

Subdivided Module Catalogue
for the Subject
Physics
as a Bachelor's with 1 major
with the degree "Bachelor of Science"
(180 ECTS credits)

Examination regulations version: 2009
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 physics and to make the students familiar with the methods of physical 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 experimental and theoretical physical terms and laws as well as on basic scientific methods and the development of the typical scientific thinking and working structures. During the Bachelor thesis the student should work on a thematic and temporally limited experimental or theoretical engineering-scientific task in the field of experimental or theoretical physics 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)):

02-Sep-2010 (2010-48)

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 (140 ECTS credits)				
Experimental Physics (46 ECTS credits)				
11-E1-072-m01	Experimental Physics 1 (Mechanics, Thermodynamics, Waves and Oscillations)	8	NUM	26
11-E2-072-m01	Experimental Physics 2 (Electrics and Magnetism)	8	NUM	27
11-E3-072-m01	Experimental Physics 3 (Optics, Quantum Phenomena, Introduction Atomic Physics)	8	NUM	28
11-E4-072-m01	Experimental Physics 4 (Introduction to Solid State Physics)	8	NUM	29
11-E5-072-m01	Experimental Physics 5 (Physics of Atoms and Molecules)	6	NUM	30
11-E6-072-m01	Nuclear and Elementary Particle Physics	4	NUM	31
11-E7-072-m01	Experimental Physics 7 (Solid State Phenomena [Semiconductor, Superconductivity, Magnetism])	4	NUM	32
Theoretical Physics (32 ECTS credits)				
11-T1-072-m01	Theoretical Physics 1 (Theoretical Mechanics)	8	NUM	46
11-T2-072-m01	Theoretical Physics 2 (Theoretical Electrostatics and Electrodynamics)	8	NUM	47
11-T3-072-m01	Theoretical Physics 3 (Theoretical Quantum Mechanics)	8	NUM	48
11-T3F-072-m01	Theoretical Physics 3 FOKUS (Theoretical Quantum Mechanics)	8	NUM	49
11-T4-072-m01	Theoretical Physics 4 (Theoretical Thermodynamics and Statistics)	8	NUM	50
Lab Course Physics (16 ECTS credits)				
11-PGA-PGR-072-m01	Basic Practical Course B for Students of Physics (Bachelor of Science and Teaching Degree)	6	B/NB	40
11-PGB-PGN-072-m01	Advanced Undergraduate Laboratory (Atomic Physics, Nuclear Physics, Basic Semiconductor Circuits)	4	B/NB	42
11-PFB-072-m01	Advanced Practical Course Bachelor	4	B/NB	38
11-PHS-072-m01	Main Seminar Experimental / Theoretical Physics	2	NUM	43
Mathematics (34 ECTS credits)				
11-MPI3-062-m01	Mathematics 3 for students of Physics and Engineering	8	NUM	34
10-M-PHY1-072-m01	Mathematics for Physicists 1	10	NUM	15
10-M-PHY2-072-m01	Mathematics for Physicists 2	8	NUM	16
11-MPI4-062-m01	Mathematics 4 for Students of Physics and Engineering	8	NUM	36
Module Comprehensive Tests (12 ECTS credits)				
11-PREP-072-m01	Oral Exam Experimental Physics (Physicists)	6	NUM	44
11-PRT-072-m01	Oral Exam Theoretical Physics	6	NUM	45
Compulsory Electives (10 ECTS credits)				
Chemistry (10 ECTS credits)				
08-CP1-072-m01	General Chemistry for Physics and Engineers	10	NUM	6
Computer Science (10 ECTS credits)				
10-I-EIN-072-m01	Introduction to Computer Science for Students of all Faculties	10	NUM	8
Numerical Mathematics (10 ECTS credits)				
10-M-NM1-082-m01	Numerical Mathematics 1	8	NUM	11
10-M-NM2-082-m01	Numerical Mathematics 2	5	NUM	13
Bachelor's with 1 major Physics (2009)		JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Bachelor (180 ECTS) Physik - 2009		page 4 / 50

10-M-PRG-o82-m01	Programming course for students of Mathematics and other subjects	3	B/NB	17
10-M-COM-o82-m01	Computeroriented Mathematics	3	B/NB	9
Thesis (10 ECTS credits)				
11-BA-P-072-m01	Bachelor Thesis Physics	10	NUM	25
Subject-specific Key Skills (14 ECTS credits)				
11-PFR-072-m01	Measurements and Data Analysis	2	NUM	39
11-A1-072-m01	Computational Physics	6	NUM	19
11-A3-072-m01	Laboratory and Measurement Technology	6	NUM	21
11-A4-072-m01	Astrophysics	6	NUM	23
11-A2-081-m01	Electronics	6	NUM	20
11-MKS-o82-m01	Introduction Course Mathematics	3	B/NB	33
11-MR-092-m01	Mathematical Methods of Physics	6	B/NB	37

