Julius-Maximilians-
UNIVERSITÄT
WÜRZBURG

Subdivided Module Catalogue

for the Subject

Nanostructure Technology

as a Bachelor's with 1 major

with the degree "Bachelor of Science"

(180 ECTS credits)

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

Course of Studies - Contents and Objectives

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

Abbreviations used

Course types: **E** = field trip, **K** = colloquium, **O** = conversatorium, **P** = placement/lab course, **R** = project, **S** = seminar, **T** = tutorial, **Ü** = exercise, **V** = lecture

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

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

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

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

Conventions

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

Notes

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

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

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

In accordance with

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

ASPO2007

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

15-Apr-2008 (2008-7)

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

The subject is divided into

Abbreviation	Module title	ECTS credits	Method of grading	page
Compulsory Courses (132 ECTS credits)				
Nanostructure Technology (12 ECTS credits)				
11-N1-072-m01	Basics of NanostructureTechnology	6	NUM	27
11-N2-072-m01	Principles of Electronics (with Practical Course)	6	NUM	28
Lab Course Engineering (18 ECTS credits)				
11-PFB-072-m01	Advanced Practical Course Bachelor	4	B/NB	34
11-PGA-NN-072-m01	Advanced Undergraduate Laboratory (Classical Mechanics, Thermodynamics, Basic Circuitry)	4	B/NB	37
11-PGB-NRN-072-m01	Advanced Undergraduate Laboratory (Optics, Basic Semiconductor Circuits)	2	B/NB	38
11-PFI-072-m01	Industrial Internship	8	B/NB	35
Mathematics for Engineers (26 ECTS credits)				
11-MPI3-062-m01	Mathematics 3 for students of Physics and Engineering	8	NUM	24
10-M-NST1-072-m01	Mathematics 1 for students in Nanostructural Engineering	10	NUM	12
10-M-NST2-072-m01	Mathematics 2 for students in Nanostructural Engineering	8	NUM	13
Chemistry (10 ECTS credits)				
08-CP1-072-m01	General Chemistry for Physics and Engineers	10	NUM	8
Experimental Physics (42 ECTS credits)				
11-E1-072-m01	Experimental Physics 1 (Mechanics, Thermodynamics, Waves and Oscillations)	8	NUM	18
11-E2-072-m01	Experimental Physics 2 (Electrics and Magnetism)	8	NUM	19
11-E3-072-m01	Experimental Physics 3 (Optics, Quantum Phenomena, Introduction Atomic Physics)	8	NUM	20
11-E4-072-m01	Experimental Physics 4 (Introduction to Solid State Physics)	8	NUM	21
11-E5-072-m01	Experimental Physics 5 (Physics of Atoms and Molecules)	6	NUM	22
11-E7-072-m01	Experimental Physics 7 (Solid State Phenomena [Semiconductor, Superconductivity, Magnetism])	4	NUM	23
Theoretical Physics (16 ECTS credits)				
11-T1-072-m01	Theoretical Physics 1 (Theoretical Mechanics)	8	NUM	41
11-T3-072-m01	Theoretical Physics 3 (Theoretical Quantum Mechanics)	8	NUM	43
11-T3F-072-m01	Theoretical Physics 3 FOKUS (Theoretical Quantum Mechanics)	8	NUM	44
Module Comprehensive Tests (8 ECTS credits)				
11-PREN-072-m01	Comprehensive Exam in Theoretical Physics / Nanostructure Technology	4	NUM	39
11-PRN-072-m01	Comprehensive Exam in Theoretical Physics / Nanostructure Technology	4	NUM	40
Compulsory Electives (18 ECTS credits)				
08-NM-AW-072-m01	Nanomatrix Inorganic Materials Chemistry	6	NUM	10
08-NM-NS-072-m01	Nanoparticle Synthesis and Structuring Technologies	6	NUM	11
11-NM-WP-072-m01	Nanomatrix insulation systems and photovoltaics	6	NUM	33
11-NM-HM-072-m01	Nanomatrix semiconductor materials	6	NUM	30
11-NM-HP-072-m01	Nanomatrix Semiconductor Processing	6	NUM	31
11-NM-MB-072-m01	Principles Micro/Nano- and Optoelectronic Devices	6	NUM	32

