e taugh	t in: German or English			
		sessment (type, scope, la on on whether module ca			tion offered — if not every seme-
a) talk	(30 to 2	45 minutes) with discussi	on and b) written exa	amination (approx. 1	20 minutes)
Allocat	tion of p	olaces			
Additio	onal inf	ormation			
this wi 3 Sente find the gistrati ly regis sessme	ll be co ence 4 / at the s ion 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 admission and examination reg qualification for adm only those students the who did not register ot be admitted to the	on to assessment pu ulations). If the mod ission to assessmen nat meet the respect for an assessment o respective assessm	n for admission to assessment, irsuant 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- ent. If a student takes an as- sessment will not be considered.
Worklo	oad				
150 h					
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	
Modul	e appea	urs in			
		gree (1 major) Nanostruct	ture Technology (201	-)	

Module					Abbreviation			
Industr	Industrial Internship							
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		od of grading	Only after succ. con	pl. of module(s)				
10	nume	rical grade						
Duratio	on	Module level	Other prerequisites					
1 seme	ster	undergraduate						
Conten	ts							
	Insights into industrial methods, work processes, goals and production methods. Summary of own experiences and tasks in a report and an oral presentation.							
Intende	ed lear	ning outcomes						
The students have knowledge and practical experience of using a variety of industrial technologies with relevan- ce to nanostructure technology and are able to summarise their experience in a report and an oral presentation.								
Course	<b>s</b> (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)			
P (o) +	S (1)							
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)								
	a) report on practical course (approx. 15 pages) and b) presentation/talk (approx. 45 minutes), weighted 1:4 Language of assessment: German and/or English							
Allocat	ion of <sub>l</sub>	olaces						
Additional information								
this wil 3 Sente find tha gistrati ly regis sessme	ll be co ence 47 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 s not put into effect will no	will to seek admission and examination reg qualification for adm nly those students the who did not register ot be admitted to the	on to assessment pu ulations). If the modu ission to assessmen nat meet the respecti for an assessment of 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								
Teachi	ng cycl	e						
Referre	ed to in	LPOI (examination regu	lations for teaching-	legree programmes)				
		· · · · · · · · · · · · · · · · · · ·						
Module	e appea	ars in						
		gree (1 major) Nanostruct	ure Technology (201	5)				
		gree (1 major) Nanostruct						

Modul					Abbreviation			
Nanote	echnolo	gy in Energy Research			11-NTE-152-m01			
Modul	e coord	inator		Module offered by				
Manag	ing Dire	ector of the Institute of	Applied Physics	Faculty of Physics a	and Astronomy			
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)				
6	nume	rical grade						
Duratio		Module level	Other prerequisites	<b>i</b>				
1 seme		graduate						
Conter								
Nanotechnology is of great significance for energy research. Energy efficiency can be heightened in numerous processes or applications by using special functional materials. This module covers special materials, surfaces and structures that have optimised properties due to effects of nanotechnology. It explains the underlying phys cal contexts. It uses specific materials and components as examples, such as thermal insulation materials, hea accumulators, functional nanoscale layer and particle systems with spectral selective properties, nanoporous v cuum insulations and electrode materials.								
	_	ning outcomes						
researd	The students have specific and advanced knowledge of the application of nanotechnology in the field of energy research. They know methods of nanotechnology to influence the properties of materials and their applications. They are able to apply their knowledge to specific questions.							
<b>Courses</b> (type, number of weekly contact hours, language — if other than German)								
V (3) +								
		t in: German or English						
			language — if other th can be chosen to earn		tion offered — if not	every seme-		
b) oral c) oral d) proj e) pres If a wri stead t of asse nation Langua Assess	examin examin ect repo sentatio tten exa cake the essmen date at age of a sment 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, su	e each (approx. 30 minu s of 2, approx. 30 minu ges) or utes). as method of assessm nation of one candidate rer must inform studen nd/or English	ites per candidate) o ent, this may be cha e each or an oral exa	nged and assessmer mination in groups.	If the method		
Allocat	tion of p	olaces						
Additio	onal inf	ormation						
Worklo	bad							
180 h								
Teachi	ng cycl	e						
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)				
Modul	e appea	in in						
			ucture Technology (201 ucture Technology (202	-				
Bachelor's (2020)	with 1 ma	or Nanostructure Technology		• generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte	-	page 122 / 156		

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 t	title				Abbreviation			
	Novel Transport Phenomena 11-NTP-152-m01							
Module coordinator				Module offered by				
Managin	ig Dire	ctor of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy			
		d of grading	Only after succ. com	pl. of module(s)				
6 r	numer	ical grade						
Duration Module level Other prerequisites								
1 semester undergraduate								
Contents	S							
Current r	resear	ch topics and applicatior	ns of novel transport	phenomena.				
Intended	l learn	ing outcomes						
ly in the to acquir	The students have knowledge of a current subdiscipline of nanostructure technology or nano sciences, especial- ly in the field of novel transport phenomena, and understand the measuring and evaluation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas							
		number of weekly conta	ct nours, language –	frother than Germa	n)			
V (3) + R Module t		in: German or English						
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a 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 presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may in- stead take the form of an oral examination of one candidate each or an oral examination in groups. If the method								
of assess nation da	If a written examination was chosen as method of assessment, this may be changed and assessment may in- stead 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 exami- nation date at the latest. Language of assessment: German and/or English							
Allocatio								
Addition	al info	ormation						
Workloa	d							
180 h								
Teaching	o cvcla							
	Scycii	•						
Referred	to in	LPOI (examination regu	lations for teaching-o	legree programmes)				
			0	0 1 0 /				
Module a	appea	rs in						
Bachelor	r's deg	gree (1 major) Nanostruct gree (1 major) Nanostruct gree (1 major) Quantum T	ure Technology (202					

Module title				Abbreviation	
Data and Erro	r Analysis			11-P-FR1-152-m01	
Module coord	linator		Module offered by	<u> </u>	
	ector of the Institute of A	nnlied Physics	Faculty of Physics a	nd Astronomy	
	od of grading	Only after succ. con		ind ristionomy	
	successfully completed				
Duration	Module level	Other prerequisites			
1 semester       undergraduate       Admission prerequisite to assessment: completion of exercises ( 13 exercise sheets per semester). Students who successfully com approx. 50% of exercises will qualify for admission to assessmen lecturer will inform students about the respective details at the b of the semester.					
Contents		of the semester.			
	s, error approximation a deviation.	nd propagation, graph	nic representations,	linear regression, m	ean values
	ning outcomes				
	are able to evaluate mea to draw, present and dis			gation and of the pri	nciples of
Courses (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (1) + Ü (1) Module taugł	ıt in: Ü: German or Englis	h			
	<b>sessment</b> (type, scope, l ion on whether module o			tion offered — if not	every seme-
	nation (approx. 120 min assessment: German and				
Allocation of					
Additional in	ormation				
this will be co 3 Sentence 4 find that the s gistration for ly register for sessment was	If a student registers for onsidered a declaration of ASPO (general academic student has obtained the assessment into effect. ( an assessment. Student s not put into effect will r which he/she has not be	of 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 lission to assessmen nat meet the respect for an assessment of respective assessm	rsuant to Section 20 ule coordinators sub it, they will put the s ive prerequisites car or whose registratior ent. If a student tak	o Subsection osequently student's re- n successful- n for an as- es an as-
Workload					
60 h					
Teaching cyc	e				
		_			
	LPOI (examination reg	ulations for teaching-	degree programmes)		
§ 53   Nr. 1 c) § 77   Nr. 1 d)					
Module appe	ars in				
Bachelor's de	gree (1 major) Mathema gree (1 major) Physics (2 gree (1 major) Nanostruc	.015)	5)		
Bachelor's with 1 ma 2020)	jor Nanostructure Technology	-	egenerated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturte	-	page 125 / 156