Module title			Abbreviation
General Chemistry for Physics and Engineers			o8-CP1-072-mo1
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. <ul style="list-style-type: none">o8-IOC-1-072: V (no information on SWS (weekly contact hours) and course language available)o8-CP1-1-072: V (no information on SWS (weekly contact hours) and course language available)o8-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 o8-IOC-1-072: Organic Chemistry for students of medicine, biomedicine, dental medicine, engineering and natural science <ul style="list-style-type: none">3 ECTS, Method of grading: numerical gradewritten examination (approx. 60 minutes)			
Assessment in module component o8-CP1-1-072: Basics of General and Inorganic Chemistry <ul style="list-style-type: none">5 ECTS, Method of grading: numerical gradewritten examination (60 minutes)			
Assessment in module component o8-CP1-3-072: General and Analytical Chemistry (lab) <ul style="list-style-type: none">2 ECTS, Method of grading: (not) successfully completedfor 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 semesterOnly after successful completion of module components: Successful completion of module component o8-CP1-1 is a prerequisite for participation in module component o8-CP1-3.			
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 (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 Special study offering (2010)

Module title		Abbreviation
Introduction to Computer Science for Students of all Faculties		10-I-EIN-072-m01
Module coordinator		Module offered by
Dean of Studies Informatik (Computer Science)		Institute of Computer Science
ECTS	Method of grading	Only after succ. compl. of module(s)
10	numerical grade	--
Duration	Module level	Other prerequisites
1 semester	undergraduate	Admission prerequisite to assessment: academic requirements to be met in exercises as specified at the beginning of the course.
Contents		
Foundations of computer science including representation of information and websites (HTML, XML, EBNF), databases, algorithms and data structures, programming (Java).		
Intended learning outcomes		
The students are familiar with the fundamentals of computer science, e. g. in the areas of representation of information and websites (HTML, XML, EBNF), databases, algorithms and data structures, programming in Java.		
Courses (type, number of weekly contact hours, language — if other than German)		
V + 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 can be chosen to earn a bonus)		
a) written examination (approx. 90 minutes) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2: 30 minutes, groups of 3: 40 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) Geography (2007) Bachelor' degree (1 major) Geography (2008) Bachelor' degree (1 major) Geography (2010) 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) Master's degree (1 major) Physics (2010) Bachelor's degree (1 major, 1 minor) Digital Humanities (Minor, 2009) Bachelor's degree (2 majors) Digital Humanities (2009)		

Module title		Abbreviation
Computeroriented Mathematics		10-M-COM-o82-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)
3	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	undergraduate	Admission prerequisite to assessment: regular attendance of exercises (attendance monitored, a maximum of one incident of unexcused absence).
Contents		
Introduction to modern mathematical software for symbolic computation (e. g. Mathematica or Maple) and numerical computation (e. g. Matlab) to supplement the basic modules in analysis and linear algebra ((10-M-ANA or 10-M-ANL) and 10-M-LNA). Computer-based solution of problems in linear algebra, geometry, analysis, in particular differential and integral calculus; visualisation of functions.		
Intended learning outcomes		
The student learns the use of advanced modern mathematical software packages, and is able to assess their fields of application to solve mathematical problems.		
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)		
project in the form of programming exercises (as specified at the beginning of the course) Assessment offered: once a year, summer semester 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's with 1 major Physics (2009)	JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Bachelor (180 ECTS) Physik - 2009	page 9 / 50

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) 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) 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)		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	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		
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 can be chosen to earn a 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's with 1 major Physics (2009)	JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Bachelor (180 ECTS) Physik - 2009	page 11 / 50

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-o82-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)
5	numerical grade	--
Duration	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.
Contents		
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 can be chosen to earn a 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) Mathematics (2008) Bachelor' degree (1 major) Physics (2010) Bachelor' degree (1 major) Physics (2009)		
Bachelor's with 1 major Physics (2009)	JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Bachelor (180 ECTS) Physik - 2009	page 13 / 50

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
Mathematics for Physicists 1		10-M-PHY1-072-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 sciences, in particular in physics, 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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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 (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008)		