03-NM-BW-072-m01	Nanomatrix Biomedical Materials	6	NUM	6
07-NM-BS-072-m01	Nanomatrix Biocompatible Structuring Technologies	6	NUM	7
11-NM-BV-072-m01	Nanomatrix Biophysical Analyzing Systems and Processes	6	NUM	29
Thesis (10 ECTS credits)				
11-BA-N-072-m01	Bachelor Thesis Nanostructure Technology	10	NUM	17
Subject-specific Key Skills (14 ECTS credits)				
11-T2-072-m01	Theoretical Physics 2 (Theoretical Electrostatics and Electrodynamics)	8	NUM	42
11-T4-072-m01	Theoretical Physics 4 (Theoretical Thermodynamics and Statistics)	8	NUM	45
11-MPI4-062-m01	Mathematics 4 for Students of Physics and Engineering	8	NUM	26
11-PFR-072-m01	Measurements and Data Analysis	2	NUM	36
11-A1-072-m01	Computational Physics	6	NUM	14
11-A3-072-m01	Laboratory and Measurement Technology	6	NUM	15

Module title			Abbreviation
Nanomatrix Biomedical Materials			03-NM-BW-072-m01
Module coordinator		**Module offered by**	
chairperson of examination committee of the Master's degree programme Human-Computer Interaction		Faculty of Medicine	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Fundamentals and specific knowledge for engineering work in the application areas power engineering, electronics and photonics and biophysical applications as well as the technology focuses materials science, nanostructuring technologies and components and system development, especially in the area of biomedical materials.

Intended learning outcomes

Students have developed an advanced knowledge in at least one application area or technology focus of engineering work, with a particular focus on biomedical 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 can be chosen to earn a bonus)

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

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Nanomatrix Biocompatible Structuring Technologies			07-NM-BS-072-m01
Module coordinator		**Module offered by**	
Dean of Studies Biologie (Biology)		Faculty of Biology	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Fundamentals as well as specific knowledge and skills for engineering work in the application directions power engineering, electronics and photonics, and biophysical applications and the technology fields of materials science, nano-structuring technologies and components and system development, in particular in the area of biocompatible structuring technologies.

Intended learning outcomes

Students have acquired advanced knowledge and skills in one or more application directions or technology fields of engineering work, in particular in the area of biocompatible structuring technologies.

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 can be chosen to earn a bonus)

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

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
General Chemistry for Physics and Engineers			08-CP1-072-m01
Module coordinator		**Module offered by**	
lecturer of the course		Institute of Inorganic Chemistry	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

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

Intended learning outcomes

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

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

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

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

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

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

Assessment in module component 08-IOC-1-072: Organic Chemistry for students of medicine, biomedicine, dental medicine, engineering and natural science

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

Assessment in module component 08-CP1-1-072: Basics of General an Inorganic Chemistry

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

Assessment in module component 08-CP1-3-072: General and Analytical Chemistry (lab)

- 2 ECTS, Method of grading: (not) successfully completed
- for each experiment: Vortestate (pre-experiment exams, approx. 10 minutes each), assessment of practical performance (log, 2 to 5 pages), Nachtestate (post-experiment exams, approx. 10 minutes each)
- Assessment offered: once a year, summer semester
- Only after successful completion of module components: Successful completion of module component 08-CP1-1 is a prerequisite for participation in module component 08-CP1-3.

Allocation of places

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Additional information

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Workload

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module appears in
Bachelor' degree (1 major) Physics (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008) Bachelor' degree (1 major) Nanostructure Technology (2008) Bachelor' degree (1 major) Nanostructure Technology (2007) Master's degree (1 major) Physics (2010) No final examination (2010)

Module title			Abbreviation
Nanomatrix Inorganic Materials Chemistry			08-NM-AW-072-m01
Module coordinator		**Module offered by**	
Dean of Studies Chemie and Pharmazie (Chemistry and Pharmacy)		Chair of Chemical Technology of Material Synthesis	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Fundamentals as well as specific knowledge and skills for engineering work in the application directions power engineering, electronics and photonics and biophysical applications and the technology fields of materials science, nano-structuring technologies and components and system development, in particular in the area of inorganic materials chemistry.

