

Module Catalogue for the Subject

Nanostructure Technology

as a Master's with 1 major with the degree "Master of Science" (120 ECTS credits)

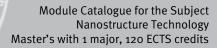
Examination regulations version: 2011 Responsible: Faculty of Physics and Astronomy



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The subject is divided into

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Content and Objectives of the Programme

The Master of Science program prepares students for scientific work in the field of Nanostructure Technology. Graduates of the program are qualified to pursue doctoral studies. The objective of the study program is to convey to the student an in-depth understanding of physical and technological principles relevant to the fields of applied physics and nanoscience. The program aims to develop not only physics knowledge, but also analytical thinking and problem solving skills, preparing the student for the constantly evolving fields in which physicists and technologists typically work. The granted degree is internationally comparable to a Masters degree in applied physics or nanotechnology.

Abbreviations used

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

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

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

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

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

Conventions

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

Notes

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

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

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

In accordance with

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

ASP02009

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

29-Jun-2011 (2011-48) except for mandatory electives added in Fast Track procedure at a later time

o2-Sep-2014 (2014-50) except for mandatory electives added in Fast Track procedure at a later time

17-Dec-2014 (2014-86)

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



Compulsory Courses

(44 ECTS credits)



Modul	e title				Abbreviation
Profes	Professional Specialization Nanostructure Technology				11-FS-N-072-m01
Modul	e coord	inator		Module offered by	•
chairp	erson o	f examination committee	2	Faculty of Physics a	and Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
15	nume	rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conte	nts				
specia	l releva				of nanostructure technology with equired fundamental topics in a
Intend	ed lear	ning outcomes			
gineer thesis	ing sub and are	discipline of nanostructue able to summarise their	re technology with sprace in an ora	pecial relevance to the presentation.	experimental, theoretical or en- ne intended topic of the Master's
	-	number of weekly contact hours,			
		tion on SWS (weekly con	<u> </u>		•
		sessment (type, scope, langua ble for bonus)	age — if other than German,	examination offered — if no	ot every semester, information on whether
talk (a	pprox. 3	30 to 45 minutes) with di	scussion		
Alloca	tion of p	places	_		
Additio	onal inf	ormation			
Workle	oad				
	-1				
Teachi	ng cycl	е			
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
<u></u>					
Modul	e appea	ars in			
	_	ee (1 major) Nanostructu	•,		
Maste	r's degr	ee (1 major) Nanostructu	re Technology (2010)		



Modul	e title	_			Abbreviation
Scient	ific Met	hods and Project Manag	ement Nanostructure	e Technology	11-MP-N-072-m01
Modul	Module coordinator			Module offered by	
chairp	erson o	f examination committee	1	Faculty of Physics a	and Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
15	nume	rical grade			
Duratio	on	Module level	Other prerequisites	1	
1 seme	ster	graduate			
Conter	ıts		•		
theore	tical, ex				project planning. Application to . Writing of a scientific project
Intend	ed learı	ning outcomes			
specia ster's t	l releva hesis, t		of the Master's thes and to summarise th	is and are able to de neir knowledge in an	nanostructure technology with evelop a project plan for the Maoral presentation.
		ion on SWS (weekly con			
		•	The state of the s		ot every semester, information on whether
		le for bonus)	ige — ii other than derman,	examination onered — ii iii	ot every semester, information on whether
talk (a	pprox. 3	30 to 45 minutes) with di	scussion		
Allocat	tion of p	olaces	,		
Additio	onal inf	ormation			
Worklo	ad				
Teachi	ng cycl	e			
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	ammes)	
Modul	e appea	rs in			
	_	ee (1 major) Nanostructu			
Master	's degr	ee (1 major) Nanostructu	re Technology (2010)		



e title				Abbreviation
Advanced Practical Course Master				11-PFM-111-m01
e coord	inator		Module offered by	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy		
Metho	od of grading	Only after succ. compl. of module(s)		
(not)	successfully completed			
on	Module level	Other prerequisites		
ster	graduate			
	e coord ing Dire Metho (not) s	e coordinator ing Director of the Institute of A Method of grading (not) successfully completed on Module level	ced Practical Course Master e coordinator ing Director of the Institute of Applied Physics Method of grading (not) successfully completed on Module level Other prerequisite	ced Practical Course Master e coordinator ing Director of the Institute of Applied Physics Method of grading (not) successfully completed on Module level Other prerequisites

Principles of Nuclear, Atomic and Molecular Physics, experiments on cryogenic temperatures and correlated systems, properties of solids, surfaces and interfaces. Experiments on the following topics: X-rays - nuclear magnetic resonance (NMR) - quantum Hall effect - optical pumping and spectroscopy in the field of optics - Hall effect - superconductivity - laser - solid-state optics

Intended learning outcomes

Knowledge of conducting experiments, analysing and documenting experimental results, basic knowledge of issuing scientific publications, application of modern evaluation systems. The students are familiar with modern experimental methods. They are able to work on a task on the basis of publications, to conduct and evaluate an experiment and to present and discuss their results in a scientific publication.

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

Prep seminar for Fortgeschrittenen-Praktikum Master (Advanced Practical Course Master): S (1 weekly contact hour)

Fortgeschrittenen-Praktikum Master (Advanced Practical Course Master) Part 1: P (3 weekly contact hours), German or English

Fortgeschrittenen-Praktikum Master (Advanced Practical Course Master) Part 2: P (3 weekly contact hours), German or English

Fortgeschrittenen-Praktikum Master (Advanced Practical Course Master) Part 3: P (3 weekly contact hours), German or English

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

This module has the following assessment components

- 1. Prep seminar for Fortgeschrittenen-Praktikum Master (Advanced Practical Course Master): oral examination (approx. 5 to 10 minutes)
- 2. Lab course in part 1 (Fortgeschrittenen-Praktikum Master/Advanced Practical Course Master Part 1): a) Preparing the experiment will be considered successfully completed if an oral test (approx. 30 minutes) is passed prior to the experiment. b) Performing and evaluating the experiment will be considered successfully completed if a test is passed. Students must prepare an experiment log (approx. 8 pages).
- 3. Lab course in part 2 (Fortgeschrittenen-Praktikum Master/Advanced Practical Course Master Part 2): a) Preparing the experiment will be considered successfully completed if an oral test (approx. 30 minutes) is passed prior to the experiment. b) Performing and evaluating the experiment will be considered successfully completed if a test is passed. Students must prepare an experiment log (approx. 8 pages).
- 4. Lab course in part 3 (Fortgeschrittenen-Praktikum Master/Advanced Practical Course Master Part 3): a) Preparing the experiment will be considered successfully completed if an oral test (approx. 30 minutes) is passed prior to the experiment. b) Performing and evaluating the experiment will be considered successfully completed if a test is passed. Students must prepare an experiment log (approx. 8 pages).

Language of assessment: German or English

Students must register for assessment components 1 through 4 online (details to be announced). Only those students who have attended the prep seminar for Fortgeschrittenen-Praktikum Master (Advanced Practical Course Master) will be allowed to perform experiments as part of the courses Fortgeschrittenen-Praktikum Master Parts 1 through 3.



Students will be offered one opportunity to retake element a) and/or element b) in the respective semester. To pass an assessment component, they must pass both elements (a and b) in the same semester.

To pass this module, students must pass each of the assessment components a through 6.

To pass this module, students must pass each of the assessment components 1 through 4. Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) FOKUS Physics (2011)



Module title					Abbreviation
Advanc	Advanced Seminar Nanostructure Technology				11-OSN-111-m01
Module	Module coordinator			Module offered by	
		ectors of the Institute of A of Theoretical Physics and		Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
4	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Semina	ar on cu	urrent issues of Theoretic	al or Experimental Ph	ysics.	
Intende	ed lear	ning outcomes			
are abl	e to ex				ntal or Theoretical Physics. They this knowledge and present it to
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	rman)	
S (no ir	nforma	tion on SWS (weekly cont	act hours) and cours	e language available	2)
		sessment (type, scope, langua ole for bonus)	ge — if other than German,	examination offered — if no	t every semester, information on whether
		ussion (approx. 30 to 45 r ssessment: German, Eng			
Allocat	ion of p	places			
Additio	nal inf	ormation			
Worklo	ad		,		
Teachi	ng cycl	e			
Referre	d to in	LPO I (examination regulations	s for teaching-degree progra	mmes)	
Module	appea	ars in			
Master	's degr	ee (1 major) Nanostructur	re Technology (2011)		



Compulsory Electives

(46 ECTS credits)



Specialization in Nanostructure Technology

(40 ECTS credits)

Modules worth a total of 40 ECTS credits must be successfully completed. Of these 40 ECTS credits, no less than 10 must be achieved in one of the two sub-areas "Elektronik und Photonik" ("Electronics and Photonics") and "Energie- und Materialforschung" ("Energy and Materials Research"). No less than 10 ECTS credits must be achieved in the sub-area "Allgemeine Physik" ("General Physics"). The remaining 20 ECTS credits may be achieved in any of the sub areas.



Electronics and Photonics

(ECTS credits)



Modul	e title				Abbreviation	
Visiting Research Project					11-FPA-112-m01	
Modul	e coord	inator		Module offered by	I	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy				
ECTS	Metho	od of grading	Only after succ. cor	Only after succ. compl. of module(s)		
10	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate	Approval by examination committee required.			

Independent work on a current research topic of Experimental and Theoretical Physics. Implementation of scientific experiments including analysis and documentation of the results, especially in the context of research visits to other universities or research institutes.

Intended learning outcomes

The students are able to independently work on a current research area of Experimental or Theoretical Physics, to conduct and analyse scientific experiments and to document the results.

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

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

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

project report (approx. 10 to 20 pages) Language of assessment: German, English

Allocation of places

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Additional information

Additional information on module duration: 1 to 2 semesters.

Workload

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Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Module	title				Abbreviation
Current	Current Topics in Nanostructure Technology				11-EXN6A-112-m01
Module	Module coordinator			Module offered by	
chairpe	erson o	f examination committee	!	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	graduate	Approval by examin	ation committee req	uired.
Conten	ts				
Current or stud	•		. Accredited academi	c achievements, e.g.	in case of change of university
Intende	ed learı	ning outcomes			
Techno nology	logy of or nan	the Master's programme	e. They have knowled and the measuring and	ge of a current subdi I evaluation method	of a module of Nanostructure iscipline of nanostructure techs necessary to acquire this knowcation areas.
Course	S (type, n	number of weekly contact hours,	anguage — if other than Ger	rman)	
V + R (n	o infor	mation on SWS (weekly	contact hours) and co	urse language avail	able)
		sessment (type, scope, langua le for bonus)	ge — if other than German, o	examination offered — if no	ot every semester, information on whether
in grou weeks)	ps (app or d) p		didate) or c) project re sentation (approx. 30	eport (approx. 8 to 10	lidate each or oral examination o pages, time to complete: 1 to 4
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
Teachi	ng cycl	e			
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	
Module	appea	nrs in			
Master	's degr	ee (1 major) Nanostructu	re Technology (2011)		



Module	e title				Abbreviation
Semico	Semiconductor Lasers - Principles and Current Research				11-HLF-092-m01
Module	e coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of Ap	pplied Physics	Faculty of Physics a	nd Astronomy
ECTS	Meth	od of grading	Only after succ. con	pl. of module(s)	
6	nume	rical grade			
Duratio	on	Module level	Other prerequisites	erequisites	
1 semester graduate		Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.		nts about the respective details ion for the course will be consission to assessment. If sturadmission to assessment over will put their registration for astall prerequisites will be admite subsequent semester. For as-	

This lecture discusses the principles of laser physics, based on the example of semiconductor lasers, and current developments regarding components. The principles of lasers are described on the basis of a general laser model, which will then be extended to special aspects of semiconductor lasers. Basic concepts such as threshold condition, characteristic curve and laser efficiency are derived from coupled rate equations for charge carriers and photons. Other topics of the lecture are optical processes in semiconductors, layer and ridge waveguides, laser resonators, mode selection, dynamic properties as well as technology for the generation of semiconductor lasers. The lecture closes with current topics of laser research such as quantum dot lasers, quantum cascade lasers, terahertz lasers or high-performance lasers.

Intended learning outcomes

The students have advanced knowledge of the principles of semiconductor-laser physics. They can apply their knowledge to modern questions and know the applications in the current development of components.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

location of places	
dditional information	
orkload	



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' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

Master's degree (1 major) Mathematics (2012)

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)

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



Module	e title	·			Abbreviation
Semico	onducto	or Nanostructures			11-HNS-092-m01
Module	e coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of A	applied Physics	Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 semester graduate		sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment i	trer will inform stude the course. Registrat on of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

Semiconductor nanostructures are frequently referred to as "artificial materials". In contrast to atoms, molecules or macroscopic crystals, their electronic, optical and magnetic properties can be systematically tailored by changing their size. The lecture addresses technological challenges in the preparation of semiconductor nanostructures of varying dimensions (2D, 1D, oD). It provides the basic theoretical concepts to describe their properties, with a focus on optical properties and light-matter coupling. Moreover, it discusses the challenges and concepts of novel optoelectronic and quantum photonic devices based on such nanostructures, including building blocks for quantum communication and quantum computing architectures.

Intended learning outcomes

The students know the theoretical principles and characteristics of semiconductor nanostructures. They have knowledge of the technological methods to fabricate such structures, and of their applications to novel photonic devices. They are able to apply their knowledge to problems in this field of research.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places --Additional information --Workload ---



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' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

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

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)

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



Module	e title				Abbreviation
Nanoar	nalytic	5			11-NAN-092-m01
Module	coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of A	pplied Physics	Faculty of Physics a	nd Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
graduate Certain prerequisite sessment. The lectu at the beginning of t sidered a declaratio dents have obtained the course of the sessment into effect ted to assessment in		rer will inform stude the course. Registrat n of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- r admission to assessment over will put their registration for as- t all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for		

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

Intended learning outcomes

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.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places --Additional information --Workload ---



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' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

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



Module	e title			Abbreviation		
Nano-C	ptics			11-NOP-092-m01		
Module	coord	inator		Module offered by		
Manag	ing Dir	ector of the Institute	of Applied Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. c	ompl. of module(s)		
4	nume	rical grade				
Duratio	n	Module level	Other prerequisit	Other prerequisites		
graduate Certain prerequisites must be met to qualify for admission to sessment. The lecturer will inform students about the resperant the beginning of the course. Registration for the course will sidered a declaration of will to seek admission to assessment have obtained the qualification for admission to assessment into effect. Students who meet all prerequisites with the course of the semester, the lecturer will put their registres sessment into effect. Students who meet all prerequisites with the discovery control of the subsequent sements as a later date, students will have to obtain the quadmission to assessment anew.		cturer will inform students about the respective details of the course. Registration for the course will be contion of will to seek admission to assessment. If stuned the qualification for admission to assessment over semester, the lecturer will put their registration for asect. Students who meet all prerequisites will be admittin the current or in the subsequent semester. For aser date, students will have to obtain the qualification for				

Theoretical principles. Focussing of light. Microscopy. Optical nearfield probes. Nearfield microscopy. Single quantum emitters. Light emission in nano-tailored environments. Plasmons. Optical antennas.

Intended learning outcomes

The students have specific and advanced knowledge in the field of nano-optics. They are familiar with the theoretical principles and application areas of nano-optics and with current developments in this field.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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' degree (1 major) Physics (2010)

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 25 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Bachelor' degree (1 major) Physics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	title	,			Abbreviation
Semico	nducto	or Physics and Devices			11-SPD-102-m01
Module	coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semester graduate Ce se at si de th		sessment. The lectu at the beginning of t sidered a declaratio dents have obtained the course of the se sessment into effect ted to assessment in	rer will inform stude the course. Registraten of will to seek admed the qualification for mester, the lecturer to students who meen the current or in the date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- r admission to assessment over will put their registration for as- t all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

Principles of Semiconductor Physics. Introduction to key theories on semiconductors. Components from the areas of electronics and photonics.

Intended learning outcomes

The students are familiar with the properties of semiconductors, they have gained an overview of the electronic and phononic band structures of important semiconductors and the resulting electronic, optical and thermal properties. They know the principles of charge transport and are able to apply Poisson, Boltzmann and continuity equations to the solution of questions. They have gained insights into the methods of semiconductor production and are familiar with the methods of planar technology and current developments in this sector, they have a basic understanding of component production. They understand the structure and function of the main components of electronics (diodes, transistor, FET, thyristor, diac, triac), microwave applications (tunnel, impatt, baritt and Gunn diode) and optoelectronics (photo diode, solar cell, light-emitting diode, semiconductor injection laser). They know the realisation possibilities of low-dimensional charge carrier systems on the basis of semiconductors and their technological importance. They are familiar with current developments in the field of components.

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

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

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

written examination (approx. 90 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 27 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)

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



Module title				Abbreviation		
Quantu	m Trar	nsport in Semicondu	ctor Nanostructures	11-QTH-102-m01		
Module	Module coordinator			Module offered by		
Managi	ng Dire	ector of the Institute	of Applied Physics	Faculty of Physics and Astronomy		
ECTS	Metho	od of grading	Only after succ. co	ompl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisite	Other prerequisites		
1 semester graduate		sessment. The lector at the beginning of sidered a declarate dents have obtain the course of the sessment into effected to assessment	tes must be met to qualify for admission to asturer will inform students about the respective details of the course. Registration for the course will be contion of will to seek admission to assessment. If stued the qualification for admission to assessment over semester, the lecturer will put their registration for astect. Students who meet all prerequisites will be admitted in the current or in the subsequent semester. For aster date, students will have to obtain the qualification for essment anew.			

The lecture addresses the fundamental transport phenomena of electrons in nanostructures. This includes the topics of: ballistic and diffuse transport, electron interference effects, quantisation of conductivity, interaction phenomena between electrons, Coulomb blockade, thermoelectric properties, description of spin-dependent transport phenomena, topological insulators, solid-state quantum computers.

Intended learning outcomes

The students have mastered the basics of electronics of nanostructures in theory and practice. They know functions and applications of respective components.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Master's with 1 major Nanostructure Technolog	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 29 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

Master's degree (1 major) Physics (2011)

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

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) FOKUS Physics (2011)

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



Module	e title			Abbreviation		
Spintronics				11-SPI-102-m01		
Module	Module coordinator			Module offered by		
Manag	ing Dir	ector of the Institute	of Applied Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisite	Other prerequisites		
1 semester graduate Certain prerequisites must be met to qualify for admission sessment. The lecturer will inform students about the respect to the beginning of the course. Registration for the course sidered a declaration of will to seek admission to assess dents have obtained the qualification for admission to assessment into effect. Students who meet all prerequisites ted to assessment in the current or in the subsequent sem sessment at a later date, students will have to obtain the admission to assessment anew.		turer will inform students about the respective details if the course. Registration for the course will be conson of will to seek admission to assessment. If stued the qualification for admission to assessment over emester, the lecturer will put their registration for asct. Students who meet all prerequisites will be admitin the current or in the subsequent semester. For ascr date, students will have to obtain the qualification for				

This lecture covers the basic principles of spin transport, with a particular emphasis on the phenomena of giant magnetoresistance and tunnel magnetoresistance. As a last point, we discuss new phenomena from the field of spin dynamics and current-induced spin phenomena.

Intended learning outcomes

The students know the basic principles of spin transport models and the applications of spin transport in information technology. They have gained an overview of current findings in this field (giant magnetoresistance, tunnel magnetoresistance).