Module title		Abbreviation
Mathematics for Physicists 2		10-M-PHY2-072-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 problems in natural sciences, in particular in physics, 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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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 (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008) No final examination Special study offering (2010)		

Module title		Abbreviation
Programming course for students of Mathematics and other subjects		10-M-PRG-o82-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)
3	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	undergraduate	Admission prerequisite to assessment: regular attendance (attendance monitored, a maximum of one incident of unexcused absence).
Contents		
Basics of a modern programming language (e. g. C or Fortran) taking into account the particular needs in mathematics.		
Intended learning outcomes		
The student is able to work independently on small programming exercises and standard programming problems in mathematics.		
Courses (type, number of weekly contact hours, language — if other than German)		
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)		
project in the form of programming exercises (as specified at the beginning of the course) 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) 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) Master's degree (1 major) Physics (2010) Master's degree (1 major) Technology of Functional Materials (2010) Master's degree (1 major) Technology of Functional Materials (2009)		
Bachelor's with 1 major Physics (2009)	JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Bachelor (180 ECTS) Physik - 2009	page 17 / 50

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
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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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 (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
Electronics		11-A2-o81-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 + 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. 90 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 (2009) Bachelor' degree (1 major) Physics (2008) Master's degree (1 major) Physics (2010) 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) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008) No final examination Special study offering (2010)		

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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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 (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's with 1 major Physics (2009)	JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Bachelor (180 ECTS) Physik - 2009	page 21 / 50

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
Astrophysics		11-A4-072-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	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		
History of astronomy, coordinates and time measurement, the solar system, size scales in outer space, telescopes and detectors, stellar structure, stellar atmospheres, stellar evolution, final stages of stellar evolution, interstellar medium, structure of the Milky Way, local universe, expanding space-time, galaxies, active galactic nuclei, large-scale structure of the universe, Friedmann World Models, thermodynamics of the early universe, primordial nucleosynthesis, cosmic microwave background radiation, structure formation, inflation		
Intended learning outcomes		
The students are familiar with the modern world view of Astrophysics. They know methods and tools for astrophysical observations and evaluations. They are able to use these methods to plan and analyse own observations. They know the structure of the universe, e.g. of stars and galaxies and understand the process of their development.		
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. 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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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 (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) Mathematical Physics (2009)
 Bachelor' degree (1 major) Mathematical Physics (2012)
 Bachelor' degree (1 major) Aerospace Computer Science (2011)
 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) FOKUS Physics (2010)
 Master's degree (1 major) FOKUS Physics (2011)
 Master's degree (1 major) Computational Mathematics (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 Physics		11-BA-P-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 or theoretical task of Physics according to known procedures and scientific aspects.		
Intended learning outcomes		
The students are able to independently work on an experimental or theoretical task from Physics, especially according to known methods and scientific aspects and to write the Bachelor's thesis.		
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) Language of assessment: German or 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 (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)		

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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Teaching cycle			
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Referred to in LPO I (examination regulations for teaching-degree programmes)			
--			
Module appears in			
Bachelor' degree (1 major) Physics (2007)			
Bachelor' degree (1 major) Physics (2009)			
Bachelor' degree (1 major) Physics (2008)			
Bachelor' degree (1 major) Nanostructure Technology (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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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 (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			
--			
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) 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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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) 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		
--		
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 (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Nanostructure Technology (2007)		

Module title		Abbreviation
Nuclear and Elementary Particle Physics		11-E6-072-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 Nuclear and Elementary Particle Physics.		
Intended learning outcomes		
The students have knowledge of the basic contexts and principles of Nuclear and Elementary Particle 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		
--		
Teaching cycle		
--		
Referred to in LPO I (examination regulations for teaching-degree programmes)		
--		
Module appears in		
Bachelor' degree (1 major) Physics (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)		

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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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 (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
Introduction Course Mathematics		11-MKS-082-m01
Module coordinator		Module offered by
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy
ECTS	Method of grading	Only after succ. compl. of module(s)
3	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	undergraduate	--
Contents		
Principles of mathematics and basic calculation methods beyond the school curriculum, especially for the introduction to and preparation of the modules of Theoretical Physics and Experimental Physics.		
Intended learning outcomes		
The students have knowledge of the principles of mathematics and elementary calculation methods which are required in Theoretical and Experimental Physics.		
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 can be chosen to earn a bonus)		
written examination (approx. 120 minutes)		
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 (2009) Bachelor' degree (1 major) Physics (2008) Bachelor' degree (1 major) Nanostructure Technology (2008) 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		
--		
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 (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's with 1 major Physics (2009)	JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Bachelor (180 ECTS) Physik - 2009	page 34 / 50