Intended learning outcomes

Students have developed advanced knowledge and skills in one or more application directions or technology fields of engineering work, in particular in the area of inorganic materials chemistry.

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 can be chosen to earn a bonus)

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

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Nanoparticle Synthesis and Structuring Technologies			08-NM-NS-072-m01
Module coordinator		**Module offered by**	
Dean of Studies Chemie and Pharmazie (Chemistry and Pharmacy)		Chair of Chemical Technology of Material Synthesis	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Fundamentals as well as specific knowledge and skills for engineering work in the application directions power engineering, electronics and photonics and biophysical applications and the technology fields of materials science, nano-structuring technologies and components and system development, in particular in the area of nanoparticle synthesis and structuring technologies.

Intended learning outcomes

Students have developed advanced knowledge and skills in one or more application directions or technology fields of engineering work, in particular in the area of nanoparticle synthesis and structuring technologies.

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 can be chosen to earn a bonus)

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

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Mathematics 1 for students in Nanostructural Engineering			10-M-NST1-072-m01
Module coordinator		**Module offered by**	
Dean of Studies Mathematik (Mathematics)		Institute of Mathematics	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Basics on numbers and functions, sequences and series, differential and integral calculus in one variable, vector spaces, simple differential equations.

Intended learning outcomes

The student gets acquainted with basic concepts of mathematics. He/She learns to apply these methods to simple problems in natural and engineering sciences, in particular in the field of nanostructure technology, and is able to interpret the results.

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 can be chosen to earn a bonus)

written examination (90 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Mathematics 2 for students in Nanostructural Engineering			10-M-NST2-072-m01
Module coordinator		**Module offered by**	
Dean of Studies Mathematik (Mathematics)		Institute of Mathematics	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Linear maps and systems of linear equations, matrix calculus, eigenvalue theory, differential and integral calculus in several variables, differential equations, Fourier analysis.

Intended learning outcomes

The student gets acquainted with fundamental concepts of advanced mathematics. He/She learns to apply these methods to simple problems in natural and engineering sciences, in particular in the field of nanostructure technology, and is able to interpret the results.

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 can be chosen to earn a bonus)

written examination (90 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Computational Physics			11-A1-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Theoretical Physics and Astrophysics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Introduction to two of the programming languages relevant for students of Physics and Engineering, solving physical problems with computer programmes.

Intended learning outcomes

The students have acquired the following transferable skills: Basic knowledge of two programming languages, skills in working with computers, knowledge of algorithms to solve numeric physical problems.

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

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

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

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

Contents

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

Intended learning outcomes

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

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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

Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2010)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2012)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2010)
Bachelor' degree (1 major) Nanostructure Technology (2012)
Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)
Master's degree (1 major) Technology of Functional Materials (2010)
Master's degree (1 major) Technology of Functional Materials (2009)
Master's degree (1 major) Functional Materials (2012)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2010)

Module title			Abbreviation
Bachelor Thesis Nanostructure Technology			11-BA-N-072-m01
Module coordinator		**Module offered by**	
chairperson of examination committee		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
10	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Mostly independent processing of an experimental, theoretical or engineering task in the field of nanostructure technology, especially according to known procedures and scientific aspects; writing of the Bachelor's thesis.

Intended learning outcomes

The students are able to independently work on an experimental, theoretical and engineering task from nanostructure technology under the guidance of a supervisor, especially in accordance with known methods and scientific aspects and to summarise their results in a final paper.

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

no courses assigned

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

written thesis (approx. 25 pages)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2010)
Bachelor' degree (1 major) Nanostructure Technology (2012)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			**Abbreviation**
Experimental Physics 1 (Mechanics, Thermodynamics, Waves and Oscillations)			11-E1-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Physical laws of mechanics, vibrations and waves, thermodynamics

Intended learning outcomes

The students understand the basic contexts and principles of mechanics, vibration, waves and thermodynamics.