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 31 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) FOKUS Physics (2006)



Module title					Abbreviation	
Curren	t Topic	s in Nanostructure Techn	ology		11-EXN5-111-m01	
Modul	Module coordinator Modu			Module offered by		
chairp	erson o	f examination committee		Faculty of Physics a	nd Astronomy	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade	-			
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate	Approval by examin	ation committee req	uired.	
Conter	nts					
	t topics ly abroa		. Accredited academi	c achievements, e.g.	in case of change of university	
Intend	ed lear	ning outcomes				
Techno nology	ology of or nan	the Master's programme	. They have knowled nd the measuring and	ge of a current subdi I evaluation method	of a module of Nanostructure iscipline of nanostructure techs necessary to acquire this knowcation areas.	
Course	es (type, r	number of weekly contact hours, l	anguage — if other than Ger	rman)		
V + R (ı	no infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)	
		sessment (type, scope, langua ble for bonus)	ge — if other than German, o	examination offered — if no	ot every semester, information on whether	
less ot minute prox. 8 tes)	herwise es per c 8 to 10 p	e specified) or b) oral exa andidate, for modules wi	mination of one cand th less than 4 ECTS c 1 to 4 weeks) or d) pr	lidate each or oral ex redits approx. 20 mi	credits approx. 90 minutes; un- kamination in groups (approx. 30 nutes) or c) project report (ap- presentation (approx. 30 minu-	
	tion of					
Additio	onal inf	ormation				
Worklo	oad					
Teachi	ng cycl	e				
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)					
Modul	e appea	ars in				
Master	r's degr	ee (1 major) Nanostructuı	re Technology (2011)			
Master	Master's degree (1 major) Nanostructure Technology (2010)					



Module	e title	·	Abbreviation			
Curren	t Topic	s in Nanostructure Techn	ology		11-EXN6-111-m01	
Module	e coord	inator		Module offered by		
chairpe	erson o	f examination committee		Faculty of Physics a	and Astronomy	
ECTS	CTS Method of grading Only after succ. compl. of module(s)					
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate	Approval by examin	ation committee req	uired.	
Conten	ıts					
	t topics ly abroa		. Accredited academi	c achievements, e.g.	. in case of change of university	
Intend	ed lear	ning outcomes				
Techno nology ledge.	ology of or nan They ar	the Master's programme o sciences and understar e able to classify the sub	t. They have knowled and the measuring and ject-specific contexts	ge of a current subdi I evaluation method and know the appli	of a module of Nanostructure iscipline of nanostructure techs necessary to acquire this know-cation areas.	
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	man)		
V + R (r	no infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)	
		sessment (type, scope, langua ble for bonus)	ge $-$ if other than German, ϵ	examination offered — if no	ot every semester, information on whether	
less ot minute prox. 8 tes)	herwise es per c s to 10 p	e specified) or b) oral exa andidate, for modules wi	mination of one cand th less than 4 ECTS c 1 to 4 weeks) or d) pro	lidate each or oral ex redits approx. 20 mi	credits approx. 90 minutes; un- kamination in groups (approx. 30 nutes) or c) project report (ap- presentation (approx. 30 minu-	
	tion of p					
Additio	onal inf	ormation				
Worklo	ad					
Teachi	Teaching cycle					
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)					
Module	e appea	ars in				
		ee (1 major) Nanostructui	re Technology (2011)			
Master	Master's degree (1 major) Nanostructure Technology (2010)					



Modul	e title	,	Abbreviation						
Curren	t Topic	s in Nanostructure Techn	11-EXN7-111-mo1						
Modul	e coord	inator		Module offered by					
chairp	erson o	f examination committee		Faculty of Physics and Astronomy					
ECTS	Meth	od of grading	Only after succ. com	npl. of module(s)					
7	nume	rical grade							
Duration Module level		Module level	Other prerequisites						
1 semester graduate		graduate	Approval by examination committee required.						
Contents									
Current topics of Experimental Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.									
Intended learning outcomes									
The students have advanced competencies corresponding to the requirements of a module of Nanostructure Technology of the Master's programme. They have knowledge of a current subdiscipline of nanostructure technology or nano sciences 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.									
Course	es (type, i	number of weekly contact hours, l	anguage — if other than Ger	man)					
V + R (no information on SWS (weekly contact hours) and course language available)									
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)									
a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes) Language of assessment: German, English									
Allocation of places									
Additio	onal inf	ormation							
Worklo	oad								
Teaching cycle									
Referred to in LPO I (examination regulations for teaching-degree programmes)									
Modul	Module appears in								
Master	r's degr	ee (1 major) Nanostructui	re Technology (2011)						
Master	Master's degree (1 major) Nanostructure Technology (2010)								



Modul	e title		Abbreviation						
Curren	t Topic	s in Nanostructure Techn	11-EXN8-111-m01						
Modul	e coord	inator		Module offered by					
chairperson of examination committee				Faculty of Physics and Astronomy					
ECTS	Metho	od of grading	Only after succ. com						
8	nume	rical grade							
Duration Module level		Module level	Other prerequisites						
1 semester		graduate	Approval by examination committee required.						
Conter	Contents								
Current topics of Experimental Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.									
Intended learning outcomes									
The students have advanced competencies corresponding to the requirements of a module of Nanostructure Technology of the Master's programme. They have knowledge of a current subdiscipline of nanostructure technology or nano sciences 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.									
Courses (type, number of weekly contact hours, language — if other than German)									
V + R (1	no infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)				
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)									
a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes) Language of assessment: German, English									
Allocat	tion of	places							
Additional information									
Workload									
Teaching cycle									
Referred to in LPO I (examination regulations for teaching-degree programmes)									
									
Module appears in									
Master	Master's degree (1 major) Nanostructure Technology (2011)								

Master's degree (1 major) Nanostructure Technology (2010)



Modul	e title			Abbreviation	
Densit	Density Functional Theory and the Physics of Oxide Heterostructure				11-DFT-142-m01
Module coordinator Module offered by				by	
chairp	erson o	f examination committe	ee	Faculty of Physics and Astronomy	
ECTS	Meth	od of grading	Only after succ. cor	Only after succ. compl. of module(s)	
4	4 numerical grade				
Durati	Duration Module level		Other prerequisites	;	
1 seme	ester	graduate			
Contor	at c				

The students are familiar with the physical values of oxide heterostructures and with the principles and methods of density functional theory. They are able to model problems of Theoretical Physics with the help of important programmes such as Wien2k or VASP. They can make simple calculations with the help of density functional theory.

Intended learning outcomes

The students are familiar with the physical values of oxide heterostructures and with the principles and methods of density functional theory. They are able to model problems of Theoretical Physics with the help of important programmes such as Wienzk or VASP. They can make simple calculations with the help of density functional theory.

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

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

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

a) written examination (90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: approx. 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Energy Research and Material Science

(ECTS credits)



Contents	Modul	Module title Abbreviation				
holder of the Chair of Chemical Technology of Material Synthesis thesis Chair of Chemical Technology of Material Synthesis thesis	Techno	ology o	f Sensor and Actor Mater	ials including Smart	Fluids	08-SAM-092-m01
thesis ECTS Method of grading Only after succ. compl. of module(s) 5 numerical grade	Modul	e coord	linator		Module offered by	•
Duration Module level Other prerequisites 1 semester graduate Contents Fabrication, effects and applications of sensory and actuatory materials such as piezoelectrics, shape memory materials and magnetostrictive materials. Electrorheological and magnetorheological fluids, magnetofluids. Intended learning outcomes Students have developed fundamental knowledge in the area of sensory and actuatory materials. Courses (type, number of weekly contact hours, language – if other than German) V + P (no information on SWS (weekly contact hours) and course language available) Method of assessment (type, scope, language – if other than German, examination offered – if not every semester, information on whether module is creditable for bonus) written examination (90 minutes) Allocation of places Additional information Workload Teaching cycle Referred to in LPO 1 (examination regulations for teaching-degree programmes) Module appears in Master's degree (1 major) Physics (2010) Master's degree (1 major) Physics (2011) Master's degree (1 major) Technology of Functional Materials (2009) Master's degree (1 major) Technology of Functional Materials (2009) Master's degree (1 major) Technology of Functional Materials (2009) Master's degree (1 major) Technology of Functional Materials (2009) Master's degree (1 major) Nanostructure Technology (2011)	holder thesis	of the	Chair of Chemical Techno	logy of Material Syn-	Chair of Chemical T	echnology of Material Synthesis
Duration Module level Other prerequisites 1 semester graduate Contents Fabrication, effects and applications of sensory and actuatory materials such as piezoelectrics, shape memory materials and magnetostrictive materials. Electrorheological and magnetorheological fluids, magnetofluids. Intended learning outcomes Students have developed fundamental knowledge in the area of sensory and actuatory materials. Courses (type, number of weekly contact hours, language — if other than German) V + P (no information on SWS (weekly contact hours) and course language available) Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus) written examination (90 minutes) Allocation of places Additional information Teaching cycle Referred to in LPO I (examination regulations for teaching-degree programmes) Module appears in Master's degree (1 major) Physics (2010) Master's degree (1 major) Physics (2011) Master's degree (1 major) Technology of Functional Materials (2010) Master's degree (1 major) Technology of Functional Materials (2010) Master's degree (1 major) Technology of Functional Materials (2010) Master's degree (1 major) Nanostructure Technology (2011)	ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
Teaching cycle	5	nume	rical grade			
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Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus) written examination (90 minutes) Allocation of places						able)
Allocation of places	module i	s credital	ole for bonus)	ge — if other than German, d	examination offered — if no	ot every semester, information on whether
Additional information Workload Teaching cycle Referred to in LPO I (examination regulations for teaching-degree programmes) Module appears in Master's degree (1 major) Physics (2010) Master's degree (1 major) Physics (2011) Master's degree (1 major) Technology of Functional Materials (2010) Master's degree (1 major) Technology of Functional Materials (2009) Master's degree (1 major) Nanostructure Technology (2011)						
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Workload Teaching cycle Referred to in LPO I (examination regulations for teaching-degree programmes) Module appears in Master's degree (1 major) Physics (2010) Master's degree (1 major) Physics (2011) Master's degree (1 major) Technology of Functional Materials (2010) Master's degree (1 major) Technology of Functional Materials (2009) Master's degree (1 major) Nanostructure Technology (2011)						
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Master's degree (1 major) Technology of Functional Materials (2009) Master's degree (1 major) Nanostructure Technology (2011)						
Master's degree (1 major) Nanostructure Technology (2011)		-				
					3 (2009)	



Module	title			Abbreviation		
Organi	c Semi	conductor		11-OHL-092-m01		
Module	coord	inator		Module offered by		
Managi	ing Dire	ector of the Institute	of Applied Physics	Faculty of Physics and Astronomy		
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites	Other prerequisites		
1 semester graduate		50% of exercises. C sion to assessment ve details at the be be considered a de students have obta over the course of t assessment into eff mitted to assessme	isite to assessment: successful completion of approx. ertain prerequisites must be met to qualify for admission. The lecturer will inform students about the respectigining of the course. Registration for the course will claration of will to seek admission to assessment. If ined the qualification for admission to assessment he semester, the lecturer will put their registration for fect. Students who meet all prerequisites will be adent in the current or in the subsequent semester. For er date, students will have to obtain the qualification sessment anew.			

Physical principles of organic semiconductors, molecular and polymer electronics and sensor technology, applications.

Intended learning outcomes

The students have advanced knowledge of organic semiconductors.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Allocation of places

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Additional information

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Workload

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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' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

Master's degree (1 major) Physics (2011)

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



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

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

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



Modul	Module title Abbreviation					
Electro	chemic	cal Energy Storage and Co	onversion		08-EEW-101-m01	
Modul	e coord	inator		Module offered by		
holder thesis	of the	Chair of Chemical Techno	logy of Material Syn-	Chair of Chemical T	Fechnology of Material Synthesis	
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conter	its					
um and cal dou (Si, CIS	d nicke uble lay 5, CIGS,	l metal hydride, sodium s ver capacitors, redox-flow GaAs, organic and dye s	sulphur, sodium nicke batteries, fuel cell sy	el chloride, lithium i estems (AFC, PEMFC,	ems such as lead, nickel cadmion accumulators), electrochemion, DMFC, PAFC, SOFC), solar cells	
		ning outcomes				
		e developed a knowledge ge to research problems.	of electrochemical e	nergy storage and c	onversion and are able to apply	
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	man)		
V + P +	E (no i	nformation on SWS (weel	kly contact hours) and	d course language a	vailable)	
		sessment (type, scope, langua ble for bonus)	ge — if other than German, o	examination offered — if no	ot every semester, information on whether	
written	exami	nation (90 minutes) and	lab report (approx. 5	pages)		
Allocat	ion of p	places				
Additio	nal inf	ormation				
Worklo	ad					
Teachi	Teaching cycle					
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	mmes)		
Modul						
	_	ree (1 major) Nanostructu				
	_	ee (1 major) Physics (201 ee (1 major) Physics (201				
	_	· ·		s (2010)		
masici	Master's degree (1 major) Technology of Functional Materials (2010)					

Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010)



Modul	e title				Abbreviation
Visitin	g Resea	arch Project			11-FPA-112-m01
Modul	Module coordinator Module offered by				
Manag	Managing Director of the Institute of Applied Physics			Faculty of Physics and Astronomy	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)	
10	nume	rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate	Approval by examination committee required.		

Independent work on a current research topic of Experimental and Theoretical Physics. Implementation of scientific experiments including analysis and documentation of the results, especially in the context of research visits to other universities or research institutes.

Intended learning outcomes

The students are able to independently work on a current research area of Experimental or Theoretical Physics, to conduct and analyse scientific experiments and to document the results.

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

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

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

project report (approx. 10 to 20 pages) Language of assessment: German, English

Allocation of places

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Additional information

Additional information on module duration: 1 to 2 semesters.

Workload

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Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Module title Abbreviation				
Current Topics in Nanostructure Technology				
	Module offered by			
	Faculty of Physics a	and Astronomy		
Only after succ. con	npl. of module(s)			
Other prerequisites				
Approval by examin	ation committee req	uired.		
. Accredited academi	c achievements, e.g.	. in case of change of university		
e. They have knowled and the measuring and	ge of a current subdi d evaluation method	iscipline of nanostructure tech- s necessary to acquire this know-		
anguage — if other than Gei	rman)			
contact hours) and co	ourse language avail	able)		
ge — if other than German,	examination offered — if no	ot every semester, information on whether		
didate) or c) project r	eport (approx. 8 to 1			
Additional information				
Workload				
Teaching cycle				
Referred to in LPO I (examination regulations for teaching-degree programmes)				
	Only after succ. con Other prerequisites Approval by examin Accredited academi Accredited academi They have knowled and the measuring and ject-specific contexts anguage — if other than Ger contact hours) and co ge — if other than German, nutes) or b) oral exami didate) or c) project re sentation (approx. 30 lish	Module offered by Faculty of Physics a Only after succ. compl. of module(s) Other prerequisites Approval by examination committee requirements, e.g. Accredited academic achievements, e.g. They have knowledge of a current subdited the measuring and evaluation method ject-specific contexts and know the applicanguage — if other than German) Contact hours) and course language availage — if other than German, examination offered — if not included or c) project report (approx. 8 to 1 sentation (approx. 30 minutes) lish		

Master's degree (1 major) Nanostructure Technology (2011)



Module	e title	·			Abbreviation
Princip	les of I	Energy Technologies			11-ENT-092-m01
Module	e coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of	Applied Physics	Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)	
6	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 semester graduate		sessment. The lectrat the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment	urer will inform stude the course. Registrat on of will to seek admed the qualification for emester, the lecturer of the current or in the date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

Physical principles of energy conservation and energy conversion, energy transport and energy storage as well as renewable resources of energy. We also discuss aspects of optimising materials (e.g. nanostructured insulating materials, selective layers, highly activated carbons). The course is especially suitable for teaching degree students. Energy conservation via thermal insulation. Thermodynamic energy efficiency. Fossil fired energy converters. Nuclear power plants. Hydroelectricity. Wind turbines. Photovoltaics. Solar thermal: Heat. Solar thermal: Electricity. Biomass. Geothermal energy. Energy storage. Energy transport

Intended learning outcomes

The students know the principles of different methods of energy technology, especially energy conversion, transport and storage. They understand the structures of corresponding installations and are able to compare them.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Illocation of places	
dditional information	
Vorkload	
eaching cycle	



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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

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



Module	e title				Abbreviation
Thermo	odynan	nics and Economics			11-TDO-092-m01
Module	coord	inator		Module offered by	
Managi and Ast	_	ector of the Institute of Th	neoretical Physics Faculty of Physics and Astronomy		and Astronomy
ECTS	ECTS Method of grading		Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semester graduate		sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment i	trer will inform stude the course. Registrat on of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

Energy and economic growth, entropy production, emission reduction. Part I describes the role of energy conversion in the development of the universe, the evolution of life and the unfolding of civilisation. In non-equilibrium thermodynamics, the entropy production density shows the relevance of the second law of thermodynamics for ecological damage and resource consumption. Energy conversion, entropy production and natural resources define the technological and ecological boundaries of industrial economic growth. Part 2 analyses how the factors capital, work, energy and creativity produce the goods and services of a national economy and determine economic growth. The productive power of cheap energy by far exceeds that of expensive labour. Within the current system of taxes and social security contributions, this discrepancy between power and costs of production factors leads to job cuts, waste of resources, impoverishment of nations and growing social tensions. The course discusses how factor income taxation can counteract this development. Part 3 includes seminar presentations, comprises the techniques of rational energy use and non-fossil energy use, and introduces the optimisation programme deeco (Dynamic Energy, Emission and Cost Optimization).

Intended learning outcomes

The students understand that energy conversion and entropy production are going to play an important role in the world's economic and social development. As an extension of economic theory, the students know the connections between thermodynamics and economy as well as the productive physical basis of modern economies. They are able to apply the acquired knowledge to particular problems.

NOTE: this is the module that was run by Prof. Dr. R. Kümmel, who has now retired. As the module was tailored to his own theory of economy, it has yet to be decided whether we will continue to offer this module.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English



Allocation of places

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Additional information

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Workload

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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' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	e title				Abbreviation
Nanote	chnolo	ogy in Energy Research			11-NTE-092-m01
Module	coord	inator		Module offered by	
Managi	ing Dire	ector of the Institute of A	pplied Physics	Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
4	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semester graduate		graduate	Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.		

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 physical contexts. It uses specific materials and components as examples, such as thermal insulation materials, heat accumulators, functional nanoscale layer and particle systems with spectral selective properties, nanoporous vacuum insulations and electrode materials.

Intended learning outcomes

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.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

examination regulations) 2009.
Allocation of places
Additional information
Workload
Teaching cycle



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

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

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

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Module	e title			Abbreviation		
Coating	g Techi	nologies based on V	apour Deposition	11-BVG-092-m01		
Module	e coord	linator		Module offered by		
Manag	ing Dir	ector of the Institute	of Applied Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. o	compl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisit	Other prerequisites		
1 semester graduate		sessment. The leat the beginning of sidered a declarate dents have obtain the course of the sessment into effect to assessment	ites must be met to qualify for admission to ascturer will inform students about the respective details of the course. Registration for the course will be contion of will to seek admission to assessment. If stuned the qualification for admission to assessment over semester, the lecturer will put their registration for asfect. Students who meet all prerequisites will be admitted in the current or in the subsequent semester. For aser date, students will have to obtain the qualification for essment anew.			

Physical technical principles of PVD and CVD installations and processes. Coating deposit and layer characterisation. Application of layer materials on an industrial level.