## 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 coordinatoManaging DirectorECTSMethod of2(not) succe2(not) succeDurationMod1 semesterund1 semesterundAdvanced methodsdataContentsdataAdvanced methodsdataIntende learringThe students havestered methods ofdiscuss the resultsCourses(type, numV (1) + Ü (1)Method of assesserStercises (success)success	of the Institute of Ap grading essfully completed dule level ergraduate s of data analysis an a analysis. outcomes advanced knowledg computerised data a	oplied Physics Only after succ. con  Other prerequisites Students are highly completing module ad error calculation. D	recommended to co 11-P-FR2. Distribution function, neasuring data and o	mplete module 11-P-FR1 prior to significance tests, modelling. error calculation. They have ma-
Managing DirectorMethod of2(not) succeDurationMod1 semesterund1 semesterund1 semesterund1 semesterundAdvanced methodsdataIntended learringThe students havestered methods ofdiscuss the resultsCourses (type, numV (1) + Ü (1)Method of assessment offereAllocation of placeAdditional informationStere information ofExercises (successAssessment offereAllocation of placeWorkload	of the Institute of Ap grading essfully completed dule level ergraduate s of data analysis an a analysis. outcomes advanced knowledg computerised data a	Only after succ. con  Other prerequisites Students are highly completing module d error calculation. D ge of the analysis of r	Faculty of Physics a npl. of module(s) recommended to co 11-P-FR2. Distribution function,	mplete module 11-P-FR1 prior to significance tests, modelling. error calculation. They have ma-
Managing DirectorMethod of2(not) succeDurationMod1 semesterund1 semesterund1 semesterundContentsdataAdvanced methodsContentsAdvanced methods ofdiscuss the resultsCourses (type, numV (1) + Ü (1)Method of assessment offereAllocation of placeAdditional informationCourses (successAssessment offereAllocation of placeMorkload	of the Institute of Ap grading essfully completed dule level ergraduate s of data analysis an a analysis. outcomes advanced knowledg computerised data a	Only after succ. con  Other prerequisites Students are highly completing module d error calculation. D ge of the analysis of r	Faculty of Physics a npl. of module(s) recommended to co 11-P-FR2. Distribution function,	mplete module 11-P-FR1 prior to significance tests, modelling. error calculation. They have ma-
ECTS       Method of         2       (not) succe         Duration       Mod         1 semester       und         Contents       Advanced methods         Advanced methods       data         Intended learning       The students have         stered methods of       discuss the results         Courses (type, num       V (1) + Ü (1)         Method of assessment offere       Allocation of place          Additional informa          Workload	grading essfully completed dule level ergraduate s of data analysis an a analysis. outcomes advanced knowledg computerised data a	Only after succ. con  Other prerequisites Students are highly completing module d error calculation. D ge of the analysis of r	npl. of module(s) recommended to co 11-P-FR2. Distribution function, neasuring data and o	mplete module 11-P-FR1 prior to significance tests, modelling. error calculation. They have ma-
2       (not) succe         Duration       Mod         1 semester       und         1 semester       und         Advanced methods       data         Advanced methods       data         Intended learning       The students have         Stered methods of       discuss the results         Courses (type, num       V (1) + Ü (1)         Method of assessment offere       Allocation of place          Additional information          Workload	essfully completed dule level ergraduate s of data analysis an a analysis. outcomes advanced knowledg computerised data a	 Other prerequisites Students are highly completing module ad error calculation. D ge of the analysis of r	recommended to co 11-P-FR2. Distribution function, neasuring data and o	significance tests, modelling. error calculation. They have ma-
Duration       Model         1 semester       und         1 semester       und         Contents       Advanced methods         Advanced methods       data         Intended learring       The students have stered methods of discuss the results         Courses (type, num       V (1) + Ü (1)         Method of assessmater, information o       Exercises (success Assessment offere         Allocation of place          Additional informater          Workload	dule level ergraduate s of data analysis an a analysis. outcomes advanced knowledg computerised data a	Students are highly completing module ad error calculation. D ge of the analysis of r	recommended to co 11-P-FR2. Distribution function, neasuring data and o	significance tests, modelling. error calculation. They have ma-
1 semester       und         Contents       Advanced methods         Advanced methods       data         Intended learning       The students have         Stered methods of       discuss the results         Courses (type, num       V (1) + Ü (1)         Method of assessment offere       Allocation of place          Additional informa          Workload	ergraduate s of data analysis an a analysis. <b>outcomes</b> advanced knowledg computerised data a	Students are highly completing module ad error calculation. D ge of the analysis of r	recommended to co 11-P-FR2. Distribution function, neasuring data and o	significance tests, modelling. error calculation. They have ma-
Contents Advanced methods Computerised data Intended learning The students have stered methods of discuss the results Courses (type, nun V (1) + Ü (1) Method of assessm ster, information o Exercises (success Assessment offere Allocation of place  Additional informa  Workload	s of data analysis an a analysis. <b>outcomes</b> advanced knowledg computerised data a	completing module nd error calculation. D ge of the analysis of r	11-P-FR2. Distribution function, neasuring data and o	significance tests, modelling. error calculation. They have ma-
Advanced methods Computerised data Intended learning The students have stered methods of discuss the results Courses (type, num V (1) + Ü (1) Method of assessm ster, information o Exercises (success Assessment offere Allocation of place  Additional informa  Workload	a analysis. outcomes advanced knowledg computerised data a	ge of the analysis of r	neasuring data and o	error calculation. They have ma-
Computerised data Intended learning The students have stered methods of discuss the results Courses (type, num V (1) + Ü (1) Method of assessm ster, information o Exercises (success Assessment offere Allocation of place  Additional informa  Workload	a analysis. outcomes advanced knowledg computerised data a	ge of the analysis of r	neasuring data and o	error calculation. They have ma-
The students have stered methods of discuss the results <b>Courses</b> (type, num V (1) + Ü (1) <b>Method of assessm</b> ster, information o Exercises (success Assessment offere <b>Allocation of place</b>  <b>Additional informa</b>  <b>Workload</b>	advanced knowledg computerised data a			
stered methods of discuss the results <b>Courses</b> (type, num V (1) + Ü (1) <b>Method of assessin</b> ster, information o Exercises (success Assessment offere <b>Allocation of place</b>  <b>Additional informa</b>  <b>Workload</b>	computerised data a			
V (1) + Ü (1) Method of assessm ster, information o Exercises (success Assessment offere Allocation of place  Additional informa  Workload	nber of weekly conta			
Method of assessm ster, information o Exercises (success Assessment offere Allocation of place  Additional informa  Workload		act hours, language –	– if other than Germa	ın)
ster, information o Exercises (success Assessment offere Allocation of place  Additional informa  Workload		-		
Assessment offere Allocation of place  Additional informa  Workload		anguage — if other th an be chosen to earn		tion offered — if not every seme-
 Additional informa  Workload	ful completion of ap d: Once a year, sum	prox. 50% of approx. mer semester	. 10 exercise sheets)	
 Workload	S			
 Workload				
	tion			
60 h				
0011				
Teaching cycle				
Referred to in LPO	I (examination regu	llations for teaching-	degree programmes)	
	. (channation regu			
Modulo appoare in				
Module appears in	(1 major) Physics (20	045)		
		u15) ture Technology (201	c)	
-	(1 major) Mathemati		5)	
	(1 major) Mathemati	• •		
-	(1 major) Physics (20	•		
•		ture Technology (202	0)	
-	(1 major) Mathemati		/	
-	(1 major) Functional	•		
-	(1 major) Quantum T			
exchange program				
		ical Physics (2024)		
Bachelor's degree		•		