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Module title			Abbreviation
Experimental Physics 2 (Electrics and Magnetism)			11-E2-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Physical laws of the science of electricity, magnetism, electromagnetic vibrations and waves

Intended learning outcomes

The students understand the basic contexts and principles of science of electricity, magnetism, electromagnetic vibrations and waves.

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Module title			**Abbreviation**
Experimental Physics 3 (Optics, Quantum Phenomena, Introduction Atomic Physics)			11-E3-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Physical laws of optics, quantum phenomena, introduction to Atomic Physics.

Intended learning outcomes

The students have knowledge of the basic contexts and principles of optics, quantum phenomena and Atomic Physics.

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Mathematics (2008)
Bachelor' degree (1 major) Mathematics (2007)
Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor' degree (1 major) Computational Mathematics (2009)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Module title			Abbreviation
Experimental Physics 4 (Introduction to Solid State Physics)			11-E4-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Physical laws of solids: Bonding and structure, lattice dynamics, thermal properties, principles of electronic properties (free electron gas).

Intended learning outcomes

The students have knowledge of the basic contexts and principles of solids: Bonding and structure, lattice dynamics, thermal properties, principles of electronic properties (free electron gas).

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Mathematics (2008)
Bachelor' degree (1 major) Mathematics (2007)
Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Experimental Physics 5 (Physics of Atoms and Molecules)			11-E5-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Physical laws of Atomic and Molecular Physics.

Intended learning outcomes

The students have knowledge of the basic contexts and principles of Atomic and Molecular Physics (atoms: Quantum mechanical atom model, one/multi-electron atoms, electronic dipole transitions, atoms in B field as well as molecules: Bonding models and elementary excitations: rotations, vibrations, electronic excitations)

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Experimental Physics 7 (Solid State Phenomena [Semiconductor, Superconductivity, Magnetism])			11-E7-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
4	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Physical laws of solid-state phenomena (semiconductors, superconductivity, magnetism)

Intended learning outcomes

The students have knowledge of the basic contexts and principles of electronic transport and electrical properties (semi-conductors: Doping effects, pn transitions, metal-semiconductor interfaces; superconductivity: phenomenological models, BCS model; magnetism: Dia-, para- and ferromagnetism, mean field description of magnetic order)

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Module title			Abbreviation
Mathematics 3 for students of Physics and Engineering			11-MPI3-062-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Theoretical Physics and Astrophysics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	Admission prerequisite to assessment: successful completion of approx. 50% of exercises. Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.	

Contents

Ordinary and partial differential equations in Physics.

Intended learning outcomes

The students have basic mathematical knowledge of dynamic equations and solution methods for common and 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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Technology of Functional Materials (2009)
Bachelor' degree (1 major) Technology of Functional Materials (2010)
Bachelor' degree (1 major) Nanostructure Technology (2010)
Bachelor' degree (1 major) Nanostructure Technology (2012)
Bachelor' degree (1 major) Nanostructure Technology (2008)

Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor' degree (1 major) Functional Materials (2012)
Bachelor' degree (1 major) Technology of Functional Materials (2006)

Module title			Abbreviation
Mathematics 4 for Students of Physics and Engineering			11-MPI4-062-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Theoretical Physics and Astrophysics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Functional analysis and complex analysis.

Intended learning outcomes

The students have basic knowledge of mathematics of Hilbert space and the theory of functions of a complex variable as well as the required calculation methods.

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2010)
Bachelor' degree (1 major) Nanostructure Technology (2012)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Basics of NanostructureTechnology			11-N1-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Principles of producing, characterising and applying nanostructures.

Intended learning outcomes

The students have knowledge of the fundamental properties, technologies, characterising methods and functions of nanostructures.

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

V + S (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 can be chosen to earn a bonus)

written examination (approx. 90 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) 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 (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)
Bachelor' degree (1 major) Technology of Functional Materials (2006)

Module title			Abbreviation
Principles of Electronics (with Practical Course)			11-N2-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Principles of passive and active electronic components and their application in analogous and digital circuit technology.