Intended learning outcomes

The students have advanced knowledge of coating deposit processes in the gaseous phase and gain insights into their industrial relevance and variety.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

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

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



Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Functional Materials (2012)



Module title					Abbreviation	
Ultrafa	st Spec	troscopy and Quantur	n Control		08-PCM4-PHY-111-m01	
Modul	e coord	inator		Module offered by		
	r of the enkontr	seminar "Ultrakurzzeit olle"	tspektroskopie and	Institute of Physica	al and Theoretical Chemistry	
ECTS	Metho	od of grading	Only after succ. co	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites	;		
1 seme	ester	graduate				
Conter	nts					
		iscusses advanced top ime-resolved laser spe			control. It focuses on ultrashort	
Intend	ed learı	ning outcomes				
princip	les and	ry of time-resolved lase I applications of quant number of weekly contact hour	um control.	·	ethods. They can describe the	
S + Ü (no infor	mation on SWS (week	y contact hours) and c	ourse language avai	lable)	
		sessment (type, scope, langle for bonus)	guage — if other than German,	examination offered — if no	ot every semester, information on whether	
		nation (90 minutes) or ssessment: German or		e candidate each (20	o minutes) or talk (30 minutes)	
Allocat	tion of p	olaces				
Additio	onal inf	ormation	-			
Worklo	oad					
Teaching cycle						
						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
						
Module appears in						
Master's degree (1 major) Physics (2010) Master's degree (1 major) Physics (2011)						

Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics (2010) Master's degree (1 major) FOKUS Physics (2011)



Module title Abbreviation							
Structi	ure and	Properties of Modern Ma	and Simulations	08-MW-PHY-111-m01			
Modul	e coord	inator		Module offered by			
holder thesis	of the (Chair of Chemical Techno	logy of Material Syn-		echnology of Material 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	graduate					
Conter	nts						
Materi simula		erties of metals and cera	mics: correlation of s	tructure/property rel	ations through experiments and		
Intend	ed learı	ning outcomes					
mance	cerami special f	cs. They are introduced t	o measuring method	s and calculation me	minium alloys and high-perfor- ethods using numerical simulati- f materials and the resulting pro-		
Course	es (type, r	number of weekly contact hours, l	anguage — if other than Gei	rman)			
V + S (ı	no infor	mation on SWS (weekly o	contact hours) and co	ourse language avail	able)		
			ge — if other than German,	examination offered — if no	ot every semester, information on whether		
		le for bonus)					
		45 minutes)					
Alloca	tion of p	olaces					
Additio	onal inf	ormation					
Worklo	oad						
Teachi	ng cycl	e					
							
Referred to in LPO I (examination regulations for teaching-degree programmes)							
							
	Module appears in						
	Master's degree (1 major) Physics (2010)						
	_	ee (1 major) Physics (201 ee (1 major) Nanostructu					
	_	• •	•,				
Master's degree (1 major) Nanostructure Technology (2010)							



Module title				Abbreviation		
Current	Current Topics in Nanostructure Technology 11-EXN5-111-mo1					
Module	coord	inator		Module offered by		
chairpe	rson of	f examination committee		Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate	Approval by examin	ation committee req	uired.	
Conten	ts					
Current or stud			. Accredited academi	c achievements, e.g.	in case of change of university	
Intende	ed learr	ning outcomes				
Techno nology	logy of or nand	the Master's programme	. They have knowled; nd the measuring and	ge of a current subdi I evaluation method	of a module of Nanostructure scipline of nanostructure techs necessary to acquire this knowcation areas.	
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)		
V + R (n	o infor	mation on SWS (weekly o	contact hours) and co	urse language availa	able)	
		eessment (type, scope, langua le for bonus)	ge $-$ if other than German, ϵ	examination offered — if no	t every semester, information on whether	
less oth minute prox. 8 tes)	nerwise s per ca to 10 p	e specified) or b) oral exa andidate, for modules wi	mination of one cand th less than 4 ECTS c 1 to 4 weeks) or d) pro	lidate each or oral ex redits approx. 20 mi	credits approx. 90 minutes; un- kamination in groups (approx. 30 nutes) or c) project report (ap- presentation (approx. 30 minu-	
Allocat	ion of p	laces				
Additio	nal info	ormation				
Worklo	ad					
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master'	Master's degree (1 major) Nanostructure Technology (2011)					
Master'	Master's degree (1 major) Nanostructure Technology (2010)					



Module title				Abbreviation		
Curren	Current Topics in Nanostructure Technology				11-EXN6-111-m01	
Modul	e coord	inator		Module offered by		
chairp	erson o	f examination committee		Faculty of Physics a	nd Astronomy	
ECTS	Meth	od of grading	Only after succ. com	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate	Approval by examin	ation committee req	uired.	
Conter	nts					
	t topics ly abroa		. Accredited academi	c achievements, e.g.	in case of change of university	
Intend	ed lear	ning outcomes				
Techno nology	ology of or nan	the Master's programme	. They have knowled nd the measuring and	ge of a current subdi I evaluation method	of a module of Nanostructure scipline of nanostructure techs necessary to acquire this knowcation areas.	
Course	es (type, r	number of weekly contact hours, l	anguage — if other than Ger	rman)		
V + R (1	no infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)	
		sessment (type, scope, langua ble for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether	
less ot minute prox. 8 tes)	herwise es per c 8 to 10 p	e specified) or b) oral exa andidate, for modules wi	mination of one cand th less than 4 ECTS c 1 to 4 weeks) or d) pro	lidate each or oral ex redits approx. 20 mi	credits approx. 90 minutes; un- kamination in groups (approx. 30 nutes) or c) project report (ap- presentation (approx. 30 minu-	
	tion of					
Additio	onal inf	ormation				
Worklo	oad					
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master	Master's degree (1 major) Nanostructure Technology (2011)					
Master	Master's degree (1 major) Nanostructure Technology (2010)					



Module title				Abbreviation		
Current	Current Topics in Nanostructure Technology 11-EXN7-111-m01					
Module	coord	inator		Module offered by		
chairpe	erson of	examination committee		Faculty of Physics a	nd Astronomy	
ECTS	Metho	d of grading	Only after succ. com	ıpl. of module(s)		
7	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate	Approval by examina	ation committee req	uired.	
Conten	ts					
Current or stud			Accredited academi	c achievements, e.g.	. in case of change of university	
Intende	ed learr	ning outcomes				
Techno nology	logy of or nand	the Master's programme	. They have knowledged the measuring and	ge of a current subdi I evaluation method	of a module of Nanostructure scipline of nanostructure techs necessary to acquire this knowcation areas.	
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)		
V + R (r	o infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)	
		essment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	et every semester, information on whether	
less oth minute prox. 8 tes)	nerwise s per ca to 10 p	specified) or b) oral exa andidate, for modules wi	mination of one cand th less than 4 ECTS co 1 to 4 weeks) or d) pro	idate each or oral ex redits approx. 20 mi	credits approx. 90 minutes; un- kamination in groups (approx. 30 nutes) or c) project report (ap- presentation (approx. 30 minu-	
Allocat	ion of p	laces				
Additio	nal info	ormation				
Worklo	Workload					
-						
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master	's degre	ee (1 major) Nanostructui	re Technology (2011)			
Master	Master's degree (1 major) Nanostructure Technology (2010)					



Module title				Abbreviation		
Current	Current Topics in Nanostructure Technology 11-EXN8-111-mo1					
Module	coord	nator		Module offered by		
chairpe	rson of	examination committee		Faculty of Physics a	and Astronomy	
ECTS	Metho	d of grading	Only after succ. com	ıpl. of module(s)		
8	numei	ical grade				
Duratio	n	Module level	Other prerequisites			
1 semes	ster	graduate	Approval by examina	ation committee req	uired.	
Conten	ts					
Current or study			Accredited academi	c achievements, e.g.	. in case of change of university	
Intende	ed learr	ing outcomes				
Techno nology	logy of or nand	the Master's programme	. They have knowledged the measuring and	ge of a current subdi I evaluation method	of a module of Nanostructure iscipline of nanostructure techs necessary to acquire this know-cation areas.	
Courses	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)		
V + R (n	o infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)	
		essment (type, scope, languale for bonus)	ge — if other than German, e	examination offered — if no	ot every semester, information on whether	
less oth minutes prox. 8 tes)	nerwise s per ca to 10 p	specified) or b) oral exa andidate, for modules wi	mination of one cand th less than 4 ECTS co 1 to 4 weeks) or d) pro	idate each or oral ex redits approx. 20 mi	credits approx. 90 minutes; un- kamination in groups (approx. 30 nutes) or c) project report (ap- presentation (approx. 30 minu-	
Allocati						
	•					
Additio	nal info	ormation				
Worklo	ad					
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
	Master's degree (1 major) Nanostructure Technology (2011)					
	Master's degree (1 major) Nanostructure Technology (2010)					



Module	e title	'			Abbreviation	
Princip	les of t	wo- and threedimen	sional Röntgen imaging		11-ZDR-111-m01	
Module	coord	inator		Module offered by	•	
Manag	ing Dir	ector of the Institute	of Applied Physics	Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites	Other prerequisites		
1 semester graduate		sessment. The lecturate the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment.	urer will inform stude the course. Registrat on of will to seek adm d the qualification fo emester, the lecturer ct. Students who mee in the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for		

Physics of X-ray generation (X-ray tubes, synchrotron). Physics of the interaction between X-rays and matter (photon absorption, scattering), physics of X-ray detection. Mathematics of reconstruction algorithms (filtered rear projection, Fourier reconstruction, iterative methods). Image processing (image data pre-processing, feature extraction, visualisation,...). Applications of X-ray imaging in the industrial sector (component testing, material characterisation, metrology, biology, ...). Radiation protection and biological radiation effect (dose, ...).

Intended learning outcomes

The students know the principles of generating X-rays and of their interactions with matter. They know imaging techniques using X-rays and methods of image processing as well as application areas of these methods.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Allocation of places

Additional information

Workload

Teaching cycle

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

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 59 / 233
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

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

Master's degree (1 major) FOKUS Physics (2006)



Module	Module title				Abbreviation
Thermo	odynan	nics and Economics			11-TDOE-141-mo1
Module	Module coordinator			Module offered by	
Managing Director of the Institute of Theoret and Astrophysics			neoretical Physics	Faculty of Physics and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
3	(not)	successfully completed			
Duration Module level		Other prerequisites			
1 semester graduate					
Contents					

Energy and economic growth, entropy production, emission reduction.

Part I describes the role of energy conversion in the development of the universe, the evolution of life and the unfolding of civilisation. The entropy production density of non-equilibrium thermodynamics shows the relevance of the second law of thermodynamics for ecological damage and resource consumption. Energy conversion, entropy production and natural resources define the technological and ecological boundaries of industrial economic growth.

Part 2 analyses how the factors capital, work, energy and creativity produce the goods and services of a national economy and determine economic growth. The productive power of cheap energy by far exceeds that of expensive labour. Within the current system of taxes and social security contributions, this discrepancy between power and costs of production factors leads to job cuts, waste of resources, impoverishment of nations and growing social tensions. The course discusses how factor income taxation can counteract this development.

Part 3 includes seminar presentations, comprises the techniques of rational energy use and non-fossil energy use, and introduces the optimisation programme deeco (Dynamic Energy, Emission and Cost Optimization).

Intended learning outcomes

The students understand that energy conversion and entropy production are going to play an important role in the world's economic and social development. As an extension of economic theory, the students know the connections between thermodynamics and economy as well as the productive physical basis of modern economies. They are able to apply the acquired knowledge to particular problems.

NOTE: this is the module that was run by Prof. Dr. R. Kümmel, who has now retired. As the module was tailored to his own theory of economy, it has yet to be decided whether we will continue to offer this module.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Allocation of places

Additional information

Workload

Teaching cycle

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

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 61 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	Module title Abbreviation						
		on-destructive Characte	rization of Materials	and Components	11-ZMB-112-mo1		
Metho	us 101 11		inzation of materials	and Components	11-2MD-112-11101		
Module	e coord	inator		Module offered by			
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy		
ECTS	Metho	od of grading	Only after succ. com	npl. of module(s)			
4	nume	rical grade					
Duratio	on	Module level	Other prerequisites				
1 semester undergraduate		Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.					
Conten	ıts		<u>.</u>				
Method	ds of no	on-destructive material a	nd component charac	cterisation.			
		ning outcomes	· · · · · · · · · · · · · · · · · · ·				
The stu	ıdents	know methods of non-de	structive characterisa	ation of materials an	d components.		
Course	S (type, r	number of weekly contact hours, l	anguage — if other than Ger	rman)			
V + R (r	no infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)		
		sessment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	ot every semester, information on whether		
groups or d) pi Assess and wi	(approresenta ment o ll be an	x. 30 minutes per candid tion/seminar presentatio ffered: When and how of	late) or c) project repo on (approx. 30 minute ten assessment will l	ort (approx. 10 page: es) oe offered depends (idate each or oral examination in s, time to complete: 1 to 4 weeks) on the method of assessment 3 ASPO (general academic and		
Allocat	ion of p	olaces					
Additio	nal inf	ormation					
Worklo	ad						
							
Teaching cycle							
							
Referred to in LPO I (examination regulations for teaching-degree programmes)							
-							
	Module appears in						
	_	ree (1 major) Nanostructu)			
l	_	ee (1 major) Nanostructu ee (1 maior) Functional M					
	Master's degree (1 major) Functional Materials (2012)						



Module	title			Abbreviation		
Image a	and Sig	gnal Processing in Ph	nysics	11-BSV-122-m01		
Module	coord	inator		Module offered by		
Managi	ing Dire	ector of the Institute of	of Applied Physics	Faculty of Physics and Astronomy		
ECTS Method of grading		Only after succ. co	Only after succ. compl. of module(s)			
6	nume	rical grade				
Duratio	Duration Module level		Other prerequisite	Other prerequisites		
1 semester		graduate	sessment. The lect at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment.	es must be met to qualify for admission to as- urer will inform students about the respective details the course. Registration for the course will be con- on of will to seek admission to assessment. If stu- d the qualification for admission to assessment over emester, the lecturer will put their registration for as- ct. Students who meet all prerequisites will be admit- in the current or in the subsequent semester. For as- date, students will have to obtain the qualification for esment anew.		

Periodic and aperiodic signals; principles of discreet and exact Fourier transformation; principles of digital signal and image processing; discretisation of signals/sampling theorem (Shannon); homogeneous and linear filters, convolution product; tapering functions and interpolation of images; the Parsival theorem, correlation and energetic observation; statistical signals, image noise, moments, stationary signals; tomography: Hankel and Radon transformation.

Intended learning outcomes

The students have advanced knowledge of digital image and signal processing. They know the physical principles of image processing and are familiar with different methods of signal processing. They are able to explain different methods and to implement them, especially in the field of tomography.

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

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

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

a) written examination (90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Allocation of places

Additional information

Workload

Teaching cycle

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

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(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Modul	e title				Abbreviation	
Imagin	g Meth	nods at the Synchrotron			11-BMS-121-m01	
Module coordinator				Module offered by		
Manag	ing Dir	ector of the Institute of A	pplied Physics	Faculty of Physics and Astronomy		
ECTS	ECTS Method of grading		Only after succ. con	Only after succ. compl. of module(s)		
4	nume	rical grade				
Duratio	Duration Module level		Other prerequisites			
1 semester		graduate	sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment i	trer will inform stude the course. Registrat on of will to seek adn d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to as- ents about the respective details cion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification fo	

Overview of synchrotron radiation and its generation. - Principles of the interaction between radiation and matter. - Principles of X-ray optics, X-ray lens. - Synchroton detector technique X-ray diffractometry (diffraction) of crystalline materials.

Intended learning outcomes

The students have advanced knowledge of synchrotron radiation and X-ray optics. They know the physical principles of imaging techniques at the synchrotron and their application for crystalline materials and other materials. They understand the principles of image generation and are able to explain different techniques and interpret simple images.

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

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

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

a) written examination (90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Allocation of places

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Additional information

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Workload

--

Teaching cycle

--

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

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Module appears in



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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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



Module	title	,			Abbreviation	
Imagin	g Meth	ods at the Synchrotron			11-BMS-131-m01	
Module	coord	inator		Module offered by		
Managi	ing Dire	ector of the Institute of A	pplied Physics	Faculty of Physics and Astronomy		
ECTS	CTS Method of grading		Only after succ. compl. of module(s)			
4	numerical grade					
Duration Module level		Other prerequisites				
1 semester		graduate	sessment. The lecturation at the beginning of the sidered and declaration dents have obtained the course of the sessment into effective.	rer will inform stude the course. Registrat n of will to seek adm d the qualification fo mester, the lecturer t. Students who mee	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- ot all prerequisites will be admit- e subsequent semesters.	
Contents						

Overview of synchrotron radiation and its generation. - Principles of the interaction between radiation and matter. - Principles of X-ray optics, X-ray lens. - Synchroton detector technique X-ray diffractometry (diffraction) of crystalline materials.

Intended learning outcomes

The students have advanced knowledge of synchrotron radiation and X-ray optics. They know the physical principles of imaging techniques at the synchrotron and their application for crystalline materials and other materials. They understand the principles of image generation and are able to explain different techniques and interpret simple images.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

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

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 68 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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



Module title					Abbreviation
Image	and Sig	gnal Processing in P	Physics		11-BSV-131-m01
Modul	e coord	linator		Module offered by	
Managing Director of the Institute of Applied Physics			of Applied Physics	Faculty of Physics and Astronomy	
ECTS	Method of grading		Only after succ. cor	Only after succ. compl. of module(s)	
6	numerical grade				
Duration Module level		Other prerequisites	Other prerequisites		
1 semester		graduate	sessment. The lectuat the beginning of sidered a declaration dents have obtaine the course of the sessment into effect	urer will inform stude the course. Registrat on of will to seek adm d the qualification fo emester, the lecturer at. Students who mee	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semesters.

Periodic and aperiodic signals; principles of discreet and exact Fourier transformation; principles of digital signal and image processing; discretisation of signals/sampling theorem (Shannon); homogeneous and linear filters, convolution product; tapering functions and interpolation of images; the Parsival theorem, correlation and energetic observation; statistical signals, image noise, moments, stationary signals; tomography: Hankel and Radon transformation.

Intended learning outcomes

The students have advanced knowledge of digital image and signal processing. They know the physical principles of image processing and are familiar with different methods of signal processing. They are able to explain different methods and to implement them, especially in the field of tomography.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in



Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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



Modul	e title				Abbreviation
Physic	s of Ad	vanced Materials			11-PMM-132-m01
Modul	e coord	inator		Module offered by	
Managing Director of the Institute of Applied Physic			f Applied Physics	Faculty of Physics and Astronomy	
ECTS	Meth	Method of grading Only after succ. co		ompl. of module(s)	
6	nume	umerical grade			
Duration Module level		Other prerequisit	Other prerequisites		
1 seme	1 semester graduate				
Combando					

General properties of various material groups such as liquids, liquid crystals and polymers; magnetic materials and superconductors; thin films, heterostructures and superlattices. Methods of characterising these material groups; two-dimensional layer materials.

Intended learning outcomes

The students know the properties and characterising methods of some modern materials.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Modul	Module title				Abbreviation	
Quantum Information Technology					11-QUI-132-m01	
Module coordinator				Module offered by		
Manag	ging Dire	ector of the Institute of A	pplied Physics	ed Physics Faculty of Physics and Astronomy		
ECTS	TS Method of grading Only a		Only after succ. co	mpl. of module(s)		
6 numerical grade						
Duration Module level		Other prerequisites				
1 seme	ester	graduate				
Contor	Contonte					

Contents

Basic concepts of quantum mechanics, quantum bits and algorithms, quantal measurements, experimental approaches towards quantum computing (on the basis of photons, ions and nuclear spins), quantum operations and quantum noise, quantum information and communication.

Intended learning outcomes

The students are familiar with the basic quantum mechanical terms of quantum information technology. They know experimental approaches for the realisation of quantum computers and for the transfer of quantum information.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



General Physics

(ECTS credits)



Module title Abbreviation					Abbreviation
Visiting Research Project					11-FPA-112-m01
Module coordinator Module offered by					
Managing Director of the Institute of Applie			plied Physics Faculty of Physics and Astronomy		
ECTS	TS Method of grading Only after suc		Only after succ. con	npl. of module(s)	
10	o numerical grade				
Duration Module level		Other prerequisites			
1 seme	ester	graduate	Approval by examination committee required.		uired.
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Contents

Independent work on a current research topic of Experimental and Theoretical Physics. Implementation of scientific experiments including analysis and documentation of the results, especially in the context of research visits to other universities or research institutes.

Intended learning outcomes

The students are able to independently work on a current research area of Experimental or Theoretical Physics, to conduct and analyse scientific experiments and to document the results.

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

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

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

project report (approx. 10 to 20 pages) Language of assessment: German, English

Allocation of places

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Additional information

Additional information on module duration: 1 to 2 semesters.

Workload

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Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Module title Abbreviation						
		11-EXP6A-112-m01				
	Module offered by	<u> </u>				
e	Faculty of Physics a	and Astronomy				
Only after succ. con	npl. of module(s)					
Other prerequisites						
Approval by examin	ation committee req	uired.				
	redited academic ac	hievements, e.g. in case of				
ogramme of Nanostrue and the measuring and the subject-specific co	cture Technology. Th d/or calculation met ntexts and know the	ney have knowledge of a current hods necessary to acquire this				
, language — if other than Ger	man)					
contact hours) and co	ourse language avail	able)				
uage — if other than German,	examination offered — if no	ot every semester, information on whether				
amination of one cand vith less than 4 ECTS c : 1 to 4 weeks) or d) pr	lidate each or oral e redits approx. 20 mi	xamination in groups (approx. 30 nutes) or c) project report (ap-				
ons for teaching-degree progra	ımmes)					
ons for teaching-degree progra	ımmes)					
	cencies corresponding to rogramme of Nanostruct and the measuring and the subject-specific coordinate to contact hours) and coordinate to rogramme of Nanostruct and the measuring and the subject-specific coordinate to rogramme of other than German, and the subject specific coordinate thours and coordinate thours and coordinate thours are roughly to roman the subject specific coordinates and coordinates than German, and coordinates than German, and coordinates than German, with less than 4 ECTS coordinates and coordinates than 4 ECTS coordinates and coordinates are respectively.	Paculty of Physics a Only after succ. compl. of module(s)				

Master's degree (1 major) Nanostructure Technology (2011)



Applied Su			וממא	reviation
Module cod	perconduction		11-AS	SL-092-m01
	ordinator		Module offered by	
Nanaging [Director of the Institute	of Applied Physics	Faculty of Physics and As	stronomy
CTS Me	ethod of grading	Only after succ. co	mpl. of module(s)	
nui	merical grade			
uration	Module level	Other prerequisite	5	
1 semester graduate		sessment. The lect at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment	the course. Registration for of will to seek admission of the qualification for admemester, the lecturer will post. Students who meet all poin the current or in the subdate, students will have to	oout the respective details or the course will be con- n to assessment. If stu- nission to assessment over ut their registration for as- prerequisites will be admit-
ontents				
			ergy engineering. Instrumer ure profiles in superconduc	

The students have a basic understanding of superconductivity as a macroscopic quantum phenomenon. They are able to evaluate the contributions of materials sciences to the development of superconductivity. They are able to discuss questions on superconductivity in a scientific manner and to critically question developments of energy technology. Furthermore, they can deal with practical mathematical questions.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: once a year, winter semester Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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' degree (1 major) Physics (2010)

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(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Bachelor' degree (1 major) Physics (2012)

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

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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



Module	title	<u>'</u>			Abbreviation
Introdu	Introduction to Plasmaphysics				11-EPP-092-m01
Module	coord	inator		Module offered by	
Managing Director of the Institute of The and Astrophysics			neoretical Physics Faculty of Physics and Astronomy		and Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semester graduate		sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment i	trer will inform stude the course. Registrat on of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	
Conten	ts				

Plasma Astrophysics: Dynamics of charged particles in electric and magnetic fields, Magnetohydrodynamics, Transport equations for energetic particles, Properties of magnetic turbulence, Propagation of solar particles within the solar wind, Particle acceleration via shock waves and via interaction with plasma turbulence, Particle acceleration and transport in galaxies and other astrophysical objects, Cosmic radiation.