Module title				Abbreviation	
Project Management in Practice 11-PMP-152-m01					
Module coordinator Module offered by					
			<b>,</b>	u d A atua u a unu i	
	Anaging Director of the Institute of Applied Physics Faculty of Physics and Astronomy				
ECTS Method of gr	-	Only after succ. con	ipl. of module(s)		
- <u> </u>	sfully completed				
	le level	Other prerequisites			
1 semester gradua	ate				
Contents					
project schedule, kic	k-off and stakel ccess factors, te	actice, contents: Definit tolder, teams and reso chnical and economic	urces, milestones an	d planning, visualis	ation and re-
Intended learning ou	tcomes				
		nnical project managen e, plan and successful		ar with different met	hods and
Courses (type, numb	er of weekly cor	itact hours, language –	· if other than Germa	n)	
V (1) + R (1) Module taught in: Ge	erman or English				
Method of assessme	nt (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, information on v	whether module	can be chosen to earn	a bonus)		
stead take the form of of assessment is cha nation date at the lat Language of assessn Assessment offered:	(approx. 30 min ion was chosen of an oral examin nged, the lectur rest. nent: German ar	utes). as method of assessm nation of one candidate rer must inform student	e each or an oral exame s about this by four v	mination in groups. weeks prior to the o	If the method riginal exami-
Allocation of places					
Additional information	on				
Workload					
90 h					
Teaching cycle					
- caching cycle					
	(ovomination	aulations for the shire			
	(examination re	gulations for teaching-o	legree programmes)		
Module appears in					
Bachelor's degree (1					
_	major) Physics	(2015)			
		(2015) Icture Technology (201	5)		
Duchetor 5 ucgree (1		ucture Technology (201	5)		
	major) Nanostru major) Physics	ucture Technology (201			
	major) Nanostru major) Physics major) Nanostru	ucture Technology (201 (2020) ucture Technology (202			
Bachelor's degree (1	major) Nanostru major) Physics major) Nanostru major) Quantun	(2020) (2020) acture Technology (202 n Technology (2021) JMU Würzburg •			page 128 / 156

Laboratory (	Module title			Abbreviation	
Laboratory Course Physics B (Classical Physics, Electricity, Cir			Circuits)	11-P-NB-152-m01	
Module coor	rdinator		Module offered by	·	
Managing Di	irector of the Institute of A	oplied Physics	Faculty of Physics a	and Astronomy	
	hod of grading	Only after succ. com	pl. of module(s)		
4 (not)	) successfully completed				
Duration	Module level	Other prerequisites			
1 semester	undergraduate			mplete modules 11-P-PA and 11-	
		P-FR1 prior to compl	eting module 11-P-N	В.	
Contents					
Physical law	s of optics, vibrations and	waves, science of ele	ectricity and circuits	with electric components.	
Intended lea	rning outcomes	-			
le to indeper measuring p principles of	ndently plan and conduct rotocol. They are able to e statistics and to draw, pre	experiments, to coop valuate the measurin esent and discuss the	erate with others, an g results on the basi conclusions.	menting techniques. They are ab- id to document the results in a is of error propagation and of the	
<b>Courses</b> (typ	e, number of weekly conta	ict hours, language –	if other than Germa	in)	
P (2)					
	<b>ssessment</b> (type, scope, la ation on whether module c			tion offered — if not every seme-	
practical assignment with talk (approx. 30 minutes) Preparing, performing and evaluating (record of readings or lab report) the experiments will be considered suc- cessfully completed if a Testat (exam) is passed. Exactly one experiment that was not successfully completed can be repeated once. After completion of all experiments, talk (with discussion; approx. 30 minutes) to test the candidate's understanding of the physics-related contents of the module. Talks that were not successfully com- pleted can be repeated once. Both components of the assessment have to be successfully completed.					
Allocation of	fplaces				
Additional ir	nformation				
Workload					
TURIDau					
120 h					
	cle				
120 h	cle				
120 h <b>Teaching cy</b> 	cle n LPO I (examination regu	lations for teaching-o	legree programmes)		
120 h <b>Teaching cy</b> 		llations for teaching-c	legree programmes)		
120 h <b>Teaching cy</b> 	<b>n LPO I</b> (examination regu	llations for teaching-c	legree programmes)		
120 h Teaching cyo  Referred to i  Module app	<b>n LPO I</b> (examination regu				

Module	e title				Abbreviation
		oratory Course Physics (	C (Modern Physics, C	omputer Aided Ex-	11-P-NC-152-m01
perime					
Module	_			Module offered by	
Managi	ing Dire	ector of the Institute of A	oplied Physics	Faculty of Physics a	nd Astronomy
ECTS		od of grading	Only after succ. con	pl. of module(s)	
4	(not) s	successfully completed			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate	<b>.</b> ,		mplete module 11-P-NB prior to
			completing module	11-P-NC.	
Conten	ts				
		of wave optics, Molecula ised devices with examp			n measuring methods using spe-
		ning outcomes			
to recor by usin	rd mea g error	suring results in a structu	ured manner, even in cs. They are able to e	case of huge data tr	erimental setups. They are able affic, and to analyse the results raw conclusions and to present
Course	<b>s</b> (type	, number of weekly conta	ict hours, language –	- if other than Germa	n)
P (2)			-		
		sessment (type, scope, la ion on whether module c			tion offered — if not every seme-
Prepari cessful can be candida	ng, pei ly com repeat ate's u	pleted if a Testat (exam) ed once. After completion	record of readings or is passed. Exactly on n of all experiments, ics-related contents o	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.
Allocat	ion of <sub>l</sub>	places			
Additio	nal inf	ormation			
Worklo	ad				
120 h					
Teachi	ng cycl	e			
	d to in	IDO L (avamination rag			
Referre		LFUT (examination regu	lations for teaching-o	degree programmes)	
Referre		LFOT (examination regu	lations for teaching-o	degree programmes)	
Referre  Module			lations for teaching-o	degree programmes)	
 Module	e appea				

