

Module Catalogue

for the Subject

Physics

as vertieft studiertes Fach (studied with a focus on the
scientific discipline)
with the degree "Erste Staatsprüfung für das Lehramt an
Gymnasien"

Examination regulations version: 2009
Responsible: Faculty of Physics and Astronomy

Contents

The subject is divided into	3
Abbreviations used, Conventions, Notes, In accordance with	4
Scientific Discipline	5
Compulsory Courses	6
Demonstration Practical Course 1	7
Demonstration Practical Course 2	8
Experimental Physics 1 and 2 - Teaching Post (Mechanics, Thermodynamics, Oscillations, Waves, Electrics, Magnetism and Optics)	9
Advanced Practical Course	11
General Concepts	12
Modern Physics 1	14
Modern Physics 2	16
Modern Physics 3	17
Lab Course A	18
Lab Course B	20
Practice in Student Lab	22
Theoretical Physics 1 (Teaching Post)	23
Theoretical Physics 2	24
Teaching	25
Teaching 1	26
Teaching Concepts Consolidating Seminar	28
Student Lab Supervision (Physics)	29
Freier Bereich (general as well as subject-specific electives)	31
Physics	32
W- and P-Courses in Secondary Classes of Gymnasium (Physics)	33
Teaching Seminar Fundamental Principles	34
Preparatory Course Mathematics	36
Student Lab Supervision (Physics)	38
Low Cost - High Impact. Low-Budget Experiments for Science Courses (Physics)	40
Teaching Science with Hands-on-Exhibits (Physics)	41
Radiation Safety and Protection	42
Thesis	43
Thesis in Physics Grammar School	44

The subject is divided into

section / sub-section	ECTS credits	starting page
Scientific Discipline	92	5
Compulsory Courses	92	6
Teaching	10	25
Freier Bereich (general as well as subject-specific electives)		31
Physics		32
Thesis	10	43

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:

LASPO2009

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

20-Feb-2013 (2012-75)

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.

Scientific Discipline

(92 ECTS credits)

Compulsory Courses

(92 ECTS credits)

Module title		Abbreviation
Demonstration Practical Course 1		11-P-DP1-092-m01
Module coordinator		Module offered by
holder of the Chair of Physics and its Didactics		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		
Fundamental experiments of physics education in primary and secondary level I, knowledge of tools typically used in school, goal setting and didactic potential of demonstration experiments, student experiments, free-hand experiments, model experiments, etc.; computer-aided experiments; measured value acquisition, interactive screen experiments, etc.; presentation of experiments; safety in physics education, presentation competencies.		
Intended learning outcomes		
Competencies in working with teaching tools and experimenting materials used in commerce and school; systematic analysis of error sources of own experiments; identification of categories of experiments, their functions and their didactic potential; experience in choosing, constructing and presenting experiments according to the learning goals and group of pupils, experience in using computerised demonstration and pupils experiments; safety standards of Physics classes.		
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 is creditable for bonus)		
oral examination of one candidate each (approx. 10 minutes) or oral examination in groups (groups of 2, approx. 20 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)		
§ 53 (1) 1. a) Physik Mechanik, Wärmelehre, Elektrizitätslehre, Optik, der speziellen Relativitätstheorie § 53 (1) 1. c) Physik physikalische Grundpraktika § 77 (1) 1. d) Physik "physikalische Praktika"		
Module appears in		
First state examination for the teaching degree Grundschule Physics (2009) First state examination for the teaching degree Hauptschule Physics (2009) First state examination for the teaching degree Realschule Physics (2009) First state examination for the teaching degree Gymnasium Physics (2009) First state examination for the teaching degree Mittelschule Physics (2013)		

Module title		Abbreviation
Demonstration Practical Course 2		11-P-DP2-092-m01
Module coordinator		Module offered by
holder of the Chair of Physics and its Didactics		Faculty of Physics and Astronomy
ECTS	Method of grading	Only after succ. compl. of module(s)
5	numerical grade	--
Duration	Module level	Other prerequisites
1 semester	undergraduate	--
Contents		
Fundamental experiments of physics education, especially for secondary level II. Subject media, acquisition and handling of information.		
Intended learning outcomes		
The students have experiences in presenting sophisticated phenomena and experiments and in using multimedia in view of didactic-methodological aspects and know the potentials and limits of different types of media; they have experiences in working with systems for physical modelling and with methods of contemporary information acquisition (internet sources, virtual libraries).		
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 is creditable for bonus)		
oral examination of one candidate each (approx. 10 minutes) or oral examination in groups (groups of 2, approx. 20 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		
First state examination for the teaching degree Gymnasium Physics (2009)		