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-MPL4-062-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		
--		
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 (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
Mathematical Methods of Physics		11-MR-092-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	(not) successfully completed	--
Duration	Module level	Other prerequisites
2 semester	undergraduate	--
Contents		
Principles of mathematics and basic calculation methods beyond the school curriculum, especially for the introduction to and preparation of the modules of Theoretical Physics and Classical or Experimental Physics.		
Intended learning outcomes		
The students have knowledge of the principles of mathematics and elementary calculation methods which are required in Theoretical and Experimental Physics.		
Courses (type, number of weekly contact hours, language — if other than German)		
Mathematische Rechenmethoden 1 (Mathematical Methods 1): V (2 weekly contact hours) + Ü (1 weekly contact hour), once a year (winter semester) Mathematische Rechenmethoden 2 (Mathematical Methods 2): V (2 weekly contact hours) + Ü (1 weekly contact hour), once a year (summer semester)		
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. Topics covered in lectures and exercises in part 1 (Mathematische Rechenmethoden 1 (Mathematical Methods 1)): exercises or talk (approx. 15 minutes, usually chosen) or written examination (approx. 60 minutes) 2. Topics covered in lectures and exercises in part 2 (Mathematische Rechenmethoden 2 (Mathematical Methods 2)): exercises or talk (approx. 15 minutes, usually chosen) or written examination (approx. 60 minutes) Successful completion of approx. 50% of practice work each is a prerequisite for admission to assessment components 1 and 2. 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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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 (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)		
<p>This module has the following assessment components</p> <ol style="list-style-type: none"> 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). <p>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.</p>		
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 (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
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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Teaching cycle		
--		
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
Basic Practical Course B for Students of Physics (Bachelor of Science and Teaching Degree)			11-PGA-PGR-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	(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). 3. Lab course in part 3: 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 through 3 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 each of the three courses. To pass this module, students must pass each of the assessment components 1 through 3. To pass this module, students must successfully complete two out of the three courses.			
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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Bachelor's with 1 major Physics (2009)		JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Bachelor (180 ECTS) Physik - 2009	page 40 / 50

Module appears in

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

Module title			Abbreviation
Advanced Undergraduate Laboratory (Atomic Physics, Nuclear Physics, Basic Semiconductor Circuits)			11-PGB-PGN-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-PFR	
Duration	Module level	Other prerequisites	
1 semester	undergraduate	Recommended: 11-PGA-PGR	
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 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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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 (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008)			
Bachelor's with 1 major Physics (2009)		JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Bachelor (180 ECTS) Physik - 2009	page 42 / 50

Module title		Abbreviation
Main Seminar Experimental / Theoretical Physics		11-PHS-072-m01
Module coordinator		Module offered by
Managing Directors of the Institute of Applied Physics and the Institute of Theoretical Physics and Astrophysics		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		
Current issues of Theoretical/Experimental Physics.		
Intended learning outcomes		
The students have knowledge of the scientific methods, work and presentation techniques of a current question of Theoretical or Experimental Physics.		
Courses (type, number of weekly contact hours, language — if other than German)		
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)		
talk (approx. 30 to 45 minutes) with discussion		
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 (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008) Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)		

Module title		Abbreviation
Oral Exam Experimental Physics (Physicists)		11-PREP-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)
6	numerical grade	--
Duration	Module level	Other prerequisites
1 semester	undergraduate	--
Contents		
The purpose of the examination is to determine whether the candidate understands basic contexts of Experimental and Applied Physics and is able to apply the acquired scientific methods.		
Intended learning outcomes		
The students have gained an overview of the basic contexts of Experimental and Applied Physics 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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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 (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008)		

Module title		Abbreviation
Oral Exam Theoretical Physics		11-PRT-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)
6	numerical grade	--
Duration	Module level	Other prerequisites
1 semester	undergraduate	--
Contents		
The purpose of the examination is to determine whether the candidate understands basic contexts of Theoretical Physics and is able to apply the acquired scientific methods.		
Intended learning outcomes		
The students have gained an overview of the basic contexts of Theoretical Physics 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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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 (2007) Bachelor' degree (1 major) Physics (2009) Bachelor' degree (1 major) Physics (2008)		

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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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) 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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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) 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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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) 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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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 (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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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) 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)		