Modul						Abbreviation	
Labora	itory Course Physics A (Mee	chani	cs, Heat, Electromag	netism)		11-P-PA-152-m01	
Module coordinator				Module offe	red by		
		of Ar	nlied Physics			nd Astronomy	
Managing Director of the Institute of Applied PhysicsECTSMethod of gradingOnly after succ.			Only after succ. con			nu Astronomy	
3	Method of grading (not) successfully comple	tod	Unity after Succ. com	ipt. of modul	e(5)		
-		ieu					
Duratio			Other prerequisites				
1 seme							
Conter	nts						
rents, l	rement tasks in mechanics heat capacity, calorimetry, o drafting of graphics and dra	densi	ty of bodies, dynami	c viscosity, e			
Intend	ed learning outcomes						
le to in	udents know and have mast dependently plan and conc ring protocol.						
Course	es (type, number of weekly o	conta	ct hours, language –	· if other thar	n Germa	n)	
P (2)							
	<b>d of assessment</b> (type, scop formation on whether mod				xamina	tion offered — if not	t every seme-
pleted	late's understanding of the <u>can be repeated once. Both</u> <b>tion of places</b>						
Additio	onal information						
Worklo	had						
	Jud						
90 h							
Teachi	ng cycle						
Referre	ed to in LPO I (examination	regu	lations for teaching-	legree progra	ammes)		
Modul	e appears in						
	lor's degree (1 major) Mathe	emati	cs (2015)				
Bachelor's degree (1 major) Physics (2015)							
Bachelor's degree (1 major) Nanostructure Technology (2015)							
Bachelor's degree (1 major) Mathematical Physics (2015)							
Bachel	lor's degree (1 major) Comp	utatio	onal Mathematics (20	D15)			
	lor's degree (1 major) Aeros	•	•	015)			
	lor's degree (1 major) Mathe		-				
	lor's degree (1 major) Aeros	•	•	017)			
	lor's degree (1 major) Physic						
Bachel	lor's degree (1 major) Nanos	struct	ure Technology (202	o)			
Bachelor's 2020)	with 1 major Nanostructure Technolog	у	_	generated 19-Apr- or (180 ECTS) Nano	-	-	page 131 / 156
-020)				- (100 LC13) Mallu	Juanund		

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
Laborat	tory Co	urse Physical Technolog	y of Material Synthe	sis	11-PPT-152-m01
Module	coord	inator		Module offered by	<u> </u>
Managi	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy
ECTS		od of grading	Only after succ. con	, ,	·
8		successfully completed			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate			onal Materials, Bachelor's) are
			recommended to ta	ke module 11-P-FR1.	
Conten	ts				
Physica nologie		rial properties, growth ar	nd coating procedure	s, methods of charad	cterisation and structuring tech-
Intende	ed learı	ning outcomes			
The stu terial sy			ractical basics of mat	erial characterisation	n and physical technology for ma-
Course	<b>s</b> (type	, number of weekly conta	ict hours, language –	- if other than Germa	in)
P (5)					
Module	taugh	t in: German or English			
		s <b>essment</b> (type, scope, la on on whether module c			tion offered — if not every seme-
Prepara	ation of	the experiment will be c	onsidered successfu	lly completed if a pre	e-experiment oral test (approx. 15
if a Test sessme en succ ted. Langua	tat (exa ent can cessfull ge of a	am) is passed. An experir be repeated once in the	nent log (approx. 8 p respective semester. semester will the mo /or English	ages) must be prepa Only if both compor	red successfully completed if a ned. Each component of the as- nents of the assessment have be- considered successfully comple-
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
240 h					
Teachir	ng cycl	e			
Referre	d to in	LPOI (examination regu	lations for teaching-	degree programmes)	
Module	e appea	ars in			
		gree (1 major) Nanostruci	ture Technology (201	5)	
		gree (1 major) Functional		-	
Bachel	or's de	gree (1 major) Nanostruct	ture Technology (202	o)	

Module					Abbreviation	
MINT P	reparat	ory Course Mathematic	al Methods of Physics	5	11-P-VKM-202-m01	
Module	e coordi	inator		Module offered by		
		ctors of the Institute of	Applied Physics and	Faculty of Physics a	nd Astronomy	
		f Theoretical Physics and			and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)		
3	(not) s	uccessfully completed				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
introdu 1. Basio	ction a	basics and elementary nd preparation for the m etry and algebra, 2. diffe coordinate systems, 6. c	nodules of experiment erential calculus and s	al and theoretical pl	nysics.	·
Intende	ed learr	ning outcomes				
		n command of knowled successful start into the				ulus as re-
Course	<b>s</b> (type,	number of weekly cont	act hours, language –	· if other than Germa	n)	
V (1) + l	Ü (2)					
Module	e taught	t in: German or English				
		<b>essment</b> (type, scope, l on on whether module o			tion offered — if not	every seme-
a) exer	cises (s	uccessful completion of	f approx. 50% of appro	ox. 6 exercise sheets	5) or	
		. 15 minutes)				
		ffered: Once a year, wint	ter semester			
Allocat	ion of p	olaces	_			
Additio	nal info	ormation				
Worklo	ad					
90 h						
Teachi	ng cycle	9				
Teachir	ng cycle	e: every year, winter sem	ester			
		LPOI (examination reg		legree programmes)		
§ 22      § 22      § 22	Nr. 1 h) Nr. 2 f)	,				
Module	e appea	rs in				
		gree (1 major) Physics (2	020)			
	-	gree (1 major) Nanostruc		o)		
		gree (1 major) Mathemat				
	-	gree (1 major, 1 minor) P				
		mination for the teachin		•	s (Primary School) (2	.020)
		mination for the teachin		•		
		mination for the teachin		-		
FIRST Sta		mination for the teachin				
	ate exai	nination for the teachin	g degree Sonderpäda	gogik Didactics in Pr	nysics (Middle Schoo	ol) (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	e title				Abbreviation	
Introduction to Quantum Computing and Quantum Informa			nd Quantum Informa	tion	11-QUI-202-m01	
Module	e coord	inator		Module offered by		
	Managing Director of the Institute of Theoretical Physics			Faculty of Physics a	and Astronomy	
	trophys		- I			
ECTS		od of grading	Only after succ. con	npl. of module(s)		
6		rical grade				
Duration		Module level undergraduate	Other prerequisites	<b>i</b>		
Conten		undergraduate				
by den ment, a of quar quantu	sity ope and ent ntum st Im com	erators. Theory of the me anglement measures. Qu ates. Introduction to qua putation and error correc	asurement process. \ iantum channels, Kra ntum teleportation a	Von Neumann entrop aus operators and St	of quantum-mechanical states by, bipartite systems, entangle- inespring theorem. Decoherence raphy. First steps in the theory of	
	-	ning outcomes				
of spec possib	ific pro le appli	perties of quantum syste	ems such as entangle rmation theory. The a	ement. Overview of th	ation. Deepened understanding he most important theorems and students for further elective cour-	
Course	<b>s</b> (type	, number of weekly conta	ct hours, language –	- if other than Germa	an)	
V (3) + Module		t in: German or English				
		<b>essment</b> (type, scope, la on on whether module c			ation offered — if not every seme-	
<ul> <li>b) oral</li> <li>c) oral</li> <li>d) projetion</li> <li>e) press</li> <li>lf a write</li> <li>stead to</li> <li>of asset</li> <li>nation</li> </ul>	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 in- stead take the form of an oral examination of one candidate each or an oral examination in groups. If the methor of assessment is changed, the lecturer must inform students about this by four weeks prior to the original exami nation date at the latest. Language of assessment: German and/or English					
	tion of p					
			<u>.</u>			
Additio	onal inf	ormation				
Worklo	ad					
180 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)		
Module	e appea	in and a second s				
Bachel	or's de	gree (1 major) Physics (20	020)			
		or Nanostructure Technology		generated 10-Apr-2025 • ex	am reg da-	