Module title		Abbreviation
Experimental Physics 1 and 2 - Teaching Post (Mechanics, Thermodynamics, Oscillations, Waves, Electrics, Magnetism and Optics)		11-P-E-092-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)
22	numerical grade	--
Duration	Module level	Other prerequisites
2 semester	undergraduate	Bridge course Mathematik (Mathematics) for first-semester students and sound reading, writing and maths skills as well as logical thinking skills.
Contents		
Physical laws and elementary mathematical calculation methods of mechanics, thermodynamics, vibration, waves, science of electricity, magnetism, electromagnetic vibration and waves, radiation and wave optics.		
Intended learning outcomes		
The students understand the basic principles, connections and calculation methods of mechanics, thermodynamics, vibrations, waves, science of electricity, magnetism, electromagnetic vibrations and waves, radiation and wave optics.		
Courses (type, number of weekly contact hours, language — if other than German)		
Experimentelle Physik 1 (Experimental Physics 1): V (4 weekly contact hours) + Ü (2 weekly contact hours), once a year (winter semester) Experimentelle Physik 2 (Experimental Physics 2): V (4 weekly contact hours) + Ü (2 weekly contact hours), once a year (summer semester) 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 is creditable for bonus)		
<p>This module has the following assessment components</p> <ol style="list-style-type: none"> Topics covered in lectures and exercises in part 1 (Experimentelle Physik 1 (Experimental Physics 1)): written examination (approx. 120 minutes, usually chosen) or oral examination of one candidate each (approx. 20 minutes) or oral examination in groups (approx. 30 minutes, groups of 2 candidates). Topics covered in lectures and exercises in part 2 (Experimentelle Physik 2 (Experimental Physics 2)): written examination (approx. 120 minutes, usually chosen) or oral examination of one candidate each (approx. 20 minutes) or oral examination in groups (approx. 30 minutes, groups of 2 candidates). Topics covered in lectures and exercises in part 2 (Mathematische Rechenmethoden 1 (Mathematical Methods 1)): exercises or talk (approx. 15 minutes, usually chosen) or written examination (approx. 60 minutes) 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) Topics covered in lectures and exercises in parts 1 and 2: oral examination of one candidate each (approx. 30 minutes, usually chosen) or written examination (approx. 120 minutes). <p>Successful completion of approx. 50% of practice work each is a prerequisite for admission to assessment components 1 through 4. To qualify for admission to assessment component 5, students must pass assessment component 1 and/or 2 as well as assessment components 3 and 4. Students are highly recommended to attend both courses Experimentelle Physik 1 (Experimental Physics 1) and Experimentelle Physik 2 (Experimental Physics 2). The topics discussed in these two courses, together with the topics discussed in Mathematische Rechenmethoden (Mathematical Methods) 1 and 2, will be covered in assessment component 5. Students must register for assessment components 1 through 5 online (details to be announced). To pass this module, students must first pass assessment component 1 or 2 as well as assessment components 3 and 4 and must then pass assessment component 5.</p>		
LA Gymnasien Physics (2009)	JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Lehramt Gymnasien Physik - 2009	page 9 / 44

The grade achieved in assessment component 5 will be the overall grade awarded for the module as a whole.

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)

§ 53 (1) 1. a) Physik Mechanik, Wärmelehre, Elektrizitätslehre, Optik, der speziellen Relativitätstheorie

§ 77 (1) 1. a) Physik "Grundlagen der Experimentalphysik"

Module appears in

First state examination for the teaching degree Grundschule Physics (2009)

First state examination for the teaching degree Hauptschule Physics (2009)

First state examination for the teaching degree Realschule Physics (2009)

First state examination for the teaching degree Gymnasium Physics (2009)

First state examination for the teaching degree Mittelschule Physics (2013)

No final examination Special study offering (2010)

Module title		Abbreviation
Advanced Practical Course		11-P-FP-092-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	--
Contents		
Experiments of modern physics (Atom and Molecular Physics, Solid-State Physics, Nuclear Physics).		
Intended learning outcomes		
The students have knowledge of conducting an experiment and of analysing and documenting the experimental results. They have basic knowledge of modern evaluation systems. They have gained insights into the experimental methods of modern Physics.		
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 is creditable for bonus)		
Preparing, performing and evaluating (lab report) the experiments will be considered successfully completed if a Testat (exam) is passed. Experiments that were not successfully completed can be repeated once. Talk (with discussion; approx. 30 minutes) to test the candidate's understanding of the physics-related contents of the module component. Talks that were not successfully completed can be repeated once. Both components of the assessment have to be successfully completed.		
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)		
§ 77 (1) 1. d) Physik "physikalische Praktika"		
Module appears in		
First state examination for the teaching degree Gymnasium Physics (2009)		