Intended learning outcomes

The students know the principles of Plasma Physics, especially the description of transport phenomena in plasma. They are able to solve basic problems of Plasma Physics and to apply this knowledge to Astrophysics.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

Teaching cycle

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

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Master's with 1 major Nanostructure Technology	JMU Würzburg • genei
(2011)	ta record Master (120



Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)



Module	e title				Abbreviation	
Solid State Physics 2					11-FK2-092-m01	
Module	e coord	linator		Module offered by		
Manag	ing Dire	ector of the Institute	of Applied Physics	Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisite	Other prerequisites		
1 seme	ster	graduate	sessment. The lect at the beginning of sidered a declarated dents have obtain the course of the sessment into effected to assessment	turer will inform stude f the course. Registrat ion of will to seek adn ed the qualification fo emester, the lecturer ct. Students who mee in the current or in th	alify for admission to as- nts about the respective details cion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

Advanced Solid-State Physics. Electrons in periodic potential - the band structure. Dynamics in the semi-classical model. Dielectric properties and ferroelectrics. Semiconductors. Magnetism. Superconductivity. Coupled excitations and optical properties [optional]

Intended learning outcomes

The students have specific and advanced knowledge in the field of Solid-State Physics. They are theoretically able to specialise in a sub-discipline of Solid-State Physics.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 81 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)



Module	e title			Abbreviation		
Solid State Spectroscopy				11-FKS-092-m01		
Module	e coord	linator		Module offered by		
Manag	ing Dir	ector of the Institute	of Applied Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. co	ompl. of module(s)		
6	nume	erical grade				
Duratio	on	Module level	Other prerequisite	Other prerequisites		
1 seme	ster	graduate	sessment. The lect at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment	Ites must be met to qualify for admission to asturer will inform students about the respective deta of the course. Registration for the course will be contion of will to seek admission to assessment. If stured the qualification for admission to assessment or semester, the lecturer will put their registration for a lect. Students who meet all prerequisites will be admit in the current or in the subsequent semester. For a ler date, students will have to obtain the qualification lessment anew.		

Single- and many-particle picture of electrons in solids. Light-matter interaction. Optical spectroscopy. Electron spectroscopy. X-ray spectroscopies.

Intended learning outcomes

The students have specific and advanced knowledge in the field of solid-state spectroscopy. They know different types of spectroscopy and their fields of application. They understand the theoretical principles and the current developments in research.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 83 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)



Modul	e title			Abbreviation		
Semiconductor Physics				11-HLP-092-m01		
Modul	e coord	dinator		Module offered by		
Manag	ing Dir	ector of the Institute	of Applied Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. o	compl. of module(s)		
6	nume	erical grade				
Duratio	on	Module level	Other prerequisit	Other prerequisites		
1 seme	ester	graduate	sessment. The leat the beginning sidered a declaradents have obtain the course of the sessment into effect to assessment	cities must be met to qualify for admission to ascurer will inform students about the respective details of the course. Registration for the course will be contion of will to seek admission to assessment. If stuned the qualification for admission to assessment over semester, the lecturer will put their registration for asfect. Students who meet all prerequisites will be admitted in the current or in the subsequent semester. For aser date, students will have to obtain the qualification for essment anew.		

Advanced examination of crystal bonding and the electronic band structure of semiconductors. Optical excitations and their coupling effects. Electron-phonon coupling. Temperature-dependent transport properties. Quantisation effects of semiconductors with reduced dimensions. (Semi-)magnetic semiconductors.

Intended learning outcomes

The students have specific and advanced knowledge in the field of Semiconductor Physics. They know the physical principles of semiconductors and have gained an overview of the important characteristics of semiconductor materials.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 85 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

Master's degree (1 major) Mathematics (2012)

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)

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



Module	title	,			Abbreviation
Magnetism					11-MAG-092-m01
Module	coord	inator		Module offered by	
Managing Director of the Institute of A			Applied Physics	Faculty of Physics a	and Astronomy
ECTS Method of grading		Only after succ. con	npl. of module(s)		
6 numerical grade			-		
Duration Module level		Other prerequisites			
1 semester graduate		sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effect ted to assessment i	trer will inform stude the course. Registrat on of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to asents about the respective details tion for the course will be connission to assessment. If stuber admission to assessment over will put their registration for aset all prerequisites will be admitted subsequent semester. For astave to obtain the qualification for	

Content

Dia- and paramagnetism, exchange interaction, ferromagnetism, antiferromagnetism, anisotropy, domain structure, nanomagnetism, superparamagnetism, experimental methods to measure magnetic properties, Kondo effect.

Intended learning outcomes

The students know basic terms, concepts and phenomena of magnetism and measuring methods for magnetic experiments; they are skilled in simple model building and in the formulation of mathematical-physical approaches and are able to apply them to tasks in the stated areas; they have competencies in independently working on problems of these areas; they are able to evaluate the accuracy of observations and analyses.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Master's with 1 major Nanostructure Technology	JMU Würzburg • generated
(2011)	ta record Master (120 ECT



Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	title				Abbreviation
Low-Di	Low-Dimensional Structures				11-NDS-092-m01
Module coordinator				Module offered by	
Managi	ing Dire	ector of the Institute of A	pplied Physics	Faculty of Physics a	and Astronomy
ECTS Method of grading		Only after succ. con	pl. of module(s)		
4 numerical grade					
Duration Module level		Other prerequisites			
		graduate	sessment. The lecturat the beginning of the sidered a declaration dents have obtained the course of the sessment into effect ted to assessment i	rer will inform stude the course. Registrat n of will to seek adm the qualification fomester, the lecturer to Students who meen the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for

Contents

Low-dimensional structures: Crystal lattice symmetry. Lattice dynamics and growth techniques of low-dimensional structures. Comparison between these structures and volume solids. X-ray diffractometry. Molecular beam epitaxy.

Intended learning outcomes

The students have knowledge of the theoretical principles of the growth of low dimensional structures. They know methods of producing and analysing such structures. They know the bandstructures of the most important semiconductors as well as the fabrication and characteristics of semiconductor heterostructures and MOS-diodes. They are familiar with the subband structure of semiconductor heterostructures and MOS-diodes and can evaluate the importance of many-particle effects. They are able to solve problems related to potentials in one dimension by applying Poisson's equation. They know the k*p perturbation theory and can deduce the 2D subband structure from the bulk band structure. They have knowledge of the meaning of modulation doping and are familiar with the 2D hydrogen atom. They understand how an external magnetic field acts on the properties of a free electron gas in 2D. They have basic knowledge of the meaning of gauging, Landau-quantisation, filling factor and Landau degeneracy. They understand the dependence of various physical properties on the filling factor, and are able to solve implicit problems via numerical methods. They are familiar with elementary excitations in two-dimensional systems.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 89 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	title			Abbreviation		
Quantum Mechanics II				11-QM2-092-m01		
Module coordinator				Module offered by		
Managing Director of the Institute of Tand Astrophysics			Theoretical Physics	Faculty of Physics and Astronomy		
ECTS Method of grading		Only after succ. cor	mpl. of module(s)			
8 numerical grade						
Duratio	Duration Module level		Other prerequisites	Other prerequisites		
1 semester undergraduate		undergraduate	Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.			

Contents

"Quantum mechanics II" constitutes the central theoretical course of the international Master's program in Physics. It builds upon basics which are acquired in the lecture "Quantum mechanics I" of the Bachelor's degree. While the specific emphasis can be adjusted individually, the core topics that are supposed to be covered should include:

- 1. Second quantisation: Fermions and bosons
- 2. Band structures of particles in a crystal
- 3. Angular momentum, symmetry operators, Lie Algebras
- 4. Scattering theory: Potential scattering, partial wave expansion
- 5. Relativistic quantum mechanics: Klein-Gordon equation, Dirac equation, Loretz group, fine structure splitting of atomic spectra
- 6. Quantum entanglement
- 7. Canonical formalism

Intended learning outcomes

The students acquire in-depth knowledge of advanced quantum mechanics and have a thorough understanding of the mathematical and theoretical concepts of the listed topics. They are able to describe or model problems of modern theoretical Quantum Physics mathematically, to solve problems analytically, to use approximation methods and to interpret the results physically. The course is pivotal to subsequent theory courses in Astrophysics, High-Energy Physics and Condensed Matter/Solid-State Physics. The course is mandatory for all Master's students.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English



Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)



Modul	e title				Abbreviation	
Quant	Quantum Phenomena in electronic correlated Materia				11-QPM-092-m01	
Modul	e coord	dinator		Module offered by		
Managing Director of the Institute of Ap			of Applied Physics	Faculty of Physics	and Astronomy	
ECTS	Meth	od of grading	Only after succ. c	ompl. of module(s)		
6 numerical grade						
Durati	on	Module level	Other prerequisit	Other prerequisites		
Duration Me		graduate	sessment. The led at the beginning of sidered a declaral dents have obtain the course of the sessment into eff ted to assessment	eturer will inform stude of the course. Registra tion of will to seek add ned the qualification for semester, the lecturer ect. Students who me t in the current or in the er date, students will ler	ualify for admission to asents about the respective details ition for the course will be conmission to assessment. If stuor admission to assessment over will put their registration for aset all prerequisites will be admitted to obtain the qualification for asente to a sentence to a s	

Quantum effects and phenomena in current solid-state research. Correlations. Free electron gas and Fermi liquid. Strongly correlated systems

Intended learning outcomes

The students have specific, advanced knowledge of the current research on Solid-State Physics, especially on quantum effects in strongly correlated systems. They are able to understand the connections between the theoretical description of such systems and the current experimental results.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and

examination regulations) 2009. Language of assessment: German, English Allocation of places Additional information Workload **Teaching cycle Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	title				Abbreviation	
Many B	Many Body Quantum Theory				11-QVTP-092-m01	
Module	Module coordinator			Module offered by		
Managing Director of the Institute of Th and Astrophysics		of Theoretical Physics	heoretical Physics Faculty of Physics and Astronomy			
ECTS Method of grading 8 numerical grade		Only after succ. con	npl. of module(s)			
Duratio	Duration Module level		Other prerequisites	Other prerequisites		
1 semester		graduate	sessment. The lecturate the beginning of sidered a declaration dents have obtained the course of the sessent into effected to assessment in	trer will inform stude the course. Registrat on of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- r admission to assessment over will put their registration for as- t all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

This will usually be a course on quantum many particle physics approached by the perturbative methods using Green's functions.

An outline could be:

- 1 Single-particle Green's function
- 2 Review of second quantization
- 3 Diagrammatic method using many particle Green's functions at temperature T=0
- 4 Diagrammatic method for finite T
- 5 Landau theory of Fermi liquids
- 6 Superconductivity
- 7 One-dimensional systems and bosonization

Intended learning outcomes

The students have mastered the principles of quantum field theory in many-particle systems. They are able to apply the acquired methods to current problems of Theoretical Solid-State Physics.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 95 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Workload

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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' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	e title				Abbreviation
Relativ	istic Ef	fects in Mesoscopic Sys	tems		11-RMS-092-m01
Module	Module coordinator			Module offered by	,
Managing Director of the Institute of Theoretical Physics and Astrophysics		neoretical Physics	Faculty of Physics		
F F		Only after succ. con	npl. of module(s)		
5 numerical grade					
· · · · · · · · · · · · · · · · · · ·		Other prerequisites			
1 seme	ster	graduate	sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment i	rer will inform stude the course. Registra n of will to seek add d the qualification for mester, the lecturer t. Students who me n the current or in the date, students will h	ualify for admission to as- ents about the respective details tion for the course will be con- mission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- ne subsequent semester. For as- nave to obtain the qualification for
Conten	tc		admission to assess	sincin unew.	
The stuespecial	ed lear Idents ally in t (type, r	he field of mesoscopic p number of weekly contact hours,	ematical methods for hysics. They are able language — if other than Ge	to apply their know	elativistic quantum systems, ledge to simple systems.
		rmation on SWS (weekly			
		sessment (type, scope, langua ble for bonus)	age — if other than German,	examination offered — if n	ot every semester, information on whether
a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes) Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009. Language of assessment: German, English					
Allocation of places					
Additional information					
Worklo	ad				
Teachi	ng cycl	e			

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 97 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	

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

Module appears in



Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Module title					Abbreviation	
Theoretical Solid State Physics					11-TFK-092-m01	
Module coordinator				Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics			of Theoretical Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. cor	Only after succ. compl. of module(s)		
8 numerical grade						
Duratio	n	Module level	Other prerequisites	Other prerequisites		
1 semester		graduate	sessment. The lectuat the beginning of sidered a declaration dents have obtaine the course of the sessment into effected to assessment is	urer will inform stude the course. Registrat on of will to seek admed the qualification for emester, the lecturer of the current or in the date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- r admission to assessment over will put their registration for as- t all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

Principles of Theoretical Solid-State Physics. Fermi liquid theory. Electron-electron interaction. Variational methods. Magnetism. Superconductivity.

Intended learning outcomes

The students have basic knowledge of the theoretical description of solid-state phenomena. They know the corresponding mathematical or theoretical methods and are able to apply them to basic problems of solid-state theory and to understand the connections to experimental results. The individual students have elaborated on an advanced topic of solid-state theory and have discussed this topic in a seminar presentation.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 99 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)



Module	e title				Abbreviation	
Theory	of Sup	erconduction			11-TSL-092-m01	
Module coordinator				Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics			of Theoretical Physics	Faculty of Physics and Astronomy		
ECTS Method of grading		Only after succ. cor	Only after succ. compl. of module(s)			
5 numerical grade						
Duratio	n	Module level	Other prerequisites	Other prerequisites		
1 semester		graduate	sessment. The lectuat the beginning of sidered a declaration dents have obtaine the course of the sessment into effected to assessment is sessment at a later	Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective detain at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification admission to assessment anew.		

Contents

Introduction to the phenomenom of superconductivity. Microscopic theory of superconductivity (BCS theory). Phenomenological theory of superconductivity (Ginzburg-Landau theory). Mesoscopic aspects of superconductivity (Andreev scattering, Bobolioubov-de Gennes equation, SQUIDS). Quantum computing with superconductive elements.

Intended learning outcomes

The students have basic knowledge of the theoretical models for the description of superconductivity. They know the properties and application areas of these models and are able to apply calculation methods to simple problems.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places **Additional information** Workload Teaching cycle



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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)



Module title					Abbreviation	
Biophysical Measurement Technology in Medical Science					11-BMT-092-m01	
Module coordinator				Module offered by		
Manag	ing Dir	ector of the Institute	of Applied Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. cor	Only after succ. compl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites	Other prerequisites		
1 semester		graduate	sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment	urer will inform stude the course. Registrat on of will to seek adn d the qualification fo emester, the lecturer ct. Students who mee in the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

The lecture covers the physical principles of imaging techniques and their application in Biomedicine. The main topics are conventional X-ray technique, computer tomography, imaging techniques of nuclear medicine, ultrasound and MR-tomography. The lecture additionally addresses systems theory of imaging systems and digital image processing.

Intended learning outcomes

The students know the physical principles of imaging techniques and their application in Biomedicine. They understand the principles of image generation and are able to explain different techniques and interpret simple images.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Master's with 1 major Nanostru	cture Technology	
(2011)		



Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

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



Module title					Abbreviation
Laboratory and Measurement Technology in Biophysics					11-LMB-092-m01
Module coordinator				Module offered by	
Manag	ing Dire	ector of the Institute of Ap	pplied Physics	Faculty of Physics and Astronomy	
ECTS	Metho	od of grading	Only after succ. compl. of module(s)		
6	nume	rical grade	al grade		
Duratio	n	Module level	Other prerequisites		
1 semester		graduate	sessment. The lecturation at the beginning of the sidered a declaration dents have obtained the course of the sessment into effected to assessment i	rer will inform stude the course. Registraten of will to seek admed the qualification for mester, the lecturer to students who meen the current or in the date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- r admission to assessment over will put their registration for as- t all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for

Contents

The lecture covers relevant principles of molecular and cellular biology as well as the physical principles of biophysical procedures for the examination and manipulation of biological systems. The main topics are optical measuring techniques and sensors, methods of single-particle detection, special microscoping techniques and methods of structure elucidation of biomolecules.

Intended learning outcomes

The students know the principles of molecular and cellular biology as well as the physical principles of biophysical procedures for the examination and manipulation of biological systems. They have knowledge of optical measuring techniques and their applications and are able to apply techniques of structure elucidation to simple biomolecules.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

0 0 7 0
Allocation of places
Additional information
Workload
Teaching cycle



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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

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



Module title					Abbreviation
Physics of Complex Systems					11-PKS-092-m01
Module coordinator				Module offered by	
Managing Director of the Institute of Theoretical Phy and Astrophysics			heoretical Physics	Faculty of Physics and Astronomy	
ECTS Method of grading		Only after succ. con	Only after succ. compl. of module(s)		
6 numerical grade					
Duration Module level		Other prerequisites			
1 semester		graduate	sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment i	trer will inform stude the course. Registrat on of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for

Contents

- 1. Theory of critical phenomena in thermal equilibriumt
- 2. Introduction into the physics out of equilibriumt
- 3. Entropy production and fluctuationst
- 4. Phase transitions away from equilibriumt
- 5. Universalityt
- 6. Spin glassest
- 7. Theory of neural networks

Intended learning outcomes

The students have specific and advanced knowledge in the field of physics of complex systems. They know the methods of Statistical Physics, Computational Physics and non-linear dynamics, which are used to describe such systems. They are able to work on current research problems in this area.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Workload



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' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	e title			Abbreviation		
Quantu	ım Info	rmation and Quant	um Computing	11-QIC-092-m01		
Module	e coord	linator		Module offered by		
Managing Director of the Institute of Theore			of Theoretical Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)		
5	nume	rical grade				
Duratio	n	Module level	Other prerequisite	Other prerequisites		
1 semester graduate		sessment. The lect at the beginning of sidered a declarati dents have obtained the course of the sessment into effected to assessment	Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anow.			

The first part introduces the theoretical concepts of quantum information and quantum computers. It discusses the main quantum algorithms. The second part discusses experimental possibilities for the realisation of entangled states. One of the main topics is the production, controlling and manipulation of coherent two-electron spin states. The third part covers the description and explanation of decoherence of quantum mechanical states.

Intended learning outcomes

The students have an advanced understanding of quantum theory and basic knowledge of quantum calculation. They are able to solve simple problems of quantum information theory.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places **Additional information** Workload Teaching cycle



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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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



Modul	e title	Abbreviation				
Statist	ics, Da	ta Analysis and Con	nputer Physics		11-SDC-092-m01	
Modul	e coord	linator		Module offered by		
Manag	ing Dir	ector of the Institute	of Applied Physics	Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)		
4	nume	rical grade				
Duratio	on	Module level	Other prerequisite	Other prerequisites		
Duration 1 semester		graduate	sessment. The lect at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment sessment at a later	Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective deta at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment of the course of the semester, the lecturer will put their registration for a sessment into effect. Students who meet all prerequisites will be adred to assessment in the current or in the subsequent semester. For a sessment at a later date, students will have to obtain the qualification admission to assessment anew.		
Conter	its					
Statist	ics, da	ta analysis and com	puter physics.			
Intend	ed lear	ning outcomes				

The students have specific and advanced knowledge in the field of statistics, data analysis and Computational Physics.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)



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

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

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)



Module	e title				Abbreviation	
Electro	nics				11-A2-092-m01	
Module	e coord	inator		Module offered by		
Manag	ing Dir	ector of the Institute o	f Applied Physics	Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	Other prerequisites		
1 semester		undergraduate	sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment i	trer will inform stude the course. Registrat on of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- or all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

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

Intended learning outcomes

The students have knowledge of the practical setup of electronic circuits from the field of analogous and digital circuit technology.