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)

Introdu	e title				Abbreviation	
Introduction to Relativistic Physics and Classical Field The			ory	11-RRF-202-m01		
Module coordinator			Module offered by	<u> </u>		
Manag	ing Dir	ector of the Institute of T	heoretical Physics	Faculty of Physics a	and Astronomy	
and As	<u> </u>					
ECTS		od of grading	Only after succ. cor	npl. of module(s)		
6	I	rical grade				
Duration		Module level undergraduate	Other prerequisites	6		
Conten		undergraduate				
basic c Theory	concept , Conse	he special theory of rela s of classical field theor rvation Quantities, Curr foundations of the gen	y using the example o ents and Noether The	of the scalar field. Ele orem. Elements of re	ectrodynamics as Re lativistic hydrodyna	lativistic Field
Intend	ed lear	ning outcomes				
in cova basics	ariant re of gene	the principles of specia epresentation. Safe hand eral relativity. The stude program.	lling of classical relat	ivistic field theories	as well as a rough o	verview of the
Course	<b>s</b> (type	, number of weekly cont	act hours, language –	– if other than Germa	an)	
V (3) + Module		t in: German or English				
		sessment (type, scope, l ion on whether module			tion offered — if not	t every seme-
c) oral d) proje e) pres lf a writ	examir ect rep entatio tten ex ake the	nation of one candidate ation in groups (groups ort (approx. 8 to 10 page n/talk (approx. 30 minu amination was chosen a e form of an oral examin	of 2, approx. 30 minutes) or tes). s method of assessmation of one candidate	ites per candidate) o ent, this may be cha	nged and assessme mination in groups.	nt may in-
of asse nation Langua	date at age of a	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun	l/or English		weeks prior to the o	
of asse nation Langua	date at age of a ment o	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun	l/or English		weeks prior to the o	
of asse nation Langua Assess	date at age of a ment o	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun	l/or English		weeks prior to the o	
of assention Langua Assess Allocat	date at age of a ment o tion of p	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun	l/or English		weeks prior to the o	
of assention Langua Assess Allocat	date at age of a ment o tion of p	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun <b>blaces</b>	l/or English		weeks prior to the o	
of asse nation Langua Assess Allocat  Additio	date at age of a sment o tion of p	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun <b>blaces</b>	l/or English		weeks prior to the o	
of asse nation Langua Assess Allocat  Additio	date at age of a sment o tion of p	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun <b>blaces</b>	l/or English		weeks prior to the o	
of asse nation Langua Assess Allocat  Additio  Worklo	date at age of a ment o tion of p onal inf	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun blaces ormation	l/or English		weeks prior to the o	
of asse nation Langua Assess Allocat  Worklo 180 h Teachin 	date at age of a ment o tion of p onal inf pad	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun blaces ormation	l/or English nmer semester	ts about this by four		
of asse nation Langua Assess Allocat  Worklo 180 h Teachin 	date at age of a ment o tion of p onal inf pad	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun blaces ormation	l/or English nmer semester	ts about this by four		
of asse nation Langua Assess Allocat  Worklo 180 h Teachin  Referre	date at age of a sment o tion of p onal inf oad ng cycl ed to in	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun places ormation e LPOI (examination reg	l/or English nmer semester	ts about this by four		
of asse nation Langua Assess Allocat  Worklo 180 h Teachin  Referre  Module	date at age of a sment o tion of pnal inf pad ng cycl ed to in e appea	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun olaces ormation e LPOI (examination reg	d/or English nmer semester ulations for teaching-	ts about this by four		
of asse nation Langua Assess Allocat  Worklo 180 h Teachin  Referre  Bachel	date at age of a sment o tion of p onal inf oad ng cycl ed to in e appea or's de	t is changed, the lecture the latest. ssessment: German and ffered: Once a year, sun places ormation e LPOI (examination reg	d/or English mmer semester ulations for teaching- 2020)	ts about this by four		

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	title			Abbreviation	
Statistics, Data Analysis and Computer Physics				11-SDC-152-m01	
Module coordinator			Module offered by		
Managi	Managing Director of the Institute of Applied Physics Faculty of Physics and Astronomy				
ECTS         Method of grading         Only after succ. compl. of module(s)					
4	numerical grade				
Duratio	n Module level	Other prerequisites	i		
1 semes	ster graduate				
Content	ts				
Statistic	cs, data analysis and compute	r nhysics			
	d learning outcomes				
		11 1 1 1 1	<u> </u>		
	dents have specific and advar	ced knowledge in the	field of statistics, da	ita analysis and Con	nputational
Physics				``	
	s (type, number of weekly cont	act nours, language -	– If other than Germa	n)	
V (2) + F					
	taught in: German or English				
	of assessment (type, scope,			tion offered — if not	every seme-
	ormation on whether module		a bonus)		
	en examination (approx. 90 to				
	examination of one candidate		-		
	examination in groups (groups ect report (approx. 8 to 10 page		ites per candidate) o	ſ	
	entation/talk (approx. 30 minu				
	ten examination was chosen a		ent, this may be cha	nged and assessme	nt may in-
	ake the form of an oral examin				
	ssment is changed, the lecture	er must inform studen	ts about this by four	weeks prior to the o	riginal exami-
	late at the latest.	.,			
	ge of assessment: German and				
	ment offered: Once a year, win				
Allocati	on of places				
Additio	nal information				
Workloa	ad				
120 h					
Teachin	is cycle				
Referre	d to in LPO I (examination reg	ulations for teaching-	degree programmes)		
Module	appears in				
	or's degree (1 major) Physics (2	2015)			
	or's degree (1 major) Nanostru	-	5)		
	or's degree (1 major) Mathema				
	or's degree (1 major) Mathema	• •			
	or's degree (1 major) Physics (2				
	or's degree (1 major) Nanostru		20)		
	or's degree (1 major) Mathema				
	or's degree (1 major) Quantum				
	vith 1 major Nanostructure Technology	-	• generated 19-Apr-2025 • exa	-	page 140 / 156
2020)		ta record Bachel	or (180 ECTS) Nanostrukturte	сппік - 2020	