Module title		Abbreviation
General Concepts		11-P-GK-092-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	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. Successful completion of the courses of modules 11-P-E and 11-P-MP1 is a prerequisite for participation in module 11-P-GK.
Contents		
<p>This module focuses on important concepts and applications that constitute interconnections between the sub-disciplines of Physics (and partly other Natural Sciences). When it comes to concepts, these interconnections are structural, they are elements of the physical terminology and belong to the mental structure of the subject. Applied Physics: synergetic interconnections between elements of knowledge of the corresponding subdiscipline and beyond which are necessary for the solution of many important problems. On both levels, the specific contents and the resulting interconnections have the same significance. Structures and concepts: Dimensional analysis, scaling, similitude theory; fields; interactions; symmetries and conserved quantities, wave equation, waves; multipoles among other mode analysis; non-linear dynamics, self-organisation, deterministic chaos; analogies of transport phenomena; Virial theorem as a structural element; microscopic modelling of macroscopic phenomena; scattering and structure determination; aspects of the history of ideas of important concepts and their controversies (e.g. atomism, determinism); Applied and Technical Physics: Physics and information/communication technology; rules and process technology, sensors; medical technology; climate and weather; Biophysics; ecology; energy; celestial mechanics, satellites, GPS; measuring devices; el. light sources; displays</p>		
Intended learning outcomes		
<p>Their understanding of important shared concepts enables the students to connect different subdisciplines of Physics, they know the similarities and differences of different usage contexts and therefore have in-depth knowledge of these concepts and are able to mathematically describe and process relevant problems on the level of Theoretical Physics; they understand complex systems of nature and engineering and are able to connect their own physical knowledge in a synergetic manner by analysing the solutions to selected, complex problems, they are able to explain the interactions of knowledge of different disciplines for the solution of complex problems on the basis of selected examples.</p>		
Courses (type, number of weekly contact hours, language — if other than German)		
V + Ü (no information on SWS (weekly contact hours) and course language available)		
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)		
a) written examination (approx. 90 minutes; usually chosen) or b) oral examination of one candidate each or oral examination in groups (approx. 20 minutes per candidate)		
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)
§ 77 (1) 1. b) Physik "Fortgeschrittene Experimentalphysik"
Module appears in
First state examination for the teaching degree Gymnasium Physics (2009)

Module title		Abbreviation
Modern Physics 1		11-P-MP1-092-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	Prior completion of module 11-P-E is recommended. 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		
Fundamental experiments: Atoms: Specification of atomic values, masses and energies, Rutherford scattering; photons: Radiation laws, photoelectric effect, Compton effect; electrons: Elementary charge, e/m determination, interference experiments, matter wave, Schrödinger equation, uncertainty relation, simple quantum mechanical systems, questions of interpretation, recent experiments; quantum mechanics of hydrogen atoms, magnetic moment and spin, atomic structure, Periodic Table of the Elements		
Intended learning outcomes		
The students gain insights into the basic differences between classical and quantum physical description, they have consolidated and structured knowledge of the mentioned contents; they have knowledge of the relevant central thoughts and key experiments and of measuring methods and scales of central values and are able to apply and process relevant problems.		
Courses (type, number of weekly contact hours, language — if other than German)		
V + Ü (no information on SWS (weekly contact hours) and course language available)		
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)		
a) written examination (approx. 120 minutes; usually chosen) or b) oral examination of one candidate each or c) oral examination in groups (approx. 30 minutes per candidate)		
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)		
§ 53 (1) 1. a) Physik Mechanik, Wärmelehre, Elektrizitätslehre, Optik, der speziellen Relativitätstheorie § 53 (1) 1. b) Physik Aufbau der Materie § 77 (1) 1. c) Physik "Theoretische Physik"		
Module appears in		

First state examination for the teaching degree Grundschule Physics (2009)
First state examination for the teaching degree Hauptschule Physics (2009)
First state examination for the teaching degree Realschule Physics (2009)
First state examination for the teaching degree Gymnasium Physics (2009)
First state examination for the teaching degree Mittelschule Physics (2013)

Module title		Abbreviation
Modern Physics 2		11-P-MP2-092-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	Prior successful completion of modules 11-P-E and 11-P-MP1 is recommended. 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		
Mechanical, dielectric and magnetic properties of molecules, rotational, vibrational and electronic excitation of molecules, measuring methods, structure of solids, scattering methods, lattice vibrations, thermal properties of insulators.		
Intended learning outcomes		
Understanding of the structure of molecules and chemical bonding, knowledge of experimental methods for the examination of molecules, understanding of the structure of crystalline solids, their modelling as translation-invariant lattices and the consequences.		
Courses (type, number of weekly contact hours, language — if other than German)		
V + Ü (no information on SWS (weekly contact hours) and course language available)		
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)		
a) written examination (approx. 90 minutes; usually chosen) or b) oral examination of one candidate each or oral examination in groups (approx. 20 minutes per candidate)		
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)		
§ 77 (1) 1. b) Physik "Fortgeschrittene Experimentalphysik"		
Module appears in		
First state examination for the teaching degree Gymnasium Physics (2009)		

Module title		Abbreviation
Modern Physics 3		11-P-MP3-092-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)
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		
Nuclear Physics: experimental methods, detectors, structure of the atomic nucleus, radioactivity, nuclear fission, technical and medical applications, radiation protection. Elementary Particle Physics: Particle accelerator, classification of elementary particles, fundamental interactions. Astrophysics: Stellar development, structure of the Sun, cosmology.		
Intended learning outcomes		
The students have structured knowledge of the aforementioned terms; they know relevant key concepts and experiments as well as measuring methods and dimensions of central values; they are able to work on simple relevant problems in a quantitative manner.		
Courses (type, number of weekly contact hours, language — if other than German)		
V + Ü (no information on SWS (weekly contact hours) and course language available)		
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)		
a) written examination (approx. 90 minutes; usually chosen) or b) oral examination of one candidate each or oral examination in groups (approx. 20 minutes per candidate)		
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)		
§ 77 (1) 1. b) Physik "Fortgeschrittene Experimentalphysik"		
Module appears in		
First state examination for the teaching degree Gymnasium Physics (2009)		