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 + 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 can be chosen to earn a bonus)

written examination (approx. 90 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2007)
No final examination (2010)

Module title			Abbreviation
Nanomatrix Biophysical Analyzing Systems and Processes			11-NM-BV-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

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

Intended learning outcomes

The students have advanced knowledge of one or more application or technology areas of engineering work, especially in the field of biophysical analysis systems and techniques.

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 can be chosen to earn a bonus)

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

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Master's degree (1 major) Technology of Functional Materials (2010)
Master's degree (1 major) Technology of Functional Materials (2009)

Module title			Abbreviation
Nanomatrix semiconductor materials			11-NM-HM-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

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

Intended learning outcomes

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

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 can be chosen to earn a bonus)

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

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Master's degree (1 major) Technology of Functional Materials (2010)
Master's degree (1 major) Technology of Functional Materials (2009)

Module title			Abbreviation
Nanomatrix Semiconductor Processing			11-NM-HP-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

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

Intended learning outcomes

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

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 can be chosen to earn a bonus)

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

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Master's degree (1 major) Technology of Functional Materials (2010)
Master's degree (1 major) Technology of Functional Materials (2009)

Module title			Abbreviation
Principles Micro/Nano- and Optoelectronic Devices			11-NM-MB-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

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

Intended learning outcomes

The students have advanced knowledge of one or more application or technology areas of engineering work, especially in the field of micro-, nano- and optoelectronic 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 can be chosen to earn a bonus)

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

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Nanomatrix insulation systems and photovoltaics			11-NM-WP-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

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

Intended learning outcomes

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

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

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

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

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

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Master's degree (1 major) Technology of Functional Materials (2010)
Master's degree (1 major) Technology of Functional Materials (2009)

Module title			Abbreviation
Advanced Practical Course Bachelor			11-PFB-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
4	(not) successfully completed	11-E1, 11-E2	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	11-A3	

Contents

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

Intended learning outcomes

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

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

Fortgeschrittenen-Praktikum Bachelor Theorie (Advanced Practical Course Bachelor Theory): S (1 weekly contact hour)
Fortgeschrittenen-Praktikum Bachelor Praxis (Advanced Practical Course Bachelor Practice): P (3 weekly contact hours)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

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

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

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Industrial Internship			11-PFl-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Insights into industrial methods, work processes, goals and production methods. Summary of own experiences and tasks in a report and an oral presentation.

Intended learning outcomes

The students have knowledge and practical experience of using a variety of industrial technologies with relevance to nanostructure technology and are able to summarise their experience in a report and an oral presentation.

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

P + S (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 can be chosen to earn a bonus)

placement report / fieldwork report / report on practical training / report on practical course / project report / report on technical course (20 pages)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

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

Contents

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

Intended learning outcomes

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

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

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

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Mathematics (2008)
Bachelor' degree (1 major) Mathematics (2007)
Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor' degree (1 major) Computational Mathematics (2009)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Module title			Abbreviation
Advanced Undergraduate Laboratory (Classical Mechanics, Thermodynamics, Basic Circuitry)			11-PGA-NN-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
4	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	Recommended: 11-PFR	

Contents

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

Intended learning outcomes

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

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

Beispiele aus Mechanik, Wärmelehre und Elektrik (Examples from Mechanics, Thermodynamics and Electricity, BAM): P (2 weekly contact hours)
Klassische Physik (Classical Physics, KLP): P (2 weekly contact hours)
Elektrizitätslehre und Schaltungen (Electricity and Circuits, ELS): P (2 weekly contact hours)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

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

Students must register for assessment components 1 and 2 online (registration deadline to be announced).
Students will be offered one opportunity to retake element a) and/or element b). To pass an assessment component, they must pass both elements a) and b).
To pass this module, students must successfully complete two out of the three courses.
To pass this module, students must pass both assessment component 1 and assessment component 2.

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

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

Contents

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

Intended learning outcomes

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

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

Wellenoptik (Physical Optics, WOP): P (2 weekly contact hours)
Atom- und Kernphysik (Atomic and Nuclear Physics, AKP): P (2 weekly contact hours)
Computer und Messtechnik (Computers and Measurement Technology, CMT): P (2 weekly contact hours)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

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

Students must register for assessment online (registration deadline to be announced).
Students will be offered one opportunity to retake element a) and/or element b). To pass an assessment, students must pass both elements a) and b).
To pass this module, students must successfully complete one out of the three courses.
To pass this module, students must pass the assessment components.