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

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

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

written examination (approx. 90 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Allocation of places

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

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

Master's degree (1 major) Physics (2011)

Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 113 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) FOKUS Physics (2011) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2010)



Module	e title			Abbreviation	
Renorn	nalizati	ion Group Methods	in Field Theory		11-RMFT-102-m01
Module	Module coordinator				i by
Managi and As	_		of Theoretical Physics	Faculty of Phys	ics and Astronomy
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites	5	
1 seme		graduate	sessment. The lectration at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment	urer will inform s the course. Regi on of will to seek d the qualification emester, the lect ct. Students who in the current or date, students v	o qualify for admission to astudents about the respective details stration for the course will be conadmission to assessment. If stuon for admission to assessment over urer will put their registration for asmeet all prerequisites will be admiting the subsequent semester. For asvill have to obtain the qualification for
Conten	ts				
		on group methods f aviour of cryogenic t		rential equations	s, field theoretical contexts and non-
Intende	ed lear	ning outcomes			
The students gain an overview of non-linearities in partial differential equations and their solution on the basis of the renormalisation group method.					
Course	S (type, r	number of weekly contact h	nours, language — if other than Ge	erman)	

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English Allocation of places --Additional information --Workload --Teaching cycle

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

Module appears in

modute appears in



Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2012)

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

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

Master's degree (1 major) FOKUS Physics (2011)



Modul	e title			Abbreviation		
Metho	ds in S	urface Spectroscopy	/	11-MSS-102-m01		
Modul	e coord	linator		Module offered by		
Managing Director of the Institute of Applied Physics				Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. o	ompl. of module(s)		
4	nume	erical grade				
Duratio	on	Module level	Other prerequisit	Other prerequisites		
Duration 1 semester		graduate	sessment. The leat the beginning of sidered a declarated dents have obtain the course of the sessment into efficient to assessment.	ites must be met to qualify for admission to as- cturer will inform students about the respective details of the course. Registration for the course will be con- tion of will to seek admission to assessment. If stu- ned the qualification for admission to assessment over semester, the lecturer will put their registration for as- ect. Students who meet all prerequisites will be admit- it in the current or in the subsequent semester. For as- er date, students will have to obtain the qualification fo		

Boundary conditions of experiments: Ultra-high vacuum, surface sensibility, light-matter-interaction, principles of photoelectron spectroscopy (PES), one-particle image of PES, three step model, many-particle effects, line shape, satellites, Fermi liquid, quasiparticles, exemplary systems and spectra, measurements with synchrotron radiation, related experimental methods.

Intended learning outcomes

The students know the physical principles and experimental methods of surface spectroscopy. They are able to conduct, evaluate and interpret simple measurements.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 117 / 233
(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	



Module appears in

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)



Module title					Abbreviation	
Current Topics in Experimental Physics					11-EXE6-111-mo1	
Module	coord	inator		Module offered by		
chairpe	chairperson of examination committee			Faculty of Physics and Astronomy		
ECTS	Metho	od of grading	Only after succ. co	Only after succ. compl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisite	Other prerequisites		
1 semester graduate Approval by exa			Approval by exami	nation committee req	juired.	
Conten	ts					

Current topics of Experimental Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

Intended learning outcomes

The students have advanced competencies corresponding to the requirements of a module of Experimental Physics of the Master's programme. They have knowledge of a current subdiscipline of Experimental Physics and understand the measuring and/or evaluation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas.

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

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

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

a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	title				Abbreviation
Electro	n Elect	ron Interaction			11-EEW-102-m01
Module	coord	inator		Module offered by	
Managing Director of the Institute of The and Astrophysics			neoretical Physics Faculty of Physics and Astronomy		and Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
4	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
		graduate	sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment i	trer will inform stude the course. Registrat on of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for

1. Introduction, systems, Landau theory2. Interacting electron gas. 3. One-dimensional electron gas (without interaction). 4. Introduction to boson phase fields and interactions. 5. Calculation of correlation functions. 6. Method of functional integrals. 7. Renormalisation groups. 8. Consideration of spin. 9. One-dimensional lattice models. 10. Impurities in Luttinger liquids

Intended learning outcomes

The students know the principles of the theoretical description of electron-electron interactions in one dimension.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

Teaching cycle

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

Master's with 1 major Nanostructure Technology	
(2011)	ı



Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

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

Master's degree (1 major) FOKUS Physics (2011)

Abbreviation



Module title

Theore	tical S	olid State Physics 2			11-TFK2-111-m01
Module	e coord	inator		Module offered by	
Managing Director of the Institute of Theoretical Physand Astrophysics			Theoretical Physics	Faculty of Physics a	nd Astronomy
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)	
8	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 semester graduate		graduate	sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment in	urer will inform stude the course. Registrat on of will to seek admed the qualification for emester, the lecturer of the current or in the date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- r admission to assessment over will put their registration for as- t all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for

Contents

- a) metal-insulators and topological insulators
- b) transport phenomena
- c) magnetic impurities in metals. Kondo effect and heavy fermions
- d) electron-phonon interaction
- e) one-dimensional conductors

Intended learning outcomes

The students have advanced knowledge of the theoretical description of solid-state phenomena. They know the mathematical or theoretical methods and are able to apply them to problems of solid-state theory and understand the connections to experimental results. The individual students have elaborated on an advanced topic of solid-state theory and have discussed this topic in a seminar presentation.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places --Additional information --Workload ---



Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

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

Master's degree (1 major) FOKUS Physics (2011)



Module title					Abbreviation	
Current Topics in Theoretical Physics					11-EXT6-111-m01	
Module	e coord	linator		Module offered by		
chairpe	chairperson of examination committee			Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. co	ompl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	Other prerequisites		
1 seme	1 semester graduate Appro		Approval by examin	Approval by examination committee required.		
Conten	ıts	,	,			

Current topics of Theoretical Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

Intended learning outcomes

The students have advanced competencies corresponding to the requirements of a module of Theoretical Physics of the Master's programme. They have advanced specialist knowledge of a subdiscipline of Theoretical Physics and have mastered the required methods. They are able to apply the acquired methods to current problems of Theoretical Physics.

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

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

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

a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minu-

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	Module title Abbreviation					
Current	t Topics	s in Physics			11-EXP5-111-m01	
Module	e coord	inator		Module offered by	l.	
chairpe	erson o	f examination committee		Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. con		·	
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate	Approval by examin	ation committee req	uired.	
Conten	ts		, , , , ,			
		of Experimental and Theversity or study abroad.	oretical Physics. Acc	redited academic ac	hievements, e.g. in case of	
Intende	ed learı	ning outcomes				
Theore subdis	tical Ph cipline	ysics of the Master's pro	gramme of Nanostrund the measuring and	cture Technology. Th d/or calculation met	of a module of Experimental or ney have knowledge of a current hods necessary to acquire this application areas.	
Course	S (type, r	umber of weekly contact hours, l	anguage — if other than Ge	rman)		
V + R (r	no infor	mation on SWS (weekly o	contact hours) and co	ourse language avail	able)	
		sessment (type, scope, langua le for bonus)	ge — if other than German,	examination offered — if no	ot every semester, information on whether	
less otl minute prox. 8 tes)	herwise s per ca to 10 p	e specified) or b) oral exa andidate, for modules wi	mination of one cand th less than 4 ECTS c 1 to 4 weeks) or d) pr	lidate each or oral e redits approx. 20 mi	credits approx. 90 minutes; un- xamination in groups (approx. 30 inutes) or c) project report (ap- presentation (approx. 30 minu-	
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Workload						
Teaching cycle						
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	ımmes)		
		(00 100.00			
Module	annea	ers in				

Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010)



Module	e title	,	Abbreviation		
Current Topics in Physics					11-EXP6-111-m01
Module coordinator				Module offered by	
chairpe	erson o	f examination committee	!	Faculty of Physics and Astronomy	
ECTS	Metho	Method of grading Only after s		npl. of module(s)	
6	numerical grade				
Duratio	Duration Module level		Other prerequisites		
1 seme	1 semester graduate		Approval by examination committee required.		
Conten	Contents				

Current topics of Experimental and Theoretical Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

Intended learning outcomes

The students have advanced competencies corresponding to the requirements of a module of Experimental or Theoretical Physics of the Master's programme of Nanostructure Technology. They have knowledge of a current subdiscipline of Physics and understand the measuring and/or calculation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas.

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

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

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

a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minu-

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Module	Module title Abbreviation					
Curren	t Topic	s in Physics			11-EXP7-111-m01	
Module	Module coordinator			Module offered by		
chairpe	erson o	f examination committee		Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
7	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate	Approval by examin	ation committee req	uired.	
Conten	Contents					
Current topics of Experimental and Theoretical Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.						
Intend	ed lear	ning outcomes				
Theore subdis knowle	tical Ph cipline edge. Th	ysics of the Master's pro of Physics and understar ney are able to classify th	gramme of Nanostrudent the measuring and e subject-specific co	cture Technology. Th I/or calculation met ntexts and know the	of a module of Experimental or ley have knowledge of a current hods necessary to acquire this application areas.	
	-	number of weekly contact hours, l				
		mation on SWS (weekly o				
		Sessment (type, scope, langua _l le for bonus)	ge — if other than German,	examination offered — if no	ot every semester, information on whether	
less oth minute prox. 8 tes)	herwise s per c to 10 p	e specified) or b) oral exa andidate, for modules wi	mination of one cand th less than 4 ECTS c 1 to 4 weeks) or d) pr	lidate each or oral ex redits approx. 20 mi	credits approx. 90 minutes; un- xamination in groups (approx. 30 nutes) or c) project report (ap- presentation (approx. 30 minu-	
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Workload						
Teaching cycle						
Referre	ed to in	LPO I (examination regulations	s for teaching-degree progra	mmes)		
Module	e appea	ars in				

Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010)



Module title Abbreviation					Abbreviation
Curren	t Topic	s in Physics			11-EXP8-111-m01
Module coordinator				Module offered by	'
chairp	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
8	nume	rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate	Approval by examin	ation committee req	uired.
Contents					
		of Experimental and The versity or study abroad.	eoretical Physics. Acc	redited academic ac	hievements, e.g. in case of
Intend	ed lear	ning outcomes			
subdis knowle	cipline edge. Th		nd the measuring and e subject-specific co	d/or calculation met ntexts and know the	ney have knowledge of a current hods necessary to acquire this application areas.
	_	rmation on SWS (weekly			ahle)
		·	- · · · · · · · · · · · · · · · · · · ·		ot every semester, information on whether
		ole for bonus)	ise in other than definally	examination oncice in the	st every semester, information on whether
less ot minute prox. 8 tes)	herwise es per c 8 to 10 p	e specified) or b) oral exa andidate, for modules w	mination of one cand th less than 4 ECTS c 1 to 4 weeks) or d) pr	lidate each or oral e redits approx. 20 mi	credits approx. 90 minutes; un- xamination in groups (approx. 30 nutes) or c) project report (ap- presentation (approx. 30 minu-
Alloca	tion of	places			
Additio	onal inf	ormation			
Worklo	oad				
Teachi	ng cycl	e			
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	mmes)	

Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010)

Module appears in



Module	e title	·			Abbreviation
Introdu	ıction t	o Electron Microscopy			11-IEM-111-mo1
Module	coord	linator		Module offered by	
Manag	ing Dir	ector of the Institute of A	pplied Physics	Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
4	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semester graduate		Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.			

1. Microscopy with light and electrons. 2. Electrons and their interaction with a specimen. 3. Electron diffraction (selected-area ED, convergent beam ED, basics of electron crystallography, comparison with the X-ray diffraction technique). 4. Transmission electron microscopy (the instrument, contrast mechanisms, principles of image formation, imaging of microstructure). 5. Can we see atoms? High-resolution electron microscopy (principle of image formation, image simulation). 6. Scanning electron microscopy (the instrument, contrast mechanisms). 7. Chemical analysis with the electron microscope (energy-dispersive X-ray microanalysis, electron energy loss spectroscopy). 8. Sample preparation. Electron microscopy and complementary techniques.

Intended learning outcomes

The students have basic knowledge of modern research methods of electron microscopy up to an atomic level. They know microscoping procedures that are used in practice in labs and the industry as well as electron-microscopic methods for chemical analysis. They are able to evaluate the efficiency of different research methods.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

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Vorkload	



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' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

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

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

Master's degree (1 major) FOKUS Physics (2011)

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



Module	e title				Abbreviation	
Field T	heory i	n Solid State Physics			11-FTFK-112-m01	
Module	Module coordinator			Module offered by		
Managing Director of the Institute of Theoretics and Astrophysics			f Theoretical Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites	Other prerequisites		
1 semester graduate		sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment is sessment at a later	Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.			

This will usually be a course on quantum many particle physics using the method of functional integration. An outline could be:

- 1 Coherent states and review of second quantization
- 2 The functional integral formalism at finite temperatures T
- 3 Perturbation theory at T=o
- 4 Order parameters and broken symmetry
- 5 Green's functions
- 6 The Landau theory of Fermi liquids
- 7 Further developments

Intended learning outcomes

The students have mastered the principles of quantum field theory in many-particle systems. They are able to apply the acquired methods to current problems of Theoretical Solid-State Physics.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

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

Master's degree (1 major) FOKUS Physics (2011)



Module	e title				Abbreviation
Computational Materials Science					11-CMS-122-m01
Module	Module coordinator			Module offered by	L
Managing Director of the Institute of Thand Astrophysics			heoretical Physics	neoretical Physics Faculty of Physics 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		
1 semester graduate		sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment in	urer will inform stude the course. Registrat on of will to seek adm d the qualification fo emester, the lecturer t. Students who mee n the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

Density functional theory (DFT)/local-density approximation (exercise with "Wien2k"; band structure programme, Green's functions, quantum dots, Anderson impurity model (exercise, implementation of the exact diagonalisation/Lanczos), introduction to continuous-time quantum Monte Carlo (exercise), crystal field symmetry, Coulomb interaction, dynamic mean field theory (DMFT exercise). Lecture + 4-5 exercises in the CIP pool. The exercises implement the basic ideas of different algorithms, either based on template programmes or on completely self-written programmes. Electronic submission of all exercises and approx. 20 minutes presentation about one of the 4-5 topics of the lecture/exercise (freely chosen by the student) with a little more elaboration on the topic than in the exercise.

Intended learning outcomes

Theoretical treatment of the above topics complemented by hands-on tutorials to be held in the CIP-Pool. Familiarity with DFT software packages such as VASP or Wien2k and and construction of maximally localized Wannier functions by projecting DFT results onto atomic orbitals using wannier90. Focus on applications to topological materials. Knowledge how to obtain many-body solutions of the AIM and explore some of its limiting cases such as the Kondo regime. Ability to use impurity solvers based on exact diagonalization or continuous-time quantum Monte Carlo for the solution of the DMFT self-consistency equations.

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

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

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

a) written examination (90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German or English

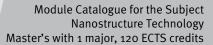
Allocation of places

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Additional information

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Ī	Master's with 1 major Nanostructure Technology	JMU Würzburg • generated 26-Aug-2024 • exam. reg. da-	page 133 / 233
-	(2011)	ta record Master (120 ECTS) Nanostrukturtechnik - 2011	





Workload

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Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Module	e title				Abbreviation
Compu	tationa	al Materials Science			11-CMS-131-m01
Module	e coord	linator		Module offered by	Į.
Managing Director of the Institute of Theoret and Astrophysics			heoretical Physics	Faculty of Physics and Astronomy	
ECTS	Meth	od of grading	Only after succ. compl. of module(s)		
8	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semester graduate		sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effects.	rer will inform stude the course. Registrat on of will to seek adn d the qualification fo mester, the lecturer t. Students who mee	alify for admission to as- ents about the respective details tion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- ne subsequent semesters.	

Density functional theory (DFT)/local-density approximation (exercise with "Wien2k"; band structure programme, Green's functions, quantum dots, Anderson impurity model (exercise, implementation of the exact diagonalisation/Lanczos), introduction to continuous-time quantum Monte Carlo (exercise), crystal field symmetry, Coulomb interaction, dynamic mean field theory (DMFT exercise). Lecture + 4-5 exercises in the CIP pool. The exercises implement the basic ideas of different algorithms, either based on template programmes or on completely self-written programmes. Electronic submission of all exercises and approx. 20 minutes presentation about one of the 4-5 topics of the lecture/exercise (freely chosen by the student) with a little more elaboration on the topic than in the exercise.

Intended learning outcomes

The students have advanced knowledge of mathematical methods of material sciences. They are able to develop algorithms for the application of these methods and to implement them into programmes.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English
Allocation of places
Additional information
Workload
Teaching cycle



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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Modul	Module title				Abbreviation	
Applied Superconduction					11-ASL-131-m01	
Modul	le coord	linator		Module offered by		
Manag	ging Dir	ector of the Institute	e of Applied Physics	Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
6	nume	erical grade				
Durati	on	Module level	Other prerequisites	Other prerequisites		
1 semester graduate		sessment. The lectuat the beginning of sidered a declaration dents have obtaine the course of the se	rrer will inform stude the course. Registrat on of will to seek adn d the qualification fo mester, the lecturer	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit-		

Physical principles of superconductivity. Application in energy engineering, Instrumental developments. Methods of materials sciences for the calculation of temperature profiles in superconductors.

Intended learning outcomes

The students have a basic understanding of superconductivity as a macroscopic quantum phenomenon. They are able to evaluate the contributions of materials sciences to the development of superconductivity. They are able to discuss questions on superconductivity in a scientific manner and to critically question developments of energy technology. Furthermore, they can deal with practical mathematical questions.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)



Module title					Abbreviation
Solid State Spectroscopy 2					11-FKS2-132-m01
Module coordinator				Module offered by	
Managing Director of the Institute of Applied Physi			pplied Physics	Faculty of Physics and Astronomy	
ECTS	Meth	od of grading	Only after succ. con	y after succ. compl. of module(s)	
6	nume	erical grade			
Duration Module level		Module level	Other prerequisites		
1 semester		graduate			
Contoute					

Modern scattering methods; neutron scattering as a method to investigate the atomic and magnetic structure and excitations such as phonons and magnetic waves; resonant elastic X-ray scattering and absorption; investigation of magnetic, orbital and charge order; X-ray and neutron reflectometry; investigation of the structural, magnetic and electronic properties of thin films and superlattices; resonant inelastic X-ray scattering; investigation of excitations in solids and thin films; STEM ("scanning transmission electron microscopy"); further topics upon agreement.

Intended learning outcomes

The students know different modern scattering methods such as neutron scattering, resonant elastic X-ray scattering, modern scattering theory, X-ray and neutron reflectometry and resonant inelastic X-ray scattering. They are familiar with the theoretical principles and applications of these methods.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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



Module title					Abbreviation	
Topology in Solid State Physics					11-TFP-132-m01	
Module coordinator				Module offered by		
Managing Director of the Institute of Applied Physics			of Applied Physics	Faculty of Physics a	Faculty of Physics and Astronomy	
ECTS	Meth	hod of grading Only after succ. c		compl. of module(s)		
6	nume	rical grade	al grade			
Duration		Module level	Other prerequisit	Other prerequisites		
1 semester		graduate				

The students are familiar with the theory of topological effects in Solid-State Physics. They know the mathematical methods necessary for their description and are able to apply these methods to simple problems.

Intended learning outcomes

The students are familiar with the theory of topological effects in Solid-State Physics. They know the mathematical methods necessary for their description and are able to apply these methods to simple problems.

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

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

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

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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



Non-technical Subsidiary Subjects

(6 ECTS credits)



Mathematics

(ECTS credits)



Module title Operations Research				Abbreviation		
				10-M-ORS-072-m01		
Module coordinator				Module offered by		
Dean of Studies Mathematik (Mathematics)			hematics)	Institute of Mathematics		
ECTS	S Method of grading		Only after succ. cor	Only after succ. compl. of module(s)		
5	nume	erical grade				
Duration Module level		Module level	Other prerequisites	Other prerequisites		
1 semester		undergraduate	sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment sessment at a later	Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.		

Linear programming, duality theory, transport problems, integral linear programming, graph theoretic problems.

Intended learning outcomes

The student is acquainted with the fundamental methods in operations research, as required as a central tool for solving many practical problems especially in economics. He/She is able to apply these methods to practical problems, both theoretically and numerically.

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

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

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

written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

§ 73 (1) 5. Mathematik Angewandte Mathematik

Module appears in

Bachelor' degree (1 major) Computer Science (2007)

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2008)

Bachelor' degree (1 major) Mathematics (2007)

Bachelor' degree (1 major) Economathematics (2009)



Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Mathematical Physics (2009)

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

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

First state examination for the teaching degree Gymnasium Mathematics (2009)



Module title				Abbreviation		
Numerical Mathematics 1				10-M-NM1-082-m01		
Module coordinator				Module offered by		
Dean of Studies Mathematik (Mathematics)			ematics)	Institute of Mathematics		
ECTS	ECTS Method of grading		Only after succ. con	Only after succ. compl. of module(s)		
8	nume	rical grade				
Duration Module level		Module level	Other prerequisites	Other prerequisites		
1 semester		undergraduate	sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effect ted to assessment it sessment at a later	Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.		