Module title		Abbreviation
Lab Course A		11-P-PA-112-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)
5	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	undergraduate	--
Contents		
Physical laws of mechanics, thermodynamics, science of electricity, 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		
The students know and have mastered physical measuring methods and experimenting techniques. They are able to independently plan and conduct experiments, to cooperate with others, and to document the results in a measuring protocol. They are able to evaluate the measuring results on the basis of error propagation and of the principles of statistics and to draw, present and discuss the conclusions.		
Courses (type, number of weekly contact hours, language — if other than German)		
Auswertung von Messungen und Fehlerrechnung (Measurements and Data Analysis): V (1 weekly contact hour) + Ü (1 weekly contact hour), once a year (winter semester) Beispiele aus Mechanik, Wärmelehre und Elektrik (Examples from Mechanics, Thermodynamics and Electricity, BAM): 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 is creditable for bonus)		
<p>This module has the following assessment components</p> <ol style="list-style-type: none"> Topics covered in lectures and exercises: written examination (approx. 120 minutes) 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). <p>Successful completion of approx. 50% of practice work is a prerequisite for admission to assessment component 1.</p> <p>To pass assessment component 2, students must pass both elements a) and b). Students will be offered one opportunity to retake element a) and/or element b).</p> <p>Students must register for assessment components 1 and 2 online (details to be announced).</p> <p>Students must attend Auswertung von Messungen und Fehlerrechnung (Measurements and Data Analysis) before attending Beispiele aus Mechanik, Wärmelehre und Elektrik (Examples from Mechanics, Thermodynamics and Electricity).</p> <p>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)

§ 53 (1) 1. a) Physik Mechanik, Wärmelehre, Elektrizitätslehre, Optik, der speziellen Relativitätstheorie
 § 53 (1) 1. c) Physik physikalische Grundpraktika
 § 77 (1) 1. a) Physik "Grundlagen der Experimentalphysik"
 § 77 (1) 1. d) Physik "physikalische Praktika"

Module appears in

Bachelor' degree (1 major) Mathematics (2012)
 Bachelor' degree (1 major) Mathematics (2013)
 Bachelor' degree (1 major) Physics (2012)
 Bachelor' degree (1 major) Nanostructure Technology (2012)
 Bachelor' degree (1 major) Mathematical Physics (2012)
 Bachelor' degree (1 major) Computational Mathematics (2012)
 Bachelor' degree (1 major) Computational Mathematics (2013)
 First state examination for the teaching degree Grundschule Physics (2009)
 First state examination for the teaching degree Hauptschule Physics (2009)
 First state examination for the teaching degree Realschule Physics (2009)
 First state examination for the teaching degree Gymnasium Physics (2009)
 First state examination for the teaching degree Mittelschule Physics (2013)

Module title		Abbreviation
Lab Course B		11-P-PB-L-092-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	11-P-PA
Duration	Module level	Other prerequisites
1 semester	undergraduate	--
Contents		
Physical laws of the science of electricity, circuits with electrical components and Atomic and Nuclear Physics.		
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)		
Elektrizitätslehre und Schaltungen (Electricity and Circuits, ELS): P (2 weekly contact hours) Atom- und Kernphysik (Atomic and Nuclear Physics, AKP): 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 is creditable for bonus)		
<p>This module has the following assessment components</p> <ol style="list-style-type: none"> 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). <p>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).</p> <p>Students must attend Elektrizitätslehre und Schaltungen (Electricity and Circuits) courses before attending Atom- und Kernphysik (Atomic and Nuclear Physics) courses.</p> <p>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)		
§ 53 (1) 1. a) Physik Mechanik, Wärmelehre, Elektrizitätslehre, Optik, der speziellen Relativitätstheorie § 53 (1) 1. b) Physik Aufbau der Materie § 53 (1) 1. c) Physik physikalische Grundpraktika § 77 (1) 1. b) Physik "Fortgeschrittene Experimentalphysik" § 77 (1) 1. d) Physik "physikalische Praktika"		

Module appears in

First state examination for the teaching degree Grundschule Physics (2009)
First state examination for the teaching degree Hauptschule Physics (2009)
First state examination for the teaching degree Realschule Physics (2009)
First state examination for the teaching degree Gymnasium Physics (2009)
First state examination for the teaching degree Mittelschule Physics (2013)