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

Physics of Semiconductor Devices       11-SPD-152-mo1         Module coordinator       Module offered by         Managing Director of the Institute of Applied Physics       Faculty of Physics and Astronomy         ECTS       Method of grading       Only after succ. compl. of module(s)         6       numerical grade          Duration       Module level       Other prerequisites         1 semester       undergraduate          Contents           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 levant semiconductors. The following part discusses the principles of charge transport involving non-equilibri into the methods of production of semiconductor materials and presents the most important methods of plan technology. It discusses the way of functioning of the following components, sorted according to volume com ponents, interface components and application fields: Rectifier diodes, Zener diodes, varistor, varactor, tunne diodes, IMPATT, Baritt- and Gunn diodes, photodiode, solar cell, LED, semiconductor injection laser, transisto JFET, Thyristor, Diac, Triac, Schottky diode, MOSFET, MESFET, HFET. It highlights the importance of low-dimens solar earrier systems for technology and basic research and shows recent developments in the compone sector.         Interded learning outcomes       The students know the characteristics of se					
Managing Director of the Institute of Applied Physics       Faculty of Physics and Astronomy         ECTS       Method of grading       Only after succ. compl. of module(s)         6       numerical grade          Duration       Module level       Other prerequisites         1 semester       undergraduate          Contents          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 levant semiconductors. The following part discusses the principles of charge transport involving non-equilibri into the methods of production of semiconductor materials and presents the most important methods of plan technology. It discusses the way of functioning of the following components, sorted according to volume com ponents, interface components and application fields: Rectifier diodes, Zener diodes, varistor, varactor, tunne diodes, IMPATT, Baritt- and Gunn diodes, photodiode, solar cell, LED, semiconductor injection laser, transisto JFET, Thyristor, Diac, Triac, Schottky diode, MOSFET, MESFET, HFET. It highlights the importance of low-dimens nal charge carrier systems for technology and basic research and shows recent developments in the compone sector.         Intended learning outcomes       The students know the characteristics of semiconductors, they have gained an overview of the electronic and discusses of semiconductors, they have gained an overview of the electronic and discuspreserview of the electronic and shows recent					
ECTS       Method of grading       Only after succ. compl. of module(s)         6       numerical grade          Duration       Module level       Other prerequisites         1 semester       undergraduate          Contents       Email 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 levant semiconductors. The following part discusses the principles of charge transport involving non-equilibri 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 plant 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, tunned diodes, IMPAT, Baritt- and Gunn diodes, photodiode, solar cell, LED, semiconductor injection laser, transisto JFET, Thyristor, Diac, Triac, Schottky diode, MOSFET, MESFET, HFET. It highlights the importance of low-dimens nal charge carrier systems for technology and basic research and shows recent developments in the component sector.         Intendet       Learning outcomes					
6       numerical grade          Duration       Module level       Other prerequisites         1 semester       undergraduate          Contents       Employed 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 levant semiconductors. The following part discusses the principles of charge transport involving non-equilibri 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 plan technology. It discusses the way of functioning of the following components, sorted according to volume com ponents, interface components and application fields: Rectifier diodes, Zener diodes, varistor, varactor, tunned diodes, IMPATT, Baritt- and Gunn diodes, photodiode, solar cell, LED, semiconductor injection laser, transisto JFET, Thyristor, Diac, Triac, Schottky diode, MOSFET, MESFET, HFET. It highlights the importance of low-dimens nal charge carrier systems for technology and basic research and shows recent developments in the compone sector.         Intended learning outcomes       The students know the characteristics of semiconductors, they have gained an overview of the electronic and					
DurationModule levelOther prerequisites1 semesterundergraduateContentsBased 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 ex amples. The basic part introduces the crystal structures and band and phonon dispersions of technologically levant semiconductors. The following part discusses the principles of charge transport involving non-equilibri 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 plan technology. It discusses the way of functioning of the following components, sorted according to volume com ponents, interface components and application fields: Rectifier diodes, Zener diodes, varistor, varactor, tunne diodes, IMPATT, Baritt- and Gunn diodes, photodiode, solar cell, LED, semiconductor injection laser, transisto JFET, Thyristor, Diac, Triac, Schottky diode, MOSFET, MESFET, HFET. It highlights the importance of low-dimens nal charge carrier systems for technology and basic research and shows recent developments in the compone sector.Intended learning outcomesThe students know the characteristics of semiconductors, they have gained an overview of the electronic and					
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ties. They know the principles of charge transport as well as the Poisson, Boltzmann and continuity equation is the solution of questions. They have gained insights into the methods of semiconductor production and are fa miliar with the theories of planar technology and recent developments in this field, they have a basic understa ding of component production. They understand the structure and way of functioning of the main components electronics (diode, transistor, field-effect transistor, thyristor, diac, triac), of microwave applications (tunnel, I patt, Baritt or Gunn diode) and of optoelectronics (photo diode, solar cell, light-emitting diode, semiconducto injection laser), they know the realisation possibilities of low-dimensional charge carrier systems on the basis of semiconductors and their technological relevance, they are familiar with current developments in the field components.					
<b>Courses</b> (type, number of weekly contact hours, language — if other than German)					
V (3) + R (1) Module taught in: German or English					
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every sen ster, information on whether module can be chosen to earn a 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 in- stead 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 exami- nation date at the latest. Language of assessment: German and/or English Assessment offered: Once a year, summer semester					
Allocation of places					

#### **Additional information**

# Workload

# 180 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 (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	Module title			Abbreviation		
Electro					11-T-E-152-m01	
Module	coordi	inator		Module offered by		
	Managing Director of the Institute of Theoretical Physics and Astrophysics			Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. com	npl. of module(s)		
8	numer	rical grade				
Duratio	n	Module level	Other prerequisites			
1 semes	ster	undergraduate				
Content	ts					
<ul> <li>o. Mathematical tools: Gradient, divergence, curl; curve, surface, volume integrals; Stokes and Gaussian sentence; Delta function; Fourier transform; full functional systems; solving PDEs;</li> <li>1. Maxwell equations;</li> <li>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; development according to orthogonal functions;</li> <li>3. Magnetostatics: Current density; continuity equation; vector potential; Biot-Savart law; magnetic moment; analogies to electrostatics;</li> <li>4. Maxwell equations in matter: Electrical and magnetic susceptibility; interfaces;</li> <li>5. Dynamics of electromagnetic fields: Faraday induction; RCL-circuits; field energy and pulse; potentials; plane waves; wave packets; plane waves in matter; cavity resonators and wave guides; inhomogeneous wave equation; temporally oscillating sources and dipole radiation; accelerated point charges;</li> <li>6. Special Theory of Relativity: Lorentz transform; simultaneity; length contraction and time dilation; light cone; effect, energy and momentum; co- and contra-variant tensors; covariant classical mechanics;</li> <li>7. Covariant electrodynamics: Field strength tensor and Maxwell's equations; transformation of the fields; Dopp-</li> </ul>						
Intende	d learr	ning outcomes				
retical e penden	electroo tly app		ar with the correspor n and solution of pro	nding mathematical blems in this area.	They know the principles of theo- methods and are able to inde-	
			ci nours, language –	- II OLIIEI LIIAII GEIIIIA	11)	
V (4) + Ü Module		t in: Ü: German or Englisł				
Method	l of ass		nguage — if other tha		tion offered — if not every seme-	
		nation (approx. 120 minu				
	-	ssessment: German and/	or English			
Allocati	ion of p	olaces				
Additio	nal info	ormation				
Worklo	ad					
240 h						
Teachin	ig cycle	9				
Referre	d to in	LPOI (examination regu	lations for teaching-o	degree programmes)		
Module	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)