Solution of systems of linear equations and curve fitting problems, nonlinear equations and systems of equations, interpolation with polynomials, splines and trigonometric functions, numerical integration.

Intended learning outcomes

The student is acquainted with the fundamental concepts and methods in numerical mathematics, applies them to practical problems and knows about their typical fields of application.

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

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

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

written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

§ 73 (1) 5. Mathematik Angewandte Mathematik

Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2008)

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Physics (2012)



Bachelor' degree (1 major) Physics (2008)

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

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

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

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Mathematical Physics (2009)

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

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

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

Master's degree (1 major) Physics (2011)

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

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

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

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

First state examination for the teaching degree Gymnasium Mathematics (2009)



Module	title	,			Abbreviation
Numerical Mathematics 2					10-M-NM2-082-m01
Module coordinator				Module offered by	
Dean o	f Studi	es Mathematik (Mathem	atics)	Institute of Mathem	natics
ECTS	Meth	od of grading	Only after succ. con	pl. of module(s)	
5	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semester undergraduate		Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.			

Solution methods and applications for eigenvalue problems, linear programming, initial value problems for ordinary differential equations, boundary value problems.

Intended learning outcomes

The student is able to draw a distinction between the different concepts of numerical mathematics and knows about their advantages and limitations concerning the possibilities of application in different fields of natural and engineering sciences and economics.

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

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

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

written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

§ 73 (1) 5. Mathematik Angewandte Mathematik

Module appears in

Bachelor' degree (1 major) Mathematics (2008)

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Physics (2012)



Bachelor' degree (1 major) Physics (2008)

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

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

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

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Mathematical Physics (2009)

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

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

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

Master's degree (1 major) Physics (2011)

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

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

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

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

First state examination for the teaching degree Gymnasium Mathematics (2009)



Module	title				Abbreviation	
Advanced Analysis					10-M-VAN-082-m01	
Module coordinator				Module offered by		
Dean of Studies Mathematik (Mathematics)			ematics)	Institute of Mathem	natics	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	n	Module level	Other prerequisites	Other prerequisites		
		undergraduate	sessment. The lectu at the beginning of the sidered a declaration dents have obtained the course of the se sessment into effect ted to assessment i	rer will inform stude the course. Registrat n of will to seek adm the qualification fo mester, the lecturer to Students who meen the current or in th date, students will h	alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- or all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for	

Lebesgue integral in several variables, including theorems on convergence and Fubini's theorem, L^p-spaces and elementary Fourier theory in L^2, Gauss's theorem.

Intended learning outcomes

The student is acquainted with advanced topics in analysis. Taking the example of the Lesbegue integral, he or she is able to understand the construction of a complex mathematical concept.

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

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

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

written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

§ 73 (1) 1. Mathematik Analysis

Module appears in

Bachelor' degree (1 major) Mathematics (2008)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Mathematical Physics (2009)

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



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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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

First state examination for the teaching degree Gymnasium Mathematics (2009)



Module title					Abbreviation
Applied Analysis					10-M=AAAN-102-m01
Module coordinator Module offered by					
Dean o	f Studi	es Mathematik (Ma	thematics)	Institute of Mathema	atics
ECTS	Metho	od of grading	rading Only after succ. compl. of module(s)		
10	nume	rical grade			
Duratio	n	Module level	Other prerequisites	;	
Duration Module level 1 semester graduate		graduate	ning of the course of the specified registr to qualify for admiss certain percentage of the respective detail exercise will be consessment. If student assessment over the gistration for assess	or as announced by the ration deadlines. Certains to assessment (exports of exercises). The lectails at the beginning of sidered a declaration its have obtained the execurse of the semestiment into effect. Studies	de via SB@home at the begine lecturer in accordance with ain prerequisites must be met a. g. successful completion of a urer will inform students about the course. Registration for the of will to seek admission to asqualification for admission to ster, the lecturer will put their redents who meet all prerequisites rent or in the subsequent seme-

In-depth study of functional analysis and operator theory, Sobolev spaces and partial differential equations, theory of Hilbert spaces and Fourier analysis, spectral theory and quantum mechanics, numerical methods (in particular FEM methods), principles of functional analysis, function spaces, embedding theorems, compactness, theory of elliptic, parabolic and hyperbolic partial differential equations with methods from functional analysis.

Recommended previous knowledge:

Familiarity with the contents of the module "Functional Analysis" is strongly recommended.

Intended learning outcomes

The student is acquainted with the fundamental notions, methods and results of higher analysis. He/She is able to establish a connection between his/her acquired skills and other branches of mathematics and questions in physics and other natural and engineering sciences.

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

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

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

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Computational Mathematics (2012)



Module title	•		Abbreviation
Complex An	alysis		10-M=AFTH-102-m01
Module coo	rdinator		Module offered by
Dean of Stu	dies Mathematik (Ma	thematics)	Institute of Mathematics
ECTS Met	hod of grading	Only after succ. con	ıpl. of module(s)
10 num	nerical grade		
Duration	Module level	Other prerequisites	
1 semester	graduate	ning of the course of the specified registr to qualify for admis certain percentage the respective detail exercise will be con sessment. If studen assessment over the gistration for assess will be admitted to	exercise must be made via SB@home at the begin- r as announced by the lecturer in accordance with ration deadlines. Certain prerequisites must be met sion to assessment (e. g. successful completion of a of exercises). The lecturer will inform students about ls at the beginning of the course. Registration for the sidered a declaration of will to seek admission to as- ts have obtained the qualification for admission to e course of the semester, the lecturer will put their re- sment into effect. Students who meet all prerequisites assessment in the current or in the subsequent seme- t at a later date, students will have to obtain the qua-

In-depth study of mapping properties of analytic functions and their generalisations with modern analytic and geometric methods. Structural properties of families of holomorphic and meromorphic functions. Special functions (e. g. elliptic functions).

Recommended previous knowledge:

Basic knowledge of the contents of the module "Introduction to Complex Analysis" is recommended.

Intended learning outcomes

The student is acquainted with the fundamental notions, methods and results of higher complex analysis, in particular the (geometric) mapping properties of holomorphic functions. He/She is able to establish a connection between his/her acquired skills and other branches of mathematics and applications in other subjects.

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

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

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

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Computational Mathematics (2012)



	le			Abbreviation	
Groups an	d their Representation	s		10-M=VGDS-102-m01	
Module co	ordinator		Module offered by		
Dean of St	udies Mathematik (Ma	thematics)	Institute of Mathem	natics	
ECTS M	ethod of grading	Only after succ. co	mpl. of module(s)		
10 nu	merical grade				
Duration	Module level	Other prerequisites	s		
Duration Module level 1 semester graduate		ning of the course of the specified regist to qualify for admis certain percentage the respective deta exercise will be cor	Other prerequisites Registration for the exercise must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be met to qualify for admission to assessment (e. g. successful completion of a certain percentage of exercises). The lecturer will inform students about the respective details at the beginning of the course. Registration for the exercise will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qua-		

Finite permutation groups and character theory of finite groups, interrelations and special techniques such as the S-rings of Schur.

Recommended previous knowledge:

Basic knowledge of algebra is assumed, such as can be acquired in the modules "Introduction to Algebra" and "Applied Algebra".

Intended learning outcomes

The student masters advanced algebraic concepts and methods. He/She gains the ability to work on contemporary research questions in group theory and representation theory and can apply his/her skills to complex problems.

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

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

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

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (approx. 90 to 120 minutes; usually chosen), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups of 2 candidates (approx. 30 minutes total)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Computational Mathematics (2012)



Module	title			Abbreviation
Numeric	of Pa	rtial Differential Equ	uations	10-M=VNPE-102-m01
Module coordinator				Module offered by
Dean of	Studie	es Mathematik (Mat	hematics)	Institute of Mathematics
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)
10	nume	rical grade		
Duration	n	Module level	Other prerequisites	
Duration Module level 1 semester graduate		ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to a ster. For assessment	exercise must be made via SB@home at the beginar as announced by the lecturer in accordance with ration deadlines. Certain prerequisites must be met sion to assessment (e. g. successful completion of a of exercises). The lecturer will inform students about its at the beginning of the course. Registration for the sidered a declaration of will to seek admission to asts have obtained the qualification for admission to e course of the semester, the lecturer will put their resment into effect. Students who meet all prerequisites assessment in the current or in the subsequent semet at a later date, students will have to obtain the quation to assessment anew.	

Types of partial differential equations, qualitative properties, finite differences, finite elements, error estimates (numerical methods for elliptic, parabolic and hyperbolic partial differential equations; finite elements method, discontinuous Gelerkin finite elements method, finite differences and finite volume methods).

Recommended previous knowledge:

We recommend basic knowledge of functional analysis and partial differential equations, such as can be acquired in the modules "Introduction to Functional Analysis" and "Applied Analysis".

Intended learning outcomes

The student is acquainted with advanced methods for discretising partial differential equations.

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

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

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

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places
Additional information
Workload
Teaching cycle



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

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Module appears in

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Computational Mathematics (2012)



Module t	Abbreviation			
Quantum Control and Quantum Computing				10-M=VQKC-102-m01
Module coordinator Mod				Module offered by
Dean of S	Studies	s Mathematik (Mat	hematics)	Institute of Mathematics
ECTS N	Nethod	d of grading	Only after succ. cor	npl. of module(s)
5 n	numeri	cal grade		
Duration	l l	Module level	Other prerequisites	•
Duration 1 semester		graduate	ning of the course of the specified registr to qualify for admis certain percentage the respective detail exercise will be con sessment. If studen assessment over th gistration for assess will be admitted to ster. For assessment	exercise must be made via SB@home at the begin- or as announced by the lecturer in accordance with ration deadlines. Certain prerequisites must be met sion to assessment (e. g. successful completion of a of exercises). The lecturer will inform students about ils at the beginning of the course. Registration for the sidered a declaration of will to seek admission to as- ots have obtained the qualification for admission to e course of the semester, the lecturer will put their re- sment into effect. Students who meet all prerequisites assessment in the current or in the subsequent seme- out at a later date, students will have to obtain the qua- sion to assessment anew.

Basics in dynamics of quantum-mechanical systems (e. g. density operators, observables, Schrödinger equation, Liouville-von-Neumann equation), bilinear control systems in quantum mechanics (e. g. finite-dimensional spin systems and/or infinite-dimensional Schrödinger equations with external control), applications (e. g. in quantum computing or magnetic resonance spectroscopy).

Intended learning outcomes

The student is acquainted with advanced methods in quantum-mechanical control systems. He gains the ability to work on contemporary research questions in and applications of control systems in quantum mechanics.

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

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

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

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Master's with 1 major Nanostructure Technology	JMU Würzburg • g
2011)	ta record Master



Module appears in

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)



Computer Science

(ECTS credits)



Module title					Abbreviation
Databases					10-I-DB-102-m01
Module coordinator				Module offered by	
Dean of Studies Informatik (Computer Science)			Science)	Institute of Computer Science	
ECTS	S Method of grading Only after su		Only after succ. con	compl. of module(s)	
5	nume	rical grade			
Duratio	n	Module level	Other prerequisites	er prerequisites	
		Admission prerequisite to assessment: exercises (type and scope to be announced by the lecturer at the beginning of the course).			
Conten	tc		•		

Relational algebra and complex SQL statements; database planning and normal forms; transaction manage-

Intended learning outcomes

The students possess knowledge about database modelling and queries in SQL as well as transactions.

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

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

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

written examination (approx. 50 to 60 minutes)

if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

Additional information

Workload

Teaching cycle

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

§ 49 (1) 1. b) Datenbanksysteme und Softwaretechnologie

§ 69 (1) 1. b) Datenbanksysteme und Softwaretechnologie

Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2012)

Bachelor' degree (1 major) Mathematics (2013)

Bachelor' degree (1 major) Business Information Systems (2013)

Bachelor' degree (1 major) Computational Mathematics (2012)

Bachelor' degree (1 major) Computational Mathematics (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Bachelor' degree (1 major) Functional Materials (2012)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)



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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Computational Mathematics (2012)

First state examination for the teaching degree Realschule Computer Science (2012)



Module title					Abbreviation
Object-oriented Programming					10-I-00P-102-m01
Module coordinator				Module offered by	
Dean of Studies Informatik (Computer Science)			Science)	Institute of Computer Science	
ECTS Method of grading		Only after succ. compl. of module(s)			
5	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semester undergraduate		Admission prerequisite to assessment: exercises (type and scope to be announced by the lecturer at the beginning of the course).			
Conten	ts				

Polymorphism, generic programming, meta programming, web programming, templates, document manage-

Intended learning outcomes

The students are proficient in the different paradigms of object-oriented programming and have experience in their practical use.

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

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

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

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes) Language of assessment: German, English if agreed upon with the examiner

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2012)

Bachelor' degree (1 major) Mathematics (2013)

Bachelor' degree (1 major) Business Information Systems (2013)

Bachelor' degree (1 major) Computational Mathematics (2012)

Bachelor' degree (1 major) Computational Mathematics (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Module title					Abbreviation	
Automation and Control Technology					10-l-AR-102-m01	
Module coordinator Module				Module offered by	Module offered by	
holder of the Chair of Computer Science VII			e VII	Institute of Computer Science		
ECTS	S Method of grading Only after succ			compl. of module(s)		
8	nume	rical grade				
Duration Module level		Other prerequisites				
1 semester undergraduate		Admission prerequisite to assessment: exercises (type and scope to be announced by the lecturer at the beginning of the course).				
Conton	tc	•				

Overview of automation systems, fundamental principles of control technology, Laplace transformation, transfer function, plant, controller types, basic feedback loop, fundamental principles of control engineering, automata, structure of Petri nets, Petri nets for automisation, machine-related structure of processing computation machines, communication between process computers and periphery devices, software for automation systems, process synchronisation, process communication, real-time operating systems, real-time planning.

Intended learning outcomes

The students master the fundamentals of automation and control.

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

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

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

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2012)

Bachelor' degree (1 major) Mathematics (2013)

Bachelor' degree (1 major) Computational Mathematics (2012)

Bachelor' degree (1 major) Computational Mathematics (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)



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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Computational Mathematics (2012)



Module	e title	Abbreviation				
Operating Systems					10-I-BS-102-m01	
Module coordinator				Module offered by		
holder of the Chair of Computer Science II			ce II	Institute of Computer Science		
ECTS	Meth	od of grading	Only after succ. con	after succ. compl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 semester		undergraduate	Admission prerequisite to assessment: exercises (type and scope to be announced by the lecturer at the beginning of the course).			
Combonto						

Batch, time sharing, real-time virtual machines, system calls, processes and threads, cooperating processes, schedulers, process synchronisation, semaphores, monitors, critical regions, deadlocks, dynamic memory management, segmentation, paging, file systems, interfaces, directory structure, network file systems, hard drive organisation, basics of MS operating systems.

Intended learning outcomes

The students possess knowledge and practical skills in building and using essential parts of operating systems.

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

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

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

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

§ 69 (1) 1. c) Informatik Technische Informatik

Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Module title					Abbreviation
Computer Architecture					10-I-RAK-102-m01
Module	e coord	inator		Module offered by	
Dean of Studies Informatik (Computer S			Science)	Institute of Computer Science	
ECTS	Meth	od of grading	Only after succ. compl. of module(s)		
5	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semester undergraduate		undergraduate	Admission prerequisite to assessment: exercises (type and scope to be announced by the lecturer at the beginning of the course).		

Instruction set architectures, command processing through pipelining, statical and dynamic instruction scheduling, caches, vector processors, multi-core processors.

Intended learning outcomes

The students master the most important techniques to design fast computers as well as their interaction with compilers and operating systems.

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

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

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

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

§ 69 (1) 1. c) Informatik Technische Informatik

Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2012)

Bachelor' degree (1 major) Mathematics (2013)

Bachelor' degree (1 major) Computational Mathematics (2012)

Bachelor' degree (1 major) Computational Mathematics (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)



Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010) Master's degree (1 major) Computational Mathematics (2012)



Module title					Abbreviation	
Programming of Distributed Systems					10-l=PVS-102-m01	
Module coordinator				Module offered by		
holder of the Chair of Computer Science II			e II	Institute of Computer Science		
ECTS	Meth	od of grading	Only after succ. con	mpl. of module(s)		
8	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
		Where applicable, prerequisites as specified by the lecturer at the beginning of the course (e. g. completion of exercises).				
Conten	Contents					

Design and development of parallely and distributedly executed programs.

Intended learning outcomes

The students possess the methodic knowledge and practical skills for the design and development of parallely and distributedly running programs.

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

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

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

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Computer Science (2010)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Module title					Abbreviation
Artificial Intelligence					10-l=Kl-102-m01
Module	coord	inator		Module offered by	
holder of the Chair of Computer Science V			e VI	Institute of Computer Science	
ECTS	Metho	od of grading	Only after succ. compl. of module(s)		
8	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semester graduate		Where applicable, prerequisites as specified by the lecturer at the beginning of the course (e. g. completion of exercises).			

Intelligent agents, uninformed and heuristic search, constraint problem solving, search with partial information, propositional and predicate logic and inference, knowledge representation, planning, probabilistic closure and Bayesian networks, utility theory and decidability problems, learning from observations, knowledge while learning, neural networks and statistical learning methods, reinforcement learning.

Intended learning outcomes

The students possess theoretical and practical knowledge about artificial intelligence and are able to assess possibilities for its application.

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

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

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

written examination (approx. 80 to 90 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Computational Mathematics (2012)



Modul	Module title Abbreviation						
Databases II 10-I=DB2-102-m01							
Modul	e coordinator		Module offered by				
Dean o	f Studies Informatik (Compute	r Science)	Institute of Compu	ter Science			
ECTS	Method of grading	Only after succ. cor	npl. of module(s)				
5	numerical grade						
Duratio	on Module level	Other prerequisites	i				
1 seme	ster graduate		orerequisites as spece.g. completion of e	cified by the lecturer at the begin exercises).			
Conter	its						
Data w	arehouses and data mining; XI	ML databases; web da	itabases;introductio	n to Datalog.			
	ed learning outcomes						
The stu	idents have advanced knowled	lge about relational da	atabases, XML and d	lata mining.			
Course	S (type, number of weekly contact hours	, language — if other than Ge	rman)				
V + Ü (no information on SWS (weekly	contact hours) and co	ourse language avai	lable)			
tion da aminat		n be replaced by an or each: 15 minutes, grou	al examination of or ps of 2: 20 minutes,	y four weeks prior to the examina ne candidate each or an oral ex- groups of 3: 25 minutes)			
Allocat	ion of places						
Additio	onal information						
Worklo	oad .						
Teachi	ng cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)							
Modul	e appears in						
	's degree (1 major) Computer S						
	's degree (1 major) Mathematic						
	's degree (1 major) Mathematic						
ıvıaster	Naster's degree (1 major) Physics (2010)						

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Business Information Systems (2011)

Master's degree (1 major) Business Information Systems (2013)

Master's degree (1 major) Computational Mathematics (2012)

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



Module title Abbreviation						
Program Design and Analysis 10-I=PA-102-m01						
Module coord	linator	Module offered	by '			
holder of the	Chair of Computer Scien	ce II	Institute of Com	puter Science		
ECTS Meth	od of grading	Only after succ. con	npl. of module(s)			
5 nume	erical grade					
Duration	Module level	Other prerequisites	i			
1 semester	graduate	Where applicable, p		pecified by the lecturer at the begin of exercises).		
Contents	•					
Program anal	ysis, model creation in s	oftware engineering, p	orogram quality, t	est of programs, process models.		
Intended lear	ning outcomes					
The students quality.	are able to analyse prog	rams, to use testing fr	ameworks and m	etrics as well as to judge program		
Courses (type,	number of weekly contact hours	, language — if other than Ge	rman)			
V + Ü (no info	rmation on SWS (weekly	contact hours) and co	ourse language av	/ailable)		
Method of as module is credital		uage — if other than German,	examination offered —	if not every semester, information on whether		
tion date, the	written examination car groups (one candidate e	n be replaced by an or	al examination of ps of 2: 20 minute	by four weeks prior to the examina one candidate each or an oral ex- es, groups of 3: 25 minutes)		
	assessificite definition, En					
		<u> </u>				

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

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

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

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Business Information Systems (2011)

Master's degree (1 major) Business Information Systems (2013)

Master's degree (1 major) Computational Mathematics (2012)



Law

(ECTS credits)



Module title					Abbreviation	
Funda	mentals	s of Commercial Law			02-N-P-H-082-m01	
Module coordinator				Module offered by		
Dean o	Dean of Studies Faculty of Law			Faculty of Law		
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)		
4	nume	rical grade				
Duration Module level		Other prerequisites				
1 seme	1 semester undergraduate					
Contracts						

German contents available but not translated yet.