Module title		Abbreviation
Practice in Student Lab		11-P-LLL-092-m01
Module coordinator		Module offered by
holder of the Chair of Physics and its Didactics		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	Modules 11-P-E, 11-P-FD1, 11-P-DP1 are recommended.
Contents		
The module gives an overview of applicable physical experiments that provide an introduction to science and can be performed in teaching-learning-laboratories (M!ND center). In these experiments, different working methods are employed.		
Intended learning outcomes		
The students know how to prepare and follow-up a visit in a teaching-learning-laboratory (M!ND-Center) and have gained an overview of current didactic research topics and further possibilities for development in the field of subject-didactic research. They are able to evaluate and assess the (affective) learning achievements of pupils, to hold scientific-propaedeutic classes, to positively influence the motivation of pupils in the subject of Physics and to raise their interest for current physical research questions. The students are able to select, set up or build pupils experiments in a target-oriented manner, and to supervise pupils while experimenting.		
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 is creditable for bonus)		
a) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes, unless different length and mode of oral examination of one candidate each or oral examination in groups stated) or b) term paper (approx. 6 to 12 pages, time to complete: 1 to 4 weeks)		
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)		
§ 53 (1) 1. a) Physik Mechanik, Wärmelehre, Elektrizitätslehre, Optik, der speziellen Relativitätstheorie § 53 (1) 1. c) Physik physikalische Grundpraktika § 77 (1) 1. d) Physik "physikalische Praktika"		
Module appears in		
First state examination for the teaching degree Grundschule Physics (2009) First state examination for the teaching degree Hauptschule Physics (2009) First state examination for the teaching degree Realschule Physics (2009) First state examination for the teaching degree Gymnasium Physics (2009) First state examination for the teaching degree Mittelschule Physics (2013)		

Module title		Abbreviation
Theoretical Physics 1 (Teaching Post)		11-P-TP1-092-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)
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		
Classical mechanics and quantum mechanics		
Intended learning outcomes		
Basic concepts, methods and mindsets of Theoretical Physics, working strategies and ways of thinking of Theoretical Physics, knowledge of the specific role of theory in 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 is creditable for bonus)		
a) written examination (approx. 120 minutes; usually chosen) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate)		
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)		
§ 77 (1) 1. c) Physik "Theoretische Physik"		
Module appears in		
First state examination for the teaching degree Gymnasium Physics (2009)		

Module title		Abbreviation
Theoretical Physics 2		11-P-TP2-092-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)
7	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		
Electrodynamics, thermodynamics and Statistical Physics.		
Intended learning outcomes		
Basic concepts, methods and mindsets of Theoretical Physics, working strategies and ways of thinking of Theoretical Physics, knowledge of the specific role of theory in 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 is creditable for bonus)		
a) written examination (approx. 120 minutes; usually chosen) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate)		
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)		
§ 77 (1) 1. c) Physik "Theoretische Physik"		
Module appears in		
First state examination for the teaching degree Gymnasium Physics (2009)		

Teaching

(10 ECTS credits)

Module title		Abbreviation
Teaching 1		11-P-FD1-092-m01
Module coordinator		Module offered by
holder of the Chair of Physics and its Didactics		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	Prior completion of module 11-P-E recommended.
Contents		
Student preconceptions and typical learning difficulties in school physics, corresponding teaching methods and techniques to change student preconceptions; epistemological and working methods of physics. Justification/legitimation of physics education, educational goals of physics, qualification models and educational standards: elementarisation and didactic reconstruction of physical contents, methods of physics education, media in physics education and their application to support learning.		
Intended learning outcomes		
In-depth understanding of school-relevant areas of Physics; knowledge of typical student preconceptions and learning difficulties; knowledge of how to change student preconceptions; knowledge of alternative teaching approaches for selected topics; knowledge of epistemological methods of Physics; knowledge of the legitimation and goals of the school subject Physics; knowledge of elementarising and teaching methods; knowledge of physical teaching and working tools.		
Courses (type, number of weekly contact hours, language — if other than German)		
Einführung Fachdidaktik 1 (Introduction to Didactics 1): S (2 weekly contact hours), once a year (summer semester) Einführung Fachdidaktik 2 (Introduction to Didactics 2): V (1 weekly contact hour) + 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 is creditable for bonus)		
<p>This module has the following assessment components</p> <ol style="list-style-type: none"> 1. Seminar (Einführung Fachdidaktik 1/Introduction to Didactics 1): term paper (approx. 8 pages) or presentation (approx. 30 minutes) or oral examination of one candidate each (approx. 10 minutes) or oral examination in groups (approx. 20 minutes, groups of 2 candidates). 2. Topics covered in lectures and exercises (Einführung Fachdidaktik 2/Introduction to Didactics 2): written examination (approx. 45 minutes) or term paper (approx. 8 pages) or presentation (approx. 30 minutes) or oral examination of one candidate each (approx. 10 minutes) or oral examination in groups (approx. 20 minutes, groups of 2 candidates). <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		
Important information on number and allocation of places: There is a restricted number of places. Should the number of applications exceed the number of available places, places will be allocated as follows: Places will be allocated according to the number of subject semesters/ECTS credits (1st: studying in 3rd subject semester or higher, 2nd: has achieved a minimum of 50 ECTS credits, and 3rd: highest number of subject semesters if studying in 1st or 2nd subject semester). Among applicants with the same number of subject semesters/ECTS credits, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.		