Module t	title			Abbreviation	
Theoreti	cal Mechanics			11-T-M-152-m01	
Module	coordinator		Module offered by		
Managin and Astro	g Director of the Institute of Tł ophysics	neoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS I	Method of grading	Only after succ. con	npl. of module(s)		
	numerical grade				
Duration	Module level	Other prerequisites			
1 semest	ter undergraduate	13 exercise sheets p approx. 50% of exer	site to assessment: o per semester). Studen rcises will qualify for students about the re	nts who successfully admission to asses	/ completed sment. The
Contents					
ons, med systems 3. Hamilt Poisson Liouville 4. Applic electrom ring, cros 5. Relativ mics: Sta	ngian formulation: Variational chanical gauge transformation and apparent forces; tonian formulation: Legendre brackets, canonical transform theorem; Hamilton-Jacobi form tations: Central-force problem lagnetic field; rigid bodies, tor ss section [optional]; vistic dynamics: Lorentz Trans ability theory; KAM theory [opt <b>I learning outcomes</b>	; symmetries, Noethe transformation, phas ations; generator of s mulation [optional]; s; mechanical similar que and inertia tenso formation; Minkowsk	er theorem, cyclic coo e space; Hamilton fu symmetries, conserva ity, Virial theorem; m or, centrifugal and Eu i space; equations o	ordinates; accelerate nction, canonical ec ation laws; minimal ninor vibrations; par ler equations [optio	ed reference quations; coupling; ticles in an nal]; scatte-
miliar wi dently ap	ents have gained first experie th the principles of theoretica oply the acquired mathematic ret the results. They have espe	l mechanics and their al methods and techr	r different formulatio niques to simple prol	ns. They are able to plems of Theoretical	indepen-
Courses	(type, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (4) + Ü Module t	(2) taught in: Ü: German or Englis	h			
	<b>of assessment</b> (type, scope, la ormation on whether module c			tion offered — if not	every seme-
	xamination (approx. 120 minu e of assessment: German and				
Allocatio	on of places				
Addition	al information				
this will 1 3 Senten find that gistration ly registe sessmen sessmen	tion: If a student registers for t be considered a declaration o ace 4 ASPO (general academic the student has obtained the n for assessment into effect. C er for an assessment. Students at was not put into effect will n at to which he/she has not bee	f will to seek admissi and examination reg qualification for adm only those students th s who did not register ot be admitted to the en admitted, the grad	on to assessment pu ulations). If the mod ission to assessmen nat meet the respecti for an assessment of respective assessm e achieved in this as	rsuant to Section 20 ule coordinators sub it, they will put the s ve prerequisites car or whose registration ent. If a student take sessment will not be	Subsection osequently tudent's re- n successful- n for an as- es an as- e considered.
Bachelor's wi (2020)	th 1 major Nanostructure Technology		e generated 19-Apr-2025 • exa or (180 ECTS) Nanostrukturtee		page 146 / 156

# Workload

240 h

Teaching cycle

D

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

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# 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					Abbreviation
Quantu	ım Mec	hanics - Exercises			11-T-QA-152-m01
Module	e coord	inator		Module offered by	<u> </u>
		ector of the Institute of Th	neoretical Physics	Faculty of Physics a	and Astronomy
and Ast					
ECTS	Î	od of grading	Only after succ. con	npl. of module(s)	
5	nume	rical grade			
Duratio		Module level	Other prerequisites		
1 seme	ster	undergraduate			completion of exercises (approx.
					nts who successfully completed
					admission to assessment. The espective details at the beginning
			of the semester.	students about the n	espective details at the beginning
Conten	te		of the semester.		
		uantum machanica area	ding to the sentent -	faa T CEV/ Amaria	there Ways function and Coher
					thers Wave function and Schrö- QM, one-dimensional problems,
					nent in the electromagnetic field,
additio	n of an	gular momenta, approxi	mation methods, ator	ns with several elect	trons, etc.
Intende	ed lear	ning outcomes			
					s and are able to independently
		the description and solu	ition of problems of q	uantum theory and	to interpret the results in a physi-
cal mar					<b>`</b>
	<b>s</b> (type	, number of weekly conta	ict hours, language –	- if other than Germa	in)
Ü (2) Module	taugh	t in: Ü: German or Englisl	h		
			-	an German, evamina	tion offered — if not every seme-
		on on whether module c			and oncice in not every serie
written	exami	nation (approx. 120 minu	ites)		
		ssessment: German and			
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
this wil 3 Sente find tha gistrati ly regis sessme sessme	l be co ence 4 / at the s on for a ter for a ent was ent to w	nsidered a declaration of ASPO (general academic tudent has obtained the assessment into effect. C an assessment. Students not put into effect will n	f will to seek admission and examination reg qualification for adm only those students the s who did not register ot 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- tent. If a student takes an as- sessment will not be considered.
Worklo	ad				
150 h					
Teachi	ng cycl	e			
Referre	d to in	LPOI (examination regu	lations for teaching-o	degree programmes)	
Module	e appea	urs in			

Bachelor's with 1 major Nanostructure Technology	
(2020)	

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)

Module title				Abbreviation
Quantum Mec	hanics and Statistical	Physics		11-T-QS-152-m01
Module coord	inator		Module offered by	
			1	
and Astrophys	ector of the Institute of sics		Faculty of Physics a	and Astronomy
ECTS Metho	od of grading	Only after succ. cor	mpl. of module(s)	
6 nume	rical grade			
Duration	Module level	Other prerequisites	5	
2 semester	undergraduate			
Contents				
A. Quantum m 1. History and to quantum m 2. Wave functi pulse measure tionary solutic 3. Formalisatic space and Dir. 4. Postulates of certainty; 5. One-Dimensi- try properties; 6. Spin-1/2 sy two-level syste 7. Angular mo- solution of the 8. Central pote 9. Motion in a mentum; Gaug- motion of a fre- 10. Spin-1/2 sy 11. Addition of 12. Approxima- time-depende 13. Atoms with- mic structure a- B. Statistical F o. Principles of cro-states; pro- 1. Statistical P closed and op 2. Ideal syster 3. Statistical F ralised forces; 4. Thermodynam	principles; limits of cla echanics (QM); on and Schrödinger ec- ement; correspondence on of SG on of QM: Eigenvalue e ac notation; representa of QM (and their interp sional problems: The h stems I: Theoretical de ems (qubits); mentum: Commutation e eigenvalue equation i ential - hydrogen atom; n electromagnetic field ge transformation; Aha ee electron in a magnet ystems II: Formulation f angular momenta; ition methods: Station; nt perturbation theory; n several electrons: Ide and Hund's rules; Physics and thermodyn of statistics: Elements of obability space (condit hysics: Entropy and pr en systems (with energy ns: Spin systems; linea Physics and thermodyn the second and third I amics: Thermodynamic ic machines (Carnot er ns II, quantum statistic	puation (SG): SG for fre e principles: postulate quations; Physical sign ations in state space; t retation): state; measu armonic oscillator; pot scription in Dirac notat and rotations; eigenv n polar coordinates (co Bonding states in 3D; ; Hamiltonian operato ronov-Bohm effect; Sc cic field; using angular moment ary perturbation theory ntical particles; heliun amics: of statistics (central limi ional probability, statis obability theory; entrop gy and / or particle exc ar oscillators; ideal gas amics: The 1st law; qua- aw; reversibility; trans cindamentals relation gine and efficiency); c	e particles; superpos s of QM; Ehrenfest the nificance of the eiger ensor products of sta- urement; chronologic tential level; potentia tion; Spin 1/2 in the l alues of the angular oncrete); Coulomb potential; r; Normal Zeeman eff hrödinger, Heisenbe sum algebra; r (with examples); va n atom; Hartree and l stical independence) py in classical physic hange); s; asi-static processes; ition from Statistical nship; thermodynam hemical potential;	al development; energy-time un- al barrier; potential well; symme- homogeneous magnetic field; momentum operators (abstract); fect; canonical and kinetic mo- rg and interaction representation riational method; WKB method; Hartree-Fock approximation; ato-