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Module title			Abbreviation
Comprehensive Exam in Theoretical Physics / Nanostructure Technology			11-PREN-072-m01
Module coordinator		**Module offered by**	
chairperson of examination committee		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
4	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

The purpose of the examination is to determine whether the candidate understands the connections between fundamental physical and chemical terms and laws and is able to apply the acquired scientific methods.

Intended learning outcomes

The students know the connections between fundamental physical and chemical terminology and laws and are able to apply the acquired scientific methods.

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

A (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 can be chosen to earn a bonus)

oral examination of one candidate each (approx. 30 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Comprehensive Exam in Theoretical Physics / Nanostructure Technology			11-PRN-072-m01
Module coordinator		**Module offered by**	
chairperson of examination committee		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
4	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

The purpose of the examination is to determine whether the candidate has profound methodological knowledge of engineering and is able to apply the acquired scientific methods.

Intended learning outcomes

The students have founded methodological knowledge in engineering and are able to apply the acquired scientific methods.

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

A (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 can be chosen to earn a bonus)

oral examination of one candidate each (approx. 30 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Theoretical Physics 1 (Theoretical Mechanics)			11-T1-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Theoretical Physics and Astrophysics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Newtonian mechanics, Lagrangian mechanics, Hamiltonian equation of motion, conservation laws.

Intended learning outcomes

The students have knowledge of the principles of classical theoretical mechanics and the required calculation methods.

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Mathematics (2008)
Bachelor' degree (1 major) Mathematics (2007)
Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor' degree (1 major) Computational Mathematics (2009)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Module title			Abbreviation
Theoretical Physics 2 (Theoretical Electrostatics and Electrodynamics)			11-T2-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Theoretical Physics and Astrophysics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Electrostatics, magnetostatics, Maxwell equations, covariant formulation, electrodynamics and matter.

Intended learning outcomes

The students have knowledge of the principles of classical electrodynamics and the required calculation methods.

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Mathematics (2008)
Bachelor' degree (1 major) Mathematics (2007)
Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor' degree (1 major) Computational Mathematics (2009)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Module title			Abbreviation
Theoretical Physics 3 (Theoretical Quantum Mechanics)			11-T3-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Theoretical Physics and Astrophysics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Limits of classical physics, Schrödinger equation, mathematical foundations of quantum mechanics, harmonic oscillator, angular momentum and spin, hydrogen atom, many-particle systems.

Intended learning outcomes

The students have knowledge of the principles of quantum mechanics and the required calculation methods.

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Mathematics (2008)
Bachelor' degree (1 major) Mathematics (2007)
Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor' degree (1 major) Computational Mathematics (2009)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Module title			Abbreviation
Theoretical Physics 3 FOKUS (Theoretical Quantum Mechanics)			11-T3F-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Theoretical Physics and Astrophysics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Limits of classical physics, Schrödinger equation, mathematical foundations of quantum mechanics, harmonic oscillator, angular momentum and spin, hydrogen atom, many-particle systems

Intended learning outcomes

The students have knowledge of the principles of quantum mechanics and the required calculation methods

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)

Module title			Abbreviation
Theoretical Physics 4 (Theoretical Thermodynamics and Statistics)			11-T4-072-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Theoretical Physics and Astrophysics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Principles of thermodynamics, fundamental theorems, thermodynamic potentials, principles of statistical mechanics.

Intended learning outcomes

The students have knowledge of the principles of thermodynamics and statistical mechanics and the required calculation methods.

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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Workload

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

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Module appears in

Bachelor' degree (1 major) Mathematics (2008)
Bachelor' degree (1 major) Mathematics (2007)
Bachelor' degree (1 major) Physics (2007)
Bachelor' degree (1 major) Physics (2009)
Bachelor' degree (1 major) Physics (2008)
Bachelor' degree (1 major) Nanostructure Technology (2008)
Bachelor' degree (1 major) Nanostructure Technology (2007)
Bachelor' degree (1 major) Computational Mathematics (2009)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)