Workload
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Teaching cycle
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Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 36 (1) 7. Didaktik der Grundschule Physik § 38 (1) 1. Didaktik der Hauptschule Physik § 38 (1) 1. Didaktik der Mittelschule Physik § 53 (1) 2. Physik Fachdidaktik § 77 (1) 1. a) Physik "Grundlagen der Experimentalphysik" § 77 (1) 2. Physik Fachdidaktik
Module appears in
First state examination for the teaching degree Grundschule Physics (2009) First state examination for the teaching degree Hauptschule Physics (2009) First state examination for the teaching degree Realschule Physics (2009) First state examination for the teaching degree Gymnasium Physics (2009) First state examination for the teaching degree Mittelschule Physics (2013)

Module title		Abbreviation
Teaching Concepts Consolidating Seminar		11-P-FD2-092-m01
Module coordinator		Module offered by
holder of the Chair of Physics and its Didactics		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	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		
Different topics of current subject-didactic research; examples: Interest and physics education, girls in physics education, evaluation, task culture, interdisciplinary classes, language in physics education, effects of subject media and their application for learning support, especially regarding computers, epistemological and working methods, new teaching methods.		
Intended learning outcomes		
Knowledge of selected methods of didactic physical research, evaluation of didactic physical research projects, knowledge of didactic physical literature. Ability to critically evaluate Physics classes in view of different aspects and to discuss different prioritisations and approaches.		
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 is creditable for bonus)		
a) written examination (approx. 45 minutes) or b) term paper (approx. 8 pages, time to complete: 1 to 4 weeks) or c) presentation/seminar presentation (approx. 30 minutes) or d) oral examination of one candidate each (approx. 10 minutes) or oral examination in groups (approx. 20 minutes, groups of 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)		
§ 77 (1) 2. Physik Fachdidaktik		
Module appears in		
First state examination for the teaching degree Gymnasium Physics (2009)		

Module title		Abbreviation
Student Lab Supervision (Physics)		11-P-FD-LLL-092-m01
Module coordinator		Module offered by
holder of the Chair of Physics and its Didactics		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	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		
The module gives an overview of applicable physical experiments that provide an introduction to science and can be performed in teaching-learning-laboratories (M!ND center). In these experiments, different working methods are employed.tz.		
Intended learning outcomes		
The students know how to prepare and follow-up a visit in a teaching-learning-laboratory (M!ND-Center) and have gained an overview of current didactic research topics and further possibilities for development in the field of subject-didactic research. They are able to evaluate and assess the (affective) learning achievements of pupils, to hold scientific-propaedeutic classes, to positively influence the motivation of pupils in the subject of Physics and to raise their interest for current physical research questions. The students are able to select, set up or build pupils experiments in a target-oriented manner, and to supervise pupils while experimenting.		
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 is creditable for bonus)		
a) written examination (approx. 45 minutes) or b) term paper (approx. 8 pages, time to complete: 1 to 4 weeks) or c) oral examination of one candidate each (approx. 10 minutes) or oral examination in groups (approx. 20 minutes, groups of 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)		
§ 53 (1) 2. Physik Fachdidaktik § 77 (1) 2. Physik Fachdidaktik		
Module appears in		

First state examination for the teaching degree Grundschule Physics (2009)
 First state examination for the teaching degree Hauptschule Physics (2009)
 First state examination for the teaching degree Realschule Physics (2009)
 First state examination for the teaching degree Gymnasium Physics (2009)
 First state examination for the teaching degree Mittelschule Physics (2013)

Freier Bereich (general as well as subject-specific electives)

(ECTS credits)

Teaching degree students must take modules worth a total of 15 ECTS credits in the area Freier Bereich (general as well as subject-specific electives) (Section 9 LASPO (general academic and examination regulations for teaching-degree programmes)). To achieve the required number of ECTS credits, students may take any modules from the areas below.

Freier Bereich -- interdisciplinary: The interdisciplinary additional offer for a teaching degree can be found in the respective Annex "Ergänzende Bestimmungen für den "Freien Bereich" im Rahmen des Studiums für ein Lehramt".

Physics

(ECTS credits)

(Freier Bereich (general as well as subject-specific electives) -- subject specific)

Module title		Abbreviation
W- and P-Courses in Secondary Classes of Gymnasium (Physics)		11-FD-WP-092-m01
Module coordinator		Module offered by
holder of the Professorship of Experimental Physics at the chair of Physics and its Didactics		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		
Contents and organisation of W- and P-seminars, sitting in on classes in a Gymnasium, career counselling and project management in a P-seminar, supervision of seminar papers and introduction to scientific working in a W-seminar, development of a W- and P-seminar.		
Intended learning outcomes		
The students are able to autonomously plan and conduct W and P seminars for Oberstufe of Gymnasium.		
Courses (type, number of weekly contact hours, language — if other than German)		
S + P (no information on SWS (weekly contact hours) and course language available)		
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)		
a) written elaboration (approx. 10 to 15 pages) or b) presentation/seminar presentation (approx. 30 minutes) or c) sitting in on classes at a Gymnasium (approx. 3 hours) Language of assessment: German, English		
Allocation of places		
Number of places: 16. Places will be allocated according to the number of subject semesters/ECTS credits (1st: studying in 3rd subject semester or higher, 2nd: has achieved a minimum of 50 ECTS credits, and 3rd: highest number of subject semesters if studying in 1st or 2nd subject semester). Among applicants with the same number of subject semesters/ECTS credits, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.		
Additional information		
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Workload		
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Teaching cycle		
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Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
First state examination for the teaching degree Gymnasium Physics (2009)		