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

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 can be chosen to earn a 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

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Workload

180 h

Teaching cycle

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**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)

Module					Abbreviation
Statist	ical Ph	ysics - Exercises			11-T-SA-152-m01
Module	a coord	inator		Module offered by	
		ector of the Institute of	Theoretical Physics	Faculty of Physics a	and Astronomy
and As	-		medielical Physics		and Astronomy
ECTS	<u> </u>	od of grading	Only after succ. cor	npl. of module(s)	
5	1	rical grade			
Duratio	n	Module level	Other prerequisites	5	
1 seme	ster	undergraduate		-	
Conten	ts				
Among potenti	others als, qu	Principles of statistics	, Statistical Physics, id and Bose gas, system	leal systems, fundar	e content of 11 T-SEV content. nental theorems, thermodynamic cles, approximation methods,
Intende	ed lear	ning outcomes			
and are	e able t		them to the descriptio		dynamics and Statistical Physics blems of Statistical Physics and
Course	<b>s</b> (type	, number of weekly con	tact hours, language -	– if other than Germa	in)
Ü (2)					
Module	e taugh	t in: Ü: German or Engli	sh		
		sessment (type, scope, ion on whether module			ition offered — if not every seme
		nation (approx. 120 mir ssessment: German an			
Allocat	ion of <sub>l</sub>	olaces			
Additio	nal inf	ormation			
Worklo	ad				
150 h					
Teachi		ρ			
	Seyer	•			
Poforro	d to in	LPOI (examination reg	ulations for toaching	degree programmas	
Referre			sulations for teaching-	uegree programmes)	
		•			
Module					
		gree (1 major) Physics (	-	-)	
		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 (			
		gree (1 major) Nanostru		20)	
		gree (1 major) Mathema		- /	
	or 5 ac	giee (I majoi) mathema	atical Physics (2020)		
Bachel		gree (1 major) Quantum			
Bachel Bachel	or's de				

Princin	e title			Abbreviation	
P	oles of Two- and Three-Dimen	sional Röntgen Imagin	g	11-ZDR-152-m01	
Modul	e coordinator		Module offered by	<u> </u>	
Manag	ging Director of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Method of grading	Only after succ. cor	· · · ·	,	
6	numerical grade		-		
Duratio	on Module level	Other prerequisites	5		
1 seme	ester graduate				
Conter	nts				
ton ab project traction charac	s of X-ray generation (X-ray tu sorption, scattering), physics tion, Fourier reconstruction, it n, visualisation,). Applicati terisation, metrology, biology	of X-ray detection. Mat erative methods). Imag ons of X-ray imaging in	hematics of reconstru- e processing (image the industrial sector	uction algorithms (fi data pre-processing (component testing	ltered rear g, feature ex- , material
	ed learning outcomes				
	udents know the principles of ques using X-rays and metho				
Course	<b>es</b> (type, number of weekly co	ntact hours, language -	– if other than Germa	n)	
V (3) + Module	R (1) e taught in: German or Englisl	1			
ster, in a) writt b) oral	d of assessment (type, scope nformation on whether module ten examination (approx. 90 t examination of one candidat examination in groups (group	e can be chosen to earr o 120 minutes) or e each (approx. 30 min	n a bonus) utes) or		t every seme-
e) pres If a wri stead t of asse	ect report (approx. 8 to 10 pa sentation/talk (approx. 30 min itten examination was chosen take the form of an oral exami essment is changed, the lectu date at the latest.	nutes). as method of assessm nation of one candidat	e each or an oral exa	mination in groups.	
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Langua Assess	•				
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Langua Assess Allocat	sment offered: Once a year, su				
Langua Assess Allocat	sment offered: Once a year, su tion of places				
Langua Assess Allocat	sment offered: Once a year, su tion of places onal information				
Langua Assess Allocat  Additic	sment offered: Once a year, su tion of places onal information				
Langua Assess Allocat  Additic  Worklo 180 h	sment offered: Once a year, su tion of places onal information				
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Langua Assess Allocat  Additio  180 h Teachi 	sment offered: Once a year, su tion of places onal information oad	ummer semester			
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Langua Assess Allocat  Additic  Worklo 180 h Teachi  Referro  Modulo	sment offered: Once a year, su tion of places onal information oad ing cycle ed to in LPO I (examination re	egulations for teaching-			
Langua Assess Allocat  Additic  Worklc 180 h Teachi  Referre  Bachel	sment offered: Once a year, su tion of places onal information oad ing cycle ed to in LPO I (examination re e appears in	egulations for teaching-	degree programmes)		
Langua Assess Allocat  Additic  Worklo 180 h Teachi  Referro  Bachel Bachel Master	sment offered: Once a year, su tion of places onal information oad ed to in LPO I (examination re e appears in lor's degree (1 major) Physics	immer semester	degree programmes)		

### Julius-Maximilians-UNIVERSITÄT WÜRZBURG

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
Method	ds of Non-Destructive Materia	al Testing		11-ZMB-152-m01
Module	coordinator		Module offered by	
	ing Director of the Institute of	Applied Physics	Faculty of Physics	
	Method of grading	Only after succ. co	· ·	
4	numerical grade			
- Duratio		Other prerequisite	16	
1 seme:			.5	
Conten				
Princip			ing. Thermography.	Neutron radiography. X-ray testing
	ed learning outcomes			
on (hea thods f	at, X-ray, terahertz), particles	(neutrons) or ultrasou types, particles and ult	nd waves with mater	es of different types of radiati- ials. They know the applied me- are able to apply them to basic
Course	<b>s</b> (type, number of weekly co	ntact hours, language	— if other than Germ	an)
V (2) + Module	R (1) e taught in: German or Englisł	1		
				ation offered — if not every seme-
	formation on whether module en examination (approx. 90 t	1	n a bonus)	
c) oral e	examination of one candidat examination in groups (group	e each (approx. 30 mir os of 2, approx. 30 min	-	or
c) oral e d) proje e) prese If a writ stead ta of asse nation Langua	examination in groups (group ect report (approx. 8 to 10 pag entation/talk (approx. 30 mir ten examination was chosen ake the form of an oral exami	e each (approx. 30 mir os of 2, approx. 30 min ges) or nutes). as method of assessn nation of one candida rer must inform studer nd/or English	utes per candidate) nent, this may be cha te each or an oral ex	or anged and assessment may in- amination in groups. If the method r weeks prior to the original exami
c) oral e d) proje e) prese If a writ stead ta of asse nation Langua Assess	examination in groups (group ect report (approx. 8 to 10 pag entation/talk (approx. 30 mir ten examination was chosen ake the form of an oral exami ssment is changed, the lectu date at the latest. ge of assessment: German a	e each (approx. 30 mir os of 2, approx. 30 min ges) or nutes). as method of assessn nation of one candida rer must inform studer nd/or English	utes per candidate) nent, this may be cha te each or an oral ex	anged and assessment may in- amination in groups. If the method
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### Julius-Maximilians-UNIVERSITÄT WÜRZBURG

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