Das Modul erschließt den zentralen Bereich des Handelsrechts.

Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden haben umfassende Kenntnisse auf dem Gebiet des Handelsrechts erworben. Sie haben sich insbesondere mit den Vorschriften über die Kaufleute, das Handelsregister, die Handelsfirma, Prokura, Handlungsvollmacht, sowie den allgemeinen Vorschriften über Handelsgeschäfte und den Handelskauf beschäftigt.

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

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

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

a) written examination (approx. 120 minutes) or b) oral examination (approx. 15 minutes)

Allocation of places

Degree programm law (degree "Erste Juristische Staatsprüfung") and Bachelor's Privatrecht (Private Law) (minor with 60 ECTS credits): no restrictions. Students of other degree programmes: 20 places. Places will be allocated as follows: Students applying after not having successfully completed assessment in in the last two semesters will be given preferential consideration. The remaining places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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



Module title					Abbreviation
Employment Law					02-N-P-A-082-m01
Module coordinator				Module offered by	
Dean c	of Studi	es Faculty of Law		Faculty of Law	
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)	
4	nume	rical grade			
Duratio	Duration Module level		Other prerequisites		
1 seme	1 semester undergraduate				

German contents available but not translated yet.

Die Veranstaltung verschafft den Studierenden einen Überblick über System und Struktur des Arbeitsrechts und geht dabei auf die wichtigsten Problembereiche ein.

Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden haben umfassende Kenntnisse auf dem Gebiet des Individualrechts erworben. Daneben haben sie sich mit bedeutenden Fragestellungen des Kollektivarbeitsrechts auseinandergesetzt.

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

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

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

a) written examination (approx. 120 minutes) or b) oral examination (approx. 15 minutes)

Allocation of places

Degree programm law (degree "Erste Juristische Staatsprüfung") and Bachelor's Privatrecht (Private Law) (minor with 60 ECTS credits): no restrictions. Students of other degree programmes: 20 places. Places will be allocated as follows: Students applying after not having successfully completed assessment in in the last two semesters will be given preferential consideration. The remaining places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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



Modul	e title		Abbreviation			
Introd	Introduction to Companies Law				02-N-P-G-082-m01	
Module coordinator				Module offered by		
Dean c	of Studi	es Faculty of Law		Faculty of Law		
ECTS	Metho	od of grading	Only after succ. co	mpl. of module(s)		
2	nume	rical grade				
Durati	Duration Module level		Other prerequisites	Other prerequisites		
1 seme	1 semester undergraduate]		
Contents						

German contents available but not translated yet.

Gegenstand der Vorlesung sind Grundzüge des Rechts der Personengesellschaften und der GmbH.

Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden haben wesentliche Kenntnisse über die Personengesellschaften, insbesondere die oHG und die GbR erlangt. Darüber hinaus haben sie Einblicke in das Recht der Kapitalgesellschaften erhalten.

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

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

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

a) written examination (approx. 120 minutes) or b) oral examination (approx. 15 minutes)

Allocation of places

Degree programm law (degree "Erste Juristische Staatsprüfung") and Bachelor's Privatrecht (Private Law) (minor with 60 ECTS credits): no restrictions. Students of other degree programmes: 20 places. Places will be allocated as follows: Students applying after not having successfully completed assessment in in the last two semesters will be given preferential consideration. The remaining places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

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



Modul	e title		Abbreviation		
European Company Law					02-N-P-W04-112-m01
Module coordinator				Module offered by	
Dean o	Dean of Studies Faculty of Law			Faculty of Law	
ECTS	Meth	od of grading	Only after succ. co	npl. of module(s)	
2	nume	rical grade			
Duration Module level		Other prerequisites	Other prerequisites		
1 seme	1 semester undergraduate				
Control					

German contents available but not translated yet.

Die Vorlesung behandelt die Einflüsse des Gemeinschaftsrechts auf das Gesellschaftsrecht: Niederlassungsfreiheit des EG-Vertrages, Rechtsangleichung durch Richtlinien, supranationale Rechtsformen.

Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden haben die in den letzten Jahren immer stärker in den Vordergrund getretenen europäischen Bezüge des Gesellschaftsrechts erlernt und können das deutsche Gesellschaftsrecht in den Kontext seiner europäischen Entwicklung einordnen.

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

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

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

a) written examination (approx. 120 minutes) or b) oral examination (approx. 15 minutes) Assessment offered: once a year, winter semester

Allocation of places

Students of the degree programme Rechtswissenschaften (Law) with the degree Erste Juristische Staatsprüfung (first state examination in law) and students of the Bachelor's degree programme Privatrecht (Private Law) (minor with 60 ECTS credits): no restrictions. Students of other degree programmes: 20 places, 10 of which will be set aside for Master's students of Economics. Should the number of places available exceed the number of applications, the remaining places can be allocated to students of other subjects/degree programmes. Should there be more than 10 applications from students of other subjects, the remaining 10 places will be allocated as follows: Students applying after not having successfully completed assessment in past years will be given preferential consideration. The remaining places will be allocated by lot. A waiting list will be maintained and places reallocated as they become available.

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Economics (2014)

Master's with 1 r	najor Nanostructure	Techno	logy
(2011)			

Master's degree (1 major) Economics (2013)



Module title					Abbreviation
Basic Course German Civil Code 1					02-N-P-G1-101-m01
Module coordinator				Module offered by	
Dean o	Dean of Studies Faculty of Law			Faculty of Law	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
10	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 semester undergradua		undergraduate	Admission prerequisite to assessment: regular attendance of conversatorium.		

German contents available but not translated yet.

Der Grundkurs Bürgerliches Recht 1 führt die Studierenden in das Privatrecht ein. Er bietet eine systematische Darstellung des Allgemeinen Teils des Bürgerlichen Gesetzbuches sowie wichtiger Fragen des Schuldrechts, Allgemeiner Teil.

Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden haben umfassende Kenntnisse auf dem Gebiet des Allgemeinen Teils des Bürgerlichen Gesetzbuchs erworben. Neben der Auseinandersetzung mit Problemen des Allgemeinen Teils, lernten sie die Systematik des BGB kennen und erlernten das Arbeiten mit juristischen Fällen anhand von Beispielen.

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

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

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

a) written examination (approx. 120 minutes) or b) oral examination (approx. 15 minutes)

Allocation of places

Degree programm law (degree "Erste Juristische Staatsprüfung") and Bachelor's Privatrecht (Private Law) (minor with 60 ECTS credits): no restrictions. Students of other degree programmes: 20 places. Places will be allocated as follows: Students applying after not having successfully completed assessment in in the last two semesters will be given preferential consideration. The remaining places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Modul	e title	,	Abbreviation			
Basic Course German Civil Code 2a and 2 b					02-N-P-G2-101-m01	
Modul	e coord	linator		Module offered by		
Dean o	of Studi	es Faculty of Law		Faculty of Law		
ECTS	Meth	od of grading	Only after succ. cor	mpl. of module(s)		
10	nume	rical grade				
Duration Module level		Other prerequisites	Other prerequisites			
1 semester undergraduate		undergraduate				
<i>~</i> .	Combanita					

German contents available but not translated yet.

Der Grundkurs Bürgerliches Recht 2.1 erschließt den für das Bürgerliche Recht zentralen Bereich des Allgemeinen Schuldrechts einschließlich der Leistungsstörungen sowie die wichtigsten Fragen der vertraglichen Schuldverhältnisse. Die Vorlesung Grundkurs Bürgerliches Recht 2.2 behandelt die gesetzlichen Schuldverhältnisse Geschäftsführung ohne Auftrag, Bereicherungsrecht und Deliktsrecht.

Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden verfügen über grundlegendes Wissen auf dem Gebiet des Schuldrechts des Bürgerlichen Gesetzbuchs (§§241-432 BGB). Sie haben insbesondere Kenntnisse auf dem Gebiet des Leistungsstörungsrechts erworben und sich mit den bedeutendsten vertraglichen Schuldverhältnissen wie dem Kaufvertrag, Werkvertrag, Darlehensvertrag und der Bürgschaft sowie den gesetzlichen Schuldverhältnissen auseinandergesetzt. Die Studierenden erlernten anhand von ausgewählten Problemen des Schuldrechts das juristische Arbeiten.

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

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

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

written examination (approx. 120 minutes)

Allocation of places

Degree programm law (degree "Erste Juristische Staatsprüfung") and Bachelor's Privatrecht (Private Law) (minor with 60 ECTS credits): no restrictions. Students of other degree programmes: 20 places. Places will be allocated as follows: Students applying after not having successfully completed assessment in in the last two semesters will be given preferential consideration. The remaining places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Bachelor's degree (1 major, 1 minor) Private Law (Minor, 2011)



Module title					Abbreviation	
Basic (Basic Course German Civil Code 3				02-N-P-G3-101-m01	
Module coordinator				Module offered by		
Dean o	Dean of Studies Faculty of Law			Faculty of Law		
ECTS	Metho	od of grading	Only after succ. con	ompl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 semester un		undergraduate	Admission prerequi rium.	site to assessment:	regular attendance of conversato-	

German contents available but not translated yet.

Gegenstand des Moduls ist das dritte Buch des BGB. Es werden die Grundlagen auf dem Gebiet des Sachenrechts vermittelt.

Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden haben grundlegendes Wissen auf dem Gebiet des Sachenrechts erworben. Sie haben insbesondere Kenntnisse über Rechtsfragen zu Besitz und Besitzschutz, das Eigentum und Fragen des Nachbarrechts, das allgemeine Grundstücksrecht, den Eigentumserwerb an Grundstücken und an beweglichen Sachen, das Rechtsverhältnis zwischen Eigentümer und Besitzer und beschränkt dingliche Rechte, wie die Dienstbarkeiten und die Sicherungsrechte (Hypothek, Grundschuld, Pfandrecht).

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

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

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

a) written examination (approx. 120 minutes) or b) oral examination (approx. 15 minutes)

Allocation of places

Degree programm law (degree "Erste Juristische Staatsprüfung") and Bachelor's Privatrecht (Private Law) (minor with 60 ECTS credits): no restrictions. Students of other degree programmes: 20 places. Places will be allocated as follows: Students applying after not having successfully completed assessment in in the last two semesters will be given preferential consideration. The remaining places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Bachelor's degree (1 major, 1 minor) Private Law (Minor, 2011)



Module title					Abbreviation	
German and European Trade Mark Law					02-N-P-W06-111-m01	
Module coordinator				Module offered by		
Dean	of Studi	es Faculty of Law		Faculty of Law		
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)		
3	nume	rical grade				
Durati	Duration Module level		Other prerequisites	Other prerequisites		
1 semester undergraduate						
Conte	Contents					

German contents available but not translated yet.

Die Vorlesung vermittelt einen Überblick über das Deutsche und Europäische Markenrecht. Neben den Grundlagen des Markenbegriffs und -schutzes nach dem deutschen Markengesetz werden u.a. die Voraussetzungen und Wirkungen der Europäischen Gemeinschaftsmarke nach der Gemeinschaftsmarkenverordnung behandelt. Ferner werden Spezialregelungen des deutschen Markenrechts wie z.B. zu geschäftlichen Bezeichnungen, geographischen Herkunftsangaben sowie zum kennzeichenrechtlichen Schutz von Internet Domains besprochen.

Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden können markenrechtliche Fragestellungen unter Gesichtspunkten des deutschen und europäischen Rechts analysieren.

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

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

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

a) written examination (approx. 120 minutes) or b) oral examination (approx. 15 minutes) Assessment offered: usually once a year, summer semester

Allocation of places

Degree programm law (degree "Erste Juristische Staatsprüfung") and Bachelor's Privatrecht (Private Law) (minor with 60 ECTS credits): no restrictions. Students of other degree programmes: 20 places. Places will be allocated as follows: Students applying after not having successfully completed assessment in in the last two semesters will be given preferential consideration. The remaining places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Media Communication (2014)



Modul	e title		Abbreviation			
Copyri	ght Lav	v and Fundamentals (eferences to EU Law	02-N-P-W07-111-m01		
Module coordinator Module offered by						
Dean o	of Studi	es Faculty of Law		Faculty of Law		
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)		
2	nume	rical grade				
Duration Module level		Other prerequisites	Other prerequisites			
1 semester undergraduate						
Contor	Contents					

German contents available but not translated yet.

Die Veranstaltung behandelt neben den allgemeinen Grundlagen des Gewerblichen Rechtsschutzes den Schutz von Werken nach dem deutschen Urhebergesetz. In einem weiteren Veranstaltungsteil werden das Geschmacksmusterrecht sowie das Patent- und Gebrauchsmusterrecht beleuchtet.

Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden haben grundlegende Kenntnisse des Gewerblichen Rechtsschutzes und des Urheberrechts erworben. Sie können Problematiken aus diesen Bereichen in den Kontext der deutschen und europäischen Regelungen einordnen.

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

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

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

a) written examination (approx. 120 minutes) or b) oral examination (approx. 15 minutes) Assessment offered: usually once a year, summer semester

Allocation of places

Degree programm law (degree "Erste Juristische Staatsprüfung") and Bachelor's Privatrecht (Private Law) (minor with 60 ECTS credits): no restrictions. Students of other degree programmes: 20 places. Places will be allocated as follows: Students applying after not having successfully completed assessment in in the last two semesters will be given preferential consideration. The remaining places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Media Communication (2014)

Master's degree (1 major) Economics (2014)

Master's degree (1 major) Economics (2013)



Modul	e title		Abbreviation				
Employ	yment l	aw for non-law student	s		02-J7-112-m01		
Modul	e coord	inator		Module offered by			
	holder of the Chair of Civil Law, Employment and Labour Law and Civil Procedure			Faculty of Law			
ECTS	Meth	od of grading	Only after succ. co	mpl. of module(s)			
3	nume	rical grade					
Duratio	Duration Module level		Other prerequisites				
1 semester undergraduate							
Conten	Contents						

German contents available but not translated yet.

Die Veranstaltung Arbeitsrecht für Studierende anderer Fachrichtungen vermittelt die Grundlagen des Arbeitsrechts.

Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden haben gelernt, arbeitsrechtliche Grundlagen auf ein späteres berufliches Handlungsfeld zu applizieren.

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

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

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

written examination (approx. 120 minutes)

Assessment offered: once a year, winter semester

Allocation of places

Number of places: maximum 50. Students applying after not having successfully completed assessment in the past two semesters will be given preferential consideration. The remaining places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available. Places on all courses of the module component with a restricted number of places will be allocated in the same procedure.

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Information Literacy

(ECTS credits)



Module title					Abbreviation	
Information Literacy for Students of the Natural Sciences (Basic Level)					41-IK-NW1-101-m01	
Module coordinator M				Module offered by	l .	
head o	f Unive	rsity Library		University Library		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
2	(not)	successfully completed				
Duration Module level		Other prerequisites				
1 semester undergraduate						
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Information literacy in an academic context:

- Search strategies and tools.
- Using the library's electronic resources.
- Resources for natural sciences: databases and journals.
- Online searches and search engines.
- Overview of additional resources (eLearning etc.).
- Reference management. Some sections of the module will focus on particular disciplines (wherever possible, on disciplines in the natural sciences).

Intended learning outcomes

Students know what information is needed for what purpose. They are able to locate information that is relevant within their discipline and beyond in a variety of resources and to evaluate this information. They recognise the difference in quality between information they have retrieved from specific, restricted access resources (databases) and information they have found on the free web. Students are able to manage and process the information they have found, using reference management software and eLearning tools. The module aims to equip students with the skills needed to find information and literature that is relevant to the topics of their Bachelor's theses.

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

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

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

a) written examination (approx. 60 minutes) or b) preparing and delivering a presentation with slides (approx. 10 minutes or approx. 5 minutes and approx. 1 page) or c) completing exercises (approx. 10 exercises) or d) presentation without slides (approx. 20 to 30 minutes) or e) preparing and delivering a presentation with slides (approx. 5 minutes) and completing exercises (approx. 5 exercises) or f) presentation without slides (approx. 10 to 15 minutes) and completing exercises (approx. 5 exercises)

Allocation of places

Number of places: 5-50. There is a restricted number of places. If necessary, places will be allocated as follows: Students of the degree programmes of the respective subject-specific focuses will be given preferential consideration. The remaining places, if and when any become available, will be allocated to students of the other natural sciences degree programmes. In each of the above-mentioned groups, 30% of places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. The remaining 70% of places will each be allocated by lot.

Additional information -Workload -Teaching cycle -Referred to in LPO I (examination regulations for teaching-degree programmes) --



Module appears in

Bachelor' degree (1 major) Biochemistry (2011)

Bachelor' degree (1 major) Biochemistry (2013)

Bachelor' degree (1 major) Biochemistry (2009)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

No final examination Special study offering (2010)



Module	e title	-	Abbreviation			
Information Literacy for Students of the Natural Sciences (Advanced Level)					41-IK-NW2-101-m01	
Module coordinator Module				Module offered by	Module offered by	
head o	f Unive	rsity Library		University Library		
ECTS	Metho	od of grading	Only after succ. compl. of module(s)			
2	(not)	successfully completed				
Duratio	on	Module level	Other prerequisites			
1 semester undergraduate		Knowledge and skills equivalent to those achieved in the basic module desirable.				

Information literacy in an academic context:

- More in-depth discussion of selected topics that were covered in the level one module, e. g. searching subject-specific databases.
- Publishing and information practices in the natural sciences.
- Subject-specific information retrieval tools, e. g. classifications and thesauri.
- New web-based information and communication technologies.
- Searching for subject-specific facts (e. g. substances and physical data).
- Information search skills for the workplace.
- Copyright and citations.
- Electronic publishing. Some sessions will focus on particular disciplines (wherever possible, on disciplines in the natural sciences).

Intended learning outcomes

Students have developed a differentiated understanding of the publishing and information practices in their discipline and are familiar with the possibilities offered by electronic publishing. They are able to use electronic tools to locate subject-specific facts in a variety of resources. Students are able to work with subject-specific information retrieval tools as well as to use new web-based technologies to share information. They have developed an understanding of the legal framework surrounding publications, information, and communication in an academic context and are able to use information responsibly.

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

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

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

a) written examination (approx. 60 minutes) or b) preparing and delivering a presentation with slides (approx. 10 minutes or approx. 5 minutes and approx. 1 page) or c) completing exercises (approx. 10 exercises) or d) presentation without slides (approx. 20 to 30 minutes) or e) preparing and delivering a presentation with slides (approx. 5 minutes) and completing exercises (approx. 5 exercises) or f) presentation without slides (approx. 10 to 15 minutes) and completing exercises (approx. 5 exercises)

Allocation of places

Number of places: 10 to 50. There is a restricted number of places. If necessary, places will be allocated as follows: Students of the degree programmes of the respective subject-specific focuses will be given preferential consideration. The remaining places, if and when any become available, will be allocated to students of the other natural sciences degree programmes. In each of the above-mentioned groups, 30% of places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. The remaining 70% of places will each be allocated by lot.

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Additional information
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Workload



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' degree (1 major) Biochemistry (2011)

Bachelor' degree (1 major) Biochemistry (2013)

Bachelor' degree (1 major) Biochemistry (2009)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)



Languages

(ECTS credits)



Modul	e title		Abbreviation			
Intercu	Intercultural Competence (English, Advanced Level)				42-ENO-IK-072-m01	
Modul	e coord	inator		Module offered by		
head c	of Langu	age Centre (ZFS)		Language Centre (ZfS)		
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
3	nume	rical grade	42-ENM2 or 42-ENM	13 or 42-ENM4 or ass	sessment test	
Duration Module level (Other prerequisites	Other prerequisites			
1 seme	1 semester undergraduate					
Canta	Contonto					

This module equips students with knowledge and skills that will enable them to act and communicate in intercultural situations. It familiarises them with criteria and options for action and equips them with knowledge that will allow them to adequately interpret intercultural situations and act appropriately.

Intended learning outcomes

Students develop advanced intercultural and language skills that will allow them to communicate, both verbally and in writing, in a globalised world, taking intercultural aspects into account. They are able to effectively and flexibly use the target language, both during study abroad periods and in the workplace. This module builds on level "B2 -- Vantage" and aims to enable students to reach level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: English

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)



Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)

Magister Theologiae Catholic Theology (2009)

No final examination Special study offering (2010)



Module	e title		Abbreviation			
Cultural Studies (English, Advanced Level)					42-ENO-LK-072-m01	
Module coordinator				Module offered by		
head o	head of Language Centre (ZFS)			Language Centre (ZfS)		
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
3	nume	rical grade	42-ENM2 or 42-ENM	l3 or 42-ENM4 or ass	essment test	
Duratio	Duration Module level Othe		Other prerequisites	Other prerequisites		
1 seme	1 semester undergraduate					
Conter	Contents					

This module familiarises students with the culture and society of countries where the target language is spoken and thus enables them to act appropriately in the target language. It discusses the culture, geography, history, society, political system, and the economy of said countries.