Module title		Abbreviation
Teaching Seminar Fundamental Principles		11-P-EL-092-m01
Module coordinator		Module offered by
holder of the Chair of Physics and its Didactics		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	Prior completion of module 11-P-E is recommended. 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		
Physical and interdisciplinary aspects of selected topics of physics education, corresponding student preconceptions and typical learning difficulties, elementarisation and didactic reconstruction of physical contents based on specific contents of physics education, verbalisation of physical contents, possible teaching methods, typical school experiments and suitable media.		
Intended learning outcomes		
Advanced, qualitative knowledge of school-relevant areas of Physics; knowledge of common methods, typical student preconceptions and special media on relevant topics; awareness of the differences between teaching Physics at university and school regarding contents and methods.		
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 is creditable for bonus)		
a) term paper (approx. 8 pages, time to complete: 1 to 4 weeks) or b) presentation/seminar presentation (approx. 45 minutes) or c) written examination (approx. 45 minutes) or d) oral examination of one candidate each (approx. 15 minutes) or e) oral examination in groups (groups of 2, 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)		
§ 53 (1) 2. Physik Fachdidaktik		
Module appears in		
First state examination for the teaching degree Grundschule Physics (2009) First state examination for the teaching degree Hauptschule Physics (2009) First state examination for the teaching degree Realschule Physics (2009)		
LA Gymnasien Physics (2009)	JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Lehramt Gymnasien Physik - 2009	page 34 / 44

First state examination for the teaching degree Gymnasium Physics (2009)
First state examination for the teaching degree Mittelschule Physics (2013)

Module title		Abbreviation
Preparatory Course Mathematics		11-P-VKM-092-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	(not) successfully completed	--
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		
Principles of mathematics and elementary calculation methods from school and partially beyond, especially for the introduction to and preparation of the modules of Experimental and Theoretical Physics. 1. Basic geometry and algebra 2. Coordinate systems and complex numbers 3. Vectors - vectored values 4. Differential calculus 5. Integral calculus		
Intended learning outcomes		
The students know the principles of mathematics and elementary calculation methods which are required for successfully studying Theoretical and Experimental Physics.		
Courses (type, number of weekly contact hours, language — if other than German)		
T (no information on SWS (weekly contact hours) and course language available)		
Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)		
discussion and exercises (approx. 15 minutes) Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.		
Allocation of places		
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Additional information		
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Workload		
--		
Teaching cycle		
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Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
Bachelor' degree (1 major) Physics (2010) Bachelor' degree (1 major) Physics (2012)		
LA Gymnasien Physics (2009)	JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Lehramt Gymnasien Physik - 2009	page 36 / 44

Bachelor' degree (1 major) Nanostructure Technology (2012)
 First state examination for the teaching degree Grundschule Physics (2009)
 First state examination for the teaching degree Hauptschule Physics (2009)
 First state examination for the teaching degree Realschule Physics (2009)
 First state examination for the teaching degree Gymnasium Physics (2009)
 First state examination for the teaching degree Mittelschule Physics (2013)
 No final examination Special study offering (2010)

Module title		Abbreviation
Student Lab Supervision (Physics)		11-P-FB-LLL-121-m01
Module coordinator		Module offered by
holder of the Chair of Physics and its Didactics		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	This module can be chosen by students studying at least one subject in the natural sciences.
Contents		
The module provides an introduction to successful supervision of pupils independently carrying out experiments in the teaching-learning-laboratory.		
Intended learning outcomes		
The students learn to classify different groups of pupils according to their subject-specific and experimental level of performance, to support the pupils according to their needs and age and to help them during independent experimenting (supervision competencies in open classroom situations). The students are able to methodically and critically evaluate their own actions. A lecturer gives individual feedback to the students to avoid negative behaviour patterns and to support the students' strengths. The students develop professional behaviour patterns by repeatedly working on the same topic with different groups of pupils (reflection competencies and self-control competencies).		
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 is creditable for bonus)		
a) written examination (approx. 45 minutes) or b) term paper (approx. 8 pages, time to complete: 1 to 4 weeks) or c) examination of one candidate each (approx. 10 minutes) or d) examination in groups (approx. 20 minutes, groups of 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		
First state examination for the teaching degree Grundschule Physics (2009) First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2009) First state examination for the teaching degree Hauptschule Physics (2009) First state examination for the teaching degree Hauptschule Didactics in Physics (Secondary School) (2009) First state examination for the teaching degree Realschule Physics (2009) First state examination for the teaching degree Gymnasium Physics (2009) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Secondary School) (2009) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2013) First state examination for the teaching degree Mittelschule Physics (2013)		
LA Gymnasien Physics (2009)	JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Lehramt Gymnasien Physik - 2009	page 38 / 44

First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2013)

Module title		Abbreviation
Low Cost - High Impact. Low-Budget Experiments for Science Courses (Physics)		11-MIND-Ph1-121-m01
Module coordinator		Module offered by
holder of the Chair of Physics and its Didactics		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	This module can be chosen by students studying at least one subject in the natural sciences.
Contents		
Conception and realisation of experimental stations with ordinary and inexpensive consumables for classes of Grundschule and secondary level I.		
Intended learning outcomes		
The students develop simple scientific experimenting stations to use for the transition from primary to secondary level I for small groups from different types of schools. In doing so, they learn to simplify and convey scientific contents relevant to the curriculum in due consideration of the target group.		
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 is creditable for bonus)		
a) written examination (approx. 45 minutes) or b) term paper (approx. 8 pages, time to complete: 1 to 4 weeks) or c) examination of one candidate each (approx. 10 minutes) or d) examination in groups (approx. 20 minutes, groups of 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		
First state examination for the teaching degree Grundschule Physics (2009) First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2009) First state examination for the teaching degree Hauptschule Physics (2009) First state examination for the teaching degree Hauptschule Didactics in Physics (Secondary School) (2009) First state examination for the teaching degree Realschule Physics (2009) First state examination for the teaching degree Gymnasium Physics (2009) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Secondary School) (2009) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2013) First state examination for the teaching degree Mittelschule Physics (2013) First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2013)		

Module title		Abbreviation
Teaching Science with Hands-on-Exhibits (Physics)		11-MIND-Ph2-121-m01
Module coordinator		Module offered by
holder of the Chair of Physics and its Didactics		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	This module can be chosen by students studying at least one subject in the natural sciences.
Contents		
Designing and creating hands-on exhibits for STEM subjects.		
Intended learning outcomes		
The students evaluate the advantages and disadvantages of the hands-on approach for teaching scientific contents in and out of school. They plan and implement an interdisciplinary science exhibition as an example of project-oriented work with pupils of secondary level I and II.		
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 is creditable for bonus)		
a) written examination (approx. 45 minutes) or b) term paper (approx. 8 pages, time to complete: 1 to 4 weeks) or c) examination of one candidate each (approx. 10 minutes) or d) examination in groups (approx. 20 minutes, groups of 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		
First state examination for the teaching degree Grundschule Physics (2009) First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2009) First state examination for the teaching degree Hauptschule Physics (2009) First state examination for the teaching degree Hauptschule Didactics in Physics (Secondary School) (2009) First state examination for the teaching degree Realschule Physics (2009) First state examination for the teaching degree Gymnasium Physics (2009) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Secondary School) (2009) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2013) First state examination for the teaching degree Mittelschule Physics (2013) First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2013)		

Module title		Abbreviation
Radiation Safety and Protection		03-98-FSQ-STRA-092-m01
Module coordinator		Module offered by
radiation protection commissioner of the University of Würzburg		Faculty of Medicine
ECTS	Method of grading	Only after succ. compl. of module(s)
2	(not) successfully completed	--
Duration	Module level	Other prerequisites
1 semester	undergraduate	--
Contents		
Course to acquire radiation protection qualification in accordance with the <i>Strahlenschutzverordnung</i> (Radiation Protection Ordinance, StrlSchV).		
Intended learning outcomes		
Acquisition of formal expertise for handling open and sealed radioactive substances in accordance with the <i>Strahlenschutzverordnung</i> (Radiation Protection Ordinance, StrlSchV).		
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 is creditable for bonus)		
2 written examinations (30 to 60 minutes each)		
Allocation of places		
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Additional information		
Additional information on module duration: Courses will usually be offered in the form of a block course with two block sessions.		
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) Biomedicine (2009) Bachelor' degree (1 major) Biomedicine (2013) First state examination for the teaching degree Gymnasien Physik (2009)		

Thesis

(10 ECTS credits)

Preparation of a written Hausarbeit (thesis) in accordance with the provisions of Section 29 LPO I (examination regulations for teaching-degree programmes) is a prerequisite for teaching degree students to be admitted to the Erste Staatsprüfung (First State Examination). In accordance with the provisions of Section 29 LPO I, students studying for a teaching degree Gymnasium may write this thesis in one of the subjects they selected as vertieft studiertes Fach (subject studied with a focus on the scientific discipline) or in the subject Erziehungswissenschaften (Educational Science). Pursuant to Section 29 Subsection 1 Sentence 2 LPO I, students may also choose to write an interdisciplinary thesis.

Module title		Abbreviation
Thesis in Physics Grammar School		11-P-HAGY-092-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	Where applicable, specific modules/module components as specified by supervisor.
Duration	Module level	Other prerequisites
1 semester	undergraduate	--
Contents		
Independent processing of a topic of Physics and/or Didactics of Physics, chosen in consultation with a lecturer.		
Intended learning outcomes		
The students are able to independently work on a predetermined physical topic while applying the knowledge and methods acquired in the teaching degree programme. They are able to present their results in written form in due consideration of didactic aspects.		
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 is creditable for bonus)		
written thesis (approx. 40 pages) Language of assessment: German, exceptions in accordance with Section 29 Subsection 4 LPO I (examination regulations for teaching degree programmes)		
Allocation of places		
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Additional information		
Additional information on module duration: 1 to 2 semesters.		
Workload		
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Teaching cycle		
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Referred to in LPO I (examination regulations for teaching-degree programmes)		
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Module appears in		
First state examination for the teaching degree Gymnasium Physics (2009)		