Intended learning outcomes

Students develop highly advanced language skills and a thorough familiarity with the culture and society of countries where the target language is spoken. They are thus able to communicate, both verbally and in writing, in a variety of situations, taking into account aspects related to the culture and society of said countries. Students are able to effectively and flexibly use the target language, both during study abroad periods and in the workplace. This module builds on level "B2 -- Vantage" and aims to enable students to reach level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: English

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

Workload

Teaching cycle

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

Module appears in

Bachelor' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)



Bachelor' degree (1 major) Business Information Systems (2009)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)

Magister Theologiae Catholic Theology (2009)

No final examination Special study offering (2010)



Module title					Abbreviation	
Englis	English for Business 1 (Advanced Level)				42-ENO-W1-072-m01	
Module coordinator				Module offered by		
head o	head of Language Centre (ZFS)			Language Centre (ZfS)		
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
4	nume	rical grade	42-ENM2 or 42-ENM	l3 or 42-ENM4 or ass	sessment test	
Duration Module level		Other prerequisites	Other prerequisites			
1 semester undergraduate						

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, at university and in business settings.

Intended learning outcomes

Students gain sound business- and economics-specific communication skills (written and oral) in the target language. They develop advanced business- and economics-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in business and economics terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed business- and economics-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: English

Assessment offered: once a year, winter semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)



Master's degree (1 major) Nanostructure Technology (2011) Bachelor's degree (1 major, 1 minor) Pedagogy (2009) No final examination Special study offering (2010)



Module title					Abbreviation	
Englis	English for Business 2 (Advanced Level)				42-ENO-W2-072-m01	
Modul	e coord	inator		Module offered by		
head o	of Langu	age Centre (ZFS)		Language Centre (ZfS)		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
4	nume	rical grade	42-ENM2 or 42-ENM	13 or 42-ENM4 or ass	essment test	
Duration Module level Other p		Other prerequisites	Other prerequisites			
1 seme	1 semester undergraduate					

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, at university and in business settings.

Intended learning outcomes

Students gain sound business- and economics-specific communication skills (written and oral) in the target language. They develop advanced business- and economics-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in business and economics terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed business- and economics-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: English

Assessment offered: once a year, summer semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)



Master's degree (1 major) Nanostructure Technology (2011) Bachelor's degree (1 major, 1 minor) Pedagogy (2009) No final examination Special study offering (2010)



Module title					Abbreviation
English for the Natural Sciences 1 (Advanced Level)					42-ENO-NW1-072-m01
Module coordinator				Module offered by	
head o	head of Language Centre (ZFS)			Language Centre (ZfS)	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
4	nume	rical grade	42-ENM2 or 42-ENM	13 or 42-ENM4 or ass	sessment test
Duration Module level Other prerequisite			Other prerequisites		
1 semester undergraduate					

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, in science-oriented situations.

Intended learning outcomes

Students gain sound natural sciences-specific communication skills (written and oral) in the target language. They develop advanced natural sciences-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in scientific terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed natural sciences-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: English

Assessment offered: once a year, winter semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)



Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010) Bachelor's degree (1 major, 1 minor) Pedagogy (2009) No final examination Special study offering (2010)



Module title					Abbreviation	
English for the Natural Sciences 2 (Advanced Level)					42-ENO-NW2-072-m01	
Module coordinator				Module offered by		
head o	of Langu	uage Centre (ZFS)		Language Centre (ZfS)		
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
4	nume	rical grade	42-ENM2 or 42-ENM	13 or 42-ENM4 or ass	sessment test	
Duration Module level Other prerequisites			Other prerequisites	3		
1 semester undergraduate						
<i>a</i> .						

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, in science-oriented situations.

Intended learning outcomes

Students gain sound natural sciences-specific communication skills (written and oral) in the target language. They develop advanced natural sciences-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in scientific terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed natural sciences-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: English

Assessment offered: once a year, summer semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)



Bachelor's degree (1 major, 1 minor) Pedagogy (2009) No final examination Special study offering (2010)



Module title					Abbreviation
French for the Humanities 1 (Advanced Level)					42-FRO-GW1-072-m01
Module coordinator				Module offered by	
head o	head of Language Centre (ZFS)			Language Centre (ZfS)	
ECTS	TS Method of grading Only after succ. cor			npl. of module(s)	
4	nume	rical grade	42-FRM2 or 42-FRM	3 or 42-FRM4 or asse	essment test
Duration Module level Other prerequi			Other prerequisites	,	
1 semester undergraduate					
Combants					

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, at university and in business settings.

Intended learning outcomes

Students gain sound humanities-specific communication skills (written and oral) in the target language. They develop advanced humanities-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in humanities terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed humanities-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: French

Assessment offered: once a year, winter semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)



Magister Theologiae Catholic Theology (2009) No final examination Special study offering (2010)



Modul	e title		Abbreviation			
French for the Humanities 2 (Advanced Level)					42-FRO-GW2-072-m01	
Modul	Module coordinator Mod				l.	
head c	of Langu	uage Centre (ZFS)		Language Centre (ZfS)		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
4	nume	rical grade	42-FRM2 or 42-FRM	3 or 42-FRM4 or asse	essment test	
Duration Module level Other prerequisite			Other prerequisites			
1 seme	1 semester undergraduate					
Canta	Contonts					

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, at university and in business settings.

Intended learning outcomes

Students gain sound humanities-specific communication skills (written and oral) in the target language. They develop advanced humanities-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in humanities terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed humanities-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: French

Assessment offered: once a year, summer semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)



Magister Theologiae Catholic Theology (2009) No final examination Special study offering (2010)



Module title					Abbreviation
Intercultural Competence (French, Advanced Level)					42-FRO-IK-072-m01
Module coordinator				Module offered by	
head o	head of Language Centre (ZFS)			Language Centre (ZfS)	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
3	nume	rical grade	42-FRM2 or 42-FRM	3 or 42-FRM4 or asse	essment test
Duration Module level Other prerequisit			Other prerequisites	,	
1 semester undergraduate					
Contacts					

This module equips students with knowledge and skills that will enable them to act and communicate in intercultural situations. It familiarises them with criteria and options for action and equips them with knowledge that will allow them to adequately interpret intercultural situations and act appropriately.

Intended learning outcomes

Students develop advanced intercultural and language skills that will allow them to communicate, both verbally and in writing, in a globalised world, taking intercultural aspects into account. They are able to effectively and flexibly use the target language, both during study abroad periods and in the workplace. This module builds on level "B2 -- Vantage" and aims to enable students to reach level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: French

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)

Master's degree (1 major) Nanostructure Technology (2011)



Master's degree (1 major) Nanostructure Technology (2010)
Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)
Bachelor's degree (1 major, 1 minor) Pedagogy (2009)
Magister Theologiae Catholic Theology (2009)
No final examination Special study offering (2010)



Module title					Abbreviation
Intercultural Competence (French, Advanced Level)					42-FRO-LK-072-m01
Module coordinator				Module offered by	
head c	head of Language Centre (ZFS)			Language Centre (ZfS)	
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)	
3	nume	rical grade	42-FRM2 or 42-FRM	3 or 42-FRM4 or asse	essment test
Duration Module level Other prerequisites			Other prerequisites	5	
1 semester undergraduate					
Contents					

This module familiarises students with the culture and society of countries where the target language is spoken and thus enables them to act appropriately in the target language. It discusses the culture, geography, history, society, political system, and the economy of said countries.

Intended learning outcomes

Students develop highly advanced language skills and a thorough familiarity with the culture and society of countries where the target language is spoken. They are thus able to communicate, both verbally and in writing, in a variety of situations, taking into account aspects related to the culture and society of said countries. Students are able to effectively and flexibly use the target language, both during study abroad periods and in the workplace. This module builds on level "B2 -- Vantage" and aims to enable students to reach level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: French

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)



Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)

Magister Theologiae Catholic Theology (2009)

No final examination Special study offering (2010)



Module title					Abbreviation
French for Business 1 (Advanced Level)					42-FRO-W1-072-m01
Module coordinator M				Module offered by	
head o	head of Language Centre (ZFS)			Language Centre (ZfS)	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
4	nume	rical grade	42-FRM2 or 42-FRM3	3 or 42-FRM4 or asse	ssment test
Duration Module level Other prerequisites			Other prerequisites		
1 semester undergraduate					

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, at university and in business settings.

Intended learning outcomes

Students gain sound business- and economics-specific communication skills (written and oral) in the target language. They develop advanced business- and economics-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in business and economics terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed business- and economics-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: French

Assessment offered: once a year, winter semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)



Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)

No final examination Special study offering (2010)



Module title					Abbreviation
French for Business 2 (Advanced Level)					42-FRO-W2-072-m01
Modul	Module coordinator N				
head o	head of Language Centre (ZFS)			Language Centre (ZfS)	
ECTS	CTS Method of grading Only after succ. con			npl. of module(s)	
4	4 numerical grade 42-FRM2 or 42-FRM			3 or 42-FRM4 or asse	ssment test
Duration Module level Other prerequisites			Other prerequisites		
1 semester undergraduate					

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, at university and in business settings.

Intended learning outcomes

Students gain sound business- and economics-specific communication skills (written and oral) in the target language. They develop advanced business- and economics-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in business and economics terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed business- and economics-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: French

Assessment offered: once a year, summer semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)



Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)

No final examination Special study offering (2010)



Modul	e title		Abbreviation		
Spanish for the Humanities 1 (Advanced Level)					42-SPO-GW1-072-m01
Modul	e coord	inator		Module offered by	
head o	head of Language Centre (ZFS)			Language Centre (ZfS)	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
4	nume	rical grade	42-SPM2 or 42-SPM	l3 or 42-SPM4 or ass	essment test
Duration Module level Other prerequisites			Other prerequisites		
1 semester undergraduate					

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, in situations involving humanistic topics.

Intended learning outcomes

Students gain sound humanities-specific communication skills (written and oral) in the target language. They develop advanced humanities-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in humanities terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed humanities-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: Spanish

Assessment offered: once a year, winter semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)



Magister Theologiae Catholic Theology (2009) No final examination Special study offering (2010)



Module title					Abbreviation
Spanis	h for th	ne Humanities 2 (Adv	anced Level)		42-SPO-GW2-072-m01
Module coordinator				Module offered by	
head o	f Langu	age Centre (ZFS)		Language Centre (ZfS)	
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)	
4	nume	rical grade	42-SPM2 or 42-SPM	3 or 42-SPM4 or ass	essment test
Duration Module level Other pre		Other prerequisites			
1 semester undergraduate					
Control					

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, in situations involving humanistic topics.

Intended learning outcomes

Students gain sound humanities-specific communication skills (written and oral) in the target language. They develop advanced humanities-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in humanities terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed humanities-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: Spanish

Assessment offered: once a year, summer semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)



Magister Theologiae Catholic Theology (2009) No final examination Special study offering (2010)



Modul	e title	-	Abbreviation		
Intercultural Competence (Spanish, Advanced Level)					42-SPO-IK-072-m01
Modul	Module coordinator				
head o	of Langu	age Centre (ZFS)		Language Centre (ZfS)	
ECTS	Method of grading Only after succ. cor			npl. of module(s)	
3	nume	rical grade	42-SPM2 or 42-SPM	3 or 42-SPM4 or ass	essment test
Duration Module level Other prerequis		Other prerequisites			
1 seme	1 semester undergraduate				
Contents					

This module equips students with knowledge and skills that will enable them to act and communicate in intercultural situations. It familiarises them with criteria and options for action and equips them with knowledge that will allow them to adequately interpret intercultural situations and act appropriately.

Intended learning outcomes

Students develop advanced intercultural and language skills that will allow them to communicate, both verbally and in writing, in a globalised world, taking intercultural aspects into account. They are able to effectively and flexibly use the target language, both during study abroad periods and in the workplace. This module builds on level "B2 -- Vantage" and aims to enable students to reach level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: Spanish

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)

Master's degree (1 major) Nanostructure Technology (2011)



Master's degree (1 major) Nanostructure Technology (2010)
Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)
Bachelor's degree (1 major, 1 minor) Pedagogy (2009)
Magister Theologiae Catholic Theology (2009)
No final examination Special study offering (2010)



Module title					Abbreviation
Cultural Studies (Spanish, Advanced Level)					42-SPO-LK-072-m01
Module coordinator				Module offered by	
head c	of Langu	uage Centre (ZFS)		Language Centre (ZfS)	
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)	
3	nume	rical grade	42-SPM2 or 42-SPM	13 or 42-SPM4 or ass	essment test
Duration Module level Other pr			Other prerequisites	5	
1 semester undergraduate					
Contents					

This module familiarises students with the culture and society of countries where the target language is spoken and thus enables them to act appropriately in the target language. It discusses the culture, geography, history, society, political system, and the economy of said countries.

Intended learning outcomes

Students develop highly advanced language skills and a thorough familiarity with the culture and society of countries where the target language is spoken. They are thus able to communicate, both verbally and in writing, in a variety of situations, taking into account aspects related to the culture and society of said countries. Students are able to effectively and flexibly use the target language, both during study abroad periods and in the workplace. This module builds on level "B2 -- Vantage" and aims to enable students to reach level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: Spanish

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

Workload

Teaching cycle

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

Module appears in

Bachelor' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)



Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)

Magister Theologiae Catholic Theology (2009)

No final examination Special study offering (2010)



Module title					Abbreviation
Spanis	sh for B	usiness 1 (Advanced	Level)		42-SPO-W1-072-m01
Modul	e coord	inator		Module offered by	
head o	f Langu	age Centre (ZFS)		Language Centre (ZfS)	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
4	nume	rical grade	42-SPM2 or 42-SPM	l3 or 42-SPM4 or ass	essment test
Duration Module level Other pre		Other prerequisites	3		
1 semester undergraduate					
Control					

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, at university and in business settings.

Intended learning outcomes

Students gain sound business- and economics-specific communication skills (written and oral) in the target language. They develop advanced business- and economics-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in business and economics terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed business- and economics-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: Spanish

Assessment offered: once a year, winter semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)



Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)

No final examination Special study offering (2010)



Module title					Abbreviation
Spanish for Business 2 (Advanced Level)					42-SPO-W2-072-m01
Module coordinator				Module offered by	
head o	f Langu	uage Centre (ZFS)		Language Centre (ZfS)	
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)	
4	nume	rical grade	42-SPM2 or 42-SPN	l3 or 42-SPM4 or ass	essment test
Duration Module level Other prere		Other prerequisites	3		
1 semester undergraduate					
Control					

This module equips students with advanced communication skills in the target language. These will allow them to communicate appropriately, in both written and oral form, at university and in business settings.

Intended learning outcomes

Students gain sound business- and economics-specific communication skills (written and oral) in the target language. They develop advanced business- and economics-specific language skills that will allow them to communicate about selected topics in corresponding situations, using language flexibly. Students are proficient in business and economics terminology and are able to communicate effectively within the discipline. At the end of the stage, they will have developed business- and economics-specific language skills that are equivalent to level "C1 -- Effective Operational Proficiency" of the Common European Framework of Reference for Languages.

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

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

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

option 1: written multi-component examination (approx. 90 minutes total) with 4 components (reading comprehension, listening comprehension, writing, communication skills) or option 2: oral assessment (approx. 10 minutes) and written multi-component examination (approx. 60 to 90 minutes total) with 3 components (reading comprehension, listening comprehension, writing) or option 3: 2 to 4 oral assessments (approx. 30 to 60 minutes total) as well as 2 to 4 written assessments (approx. 10 to 15 pages total), all components/assessments each weighted 1:1; options will be selected and examination dates be fixed at the beginning of the course Language of assessment: Spanish

Assessment offered: once a year, summer semester

Allocation of places

Number of places: 5-25. Places will be allocated by lot.

Additional information

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Workload

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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' degree (1 major) Chemistry (2009)

Bachelor' degree (1 major) Business Management and Economics (2009)

Bachelor' degree (1 major) Business Management and Economics (2010)

Bachelor' degree (1 major) Economathematics (2009)

Bachelor' degree (1 major) Economathematics (2008)

Bachelor' degree (1 major) Business Information Systems (2009)



Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010) Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Bachelor's degree (1 major, 1 minor) Pedagogy (2009)

No final examination Special study offering (2010)



Additional Qualifications

(ECTS credits)



Module	Module title Abbreviation					
Non-te	chnical	Minor Subject			11-EXNT6-112-m01	
Module	Module coordinator			Module offered by		
chairpe	rson of	f examination committee		Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	ıpl. of module(s)		
6	numer	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate	Approval by examin	ation committee req	uired.	
Conten	ts					
Non-ted	chnical	minor. Accredited acade	mic achievements, e	.g. in case of change	of university or study abroad.	
		ning outcomes				
					ond to the requirements of a molaw, business sciences).	
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Gei	man)		
V + R (n	o infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)	
		eessment (type, scope, langua	ge — if other than German,	examination offered — if no	t every semester, information on whether	
in grou weeks)	ps (app or d) p		didate) or c) project re sentation (approx. 30	eport (approx. 8 to 10	lidate each or oral examination o pages, time to complete: 1 to 4	
Allocat	ion of p	olaces				
Additio	nal info	ormation				
Worklo	ad					
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master	Master's degree (1 major) Nanostructure Technology (2011)					
Master	Master's degree (1 major) Nanostructure Technology (2010)					



Module	Module title Abbreviation					
Additional Qualifications for Engineers					11-EXZ5-111-mo1	
Module	coord	inator		Module offered by	ļ.	
chairpe	erson of	f examination committee		Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. com	ıpl. of module(s)		
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate	Approval by examin	ation committee req	uired.	
Conten	ts					
Additio abroad		lls for engineers. Accredi	ted academic achieve	ements, e.g. in case	of change of university or study	
Intende	ed learr	ning outcomes				
gree pr	ogramr				of a module of the Master's de- for an occupation in the industry	
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)		
V + R (n	o infor	mation on SWS (weekly o	contact hours) and co	urse language avail	able)	
		eessment (type, scope, langua le for bonus)	ge $-$ if other than German, ϵ	examination offered — if no	ot every semester, information on whether	
less oth minute prox. 8 tes)	nerwise s per ca to 10 p	e specified) or b) oral exa andidate, for modules wi	mination of one cand th less than 4 ECTS c 1 to 4 weeks) or d) pro	lidate each or oral ex redits approx. 20 mi	credits approx. 90 minutes; un- kamination in groups (approx. 30 nutes) or c) project report (ap- presentation (approx. 30 minu-	
Allocat						
Additio	nal info	ormation				
Workload						
Teaching cycle						
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)					

Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010)

Module appears in



Modul	le title	-	Abbreviation		
Additi	onal Qı	ualifications for Engin	11-EXZ6-111-m01		
Modul	le coord	linator	Module offered by		
chairp	erson c	of examination commi	ttee	Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
6	nume	erical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate	Approval by examin	ation committee req	uired.
Conte	nts				
Additi abroa		ills for engineers. Acc	redited academic achiev	ements, e.g. in case	of change of university or study
Intend	led lear	ning outcomes			
gree p	rogram			•	of a module of the Master's de- for an occupation in the industry
Course	es (type,	number of weekly contact ho	urs, language — if other than Ge	rman)	
V + R (no info	rmation on SWS (wee	kly contact hours) and co	ourse language avail	able)
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)					
a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes) Language of assessment: German, English					

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Nanostructure Technology (2011) Master's degree (1 major) Nanostructure Technology (2010)



Thesis

(30 ECTS credits)



Module title Abbreviation						
Master	Master Thesis Nanostructure Technology 11-MA-N-111-mo1					
Module coordinator				Module offered by		
chairpe	erson of	fexamination committee		Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
30	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
		ndent processing of an e specially according to kno			ask in the field of nanostructure riting of the thesis.	
Intende	ed learr	ning outcomes				
structu	re techi				d engineering task from nano- fic aspects and to summarise	
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)		
no cou	rses as:	signed				
		eessment (type, scope, langua le for bonus)	ge $-$ if other than German, ϵ	examination offered — if no	t every semester, information on whether	
written Langua		ssessment: German, Eng	lish			
Allocat						
Additio	nal info	ormation				
Worklo	ad					
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master	Master's degree (1 major) Nanostructure Technology (2011)					