Julius-Maximilians-
UNIVERSITÄT
WÜRZBURG

Module Catalogue

for the Subject

Didactics in Physics (Middle School)

as Didaktikfach

with the degree "Erste Staatsprüfung für das Lehramt an Mittelschulen"

Examination regulations version: 2018
Responsible: Faculty of Physics and Astronomy

Contents

The subject is divided into

Learning Outcomes

German contents and learning outcome available but not translated yet.

Wissenschaftliche Befähigung

- Die Absolventinnen und Absolventen verstehen die Grundlagen der Physik und können diese anwenden.
- Die Absolventinnen und Absolventen können unter Anleitung Experimente durchführen, analysieren und die erhaltenen Ergebnisse darstellen und bewerten.
- Die Absolventinnen und Absolventen besitzen ein grundlegendes Abstraktionsvermögen und die Fähigkeit, komplexe Zusammenhänge zu strukturieren.

Befähigung zur Aufnahme einer Erwerbstätigkeit

- Die Absolventinnen und Absolventen können fachliche Inhalte und ihre Erkenntnisse didaktisch aufbereiten und adressatengerecht vermitteln.
- Die Absolventinnen und Absolventen kennen Konzepte, Prinzipien, Methoden und evidenzbasierte Erkenntnisse aus dem Bereich der Physikdidaktik und können diese zur ziel- und adressatengerechten Ausgestaltung von Lehr/Lern-Settings anwenden.
- Die Absolventinnen und Absolventen können den Einsatz von Experimenten und Medien im Physikunterricht und die Betreuung von Schülerinnen und Schülern an ausgewählten Lehr-Lernsituationen wissenschaftlich fundiert reflektieren.

Persönlichkeitsentwicklung

- Die Absolventinnen und Absolventen kennen die Regeln guter wissenschaftlicher Praxis und beachten sie.
- Die Absolventinnen und Absolventen können ihr Wissen und ihre Erkenntnisse in einer Lehrsituation angemessen und selbstbewusst darstellen.
- Die Absolventinnen und Absolventen besitzen die Fähigkeit didaktisches Wirken in einer Lehr-/Lernsituation angemessen zu reflektieren und passende Schlussfolgerungen zu ziehen.

Befähigung zum gesellschaftlichen Engagement

- Die Absolventinnen und Absolventen haben ihr Wissen bezüglich wirtschaftlicher, gesellschaftlicher, naturwissenschaftlicher, kultureller etc. Fragestellungen erweitert (z.B im Hinblick auf Bildung für nachhaltige Entwicklung) und können begründet Position beziehen.
- Die Absolventinnen und Absolventen entwickeln die Bereitschaft und Fähigkeit, ihre Kompetenzen in partizipative Prozesse einzubringen und aktiv an Entscheidungen mitzuwirken.

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:

LASPO2015

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

11-Jul-2018 (2018-47)

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

Compulsory Courses

(20 ECTS credits)

Successful completion of modules worth 20 ECTS credits in each subject selected as Didaktikfach (subject studied with a focus on teaching methodology) is a prerequisite for admission to the Erste Staatsprüfung (First State Examination) in the subject Didaktiken einer Fächergruppe der Mittelschule (Didactics of a Group of Subjects of Mittelschule).

Module title	Abbreviation
Physics Teaching Concepts	11-L-PD-172-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
2 semester	undergraduate	--

Contents

Teaching of basic concepts of physics education and didactic consolidation of subject-relevant scientific content of the degree programme. Justification/legitimation of physics teaching; educational objectives of physics as a subject; competence models and educational standards; elementarisation and didactic reconstruction of physics content; methods and media in physics lessons and their use to promote learning; student perceptions and typical learning difficulties in the subject areas of physics relevant to teaching and teaching concepts based on these; dealing with student perceptions; teaching approaches to the structure and cognitive/working methods of the science of physics, including historical development;

Intended learning outcomes

Students are familiar with central physics teaching concepts to design target group-orientated physics lessons. They clearly differentiate didactic aspects of physics lessons from scientific and educational aspects. They are familiar with subject-specific student conceptions and their significance for the students' learning process. They critically discuss specific teaching concepts against this background.

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

V (2) + V (2) + Ü (1)

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

a) written examination (approx. 60 minutes) or
b) oral examination of one candidate each (approx. 15 minutes) or
c) oral examination in groups (groups of 2, approx. 15 minutes per candidate) or
d) term paper (approx. 8 pages)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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

§ 36 I Nr. 7
§ 38 I Nr. 1
§ 53 I Nr. 2
§ 77 I Nr. 2

Module appears in

First state examination for the teaching degree Grundschule Physics (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
First state examination for the teaching degree Realschule Physics (2018)

First state examination for the teaching degree Gymnasium Physics (2018)
First state examination for the teaching degree Mittelschule Physics (2018)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2020)
First state examination for the teaching degree Grundschule Physics (2020)
First state examination for the teaching degree Gymnasium Physics (2020)
First state examination for the teaching degree Realschule Physics (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)

Module title			Abbreviation
Physics 1 for Primary and Secondary General School			11-L-SP1-152-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

Physical contents (mechanics, thermodynamics) relevant to classes in Natural Sciences or technical-natural sciences in Grund- and Hauptschule.

Intended learning outcomes

Qualitative knowledge of the physical principles of school-relevant contents of scientific or technical-scientific classes in Grund- and Hauptschule; knowledge of typical approaches to the implementation and evaluation of demonstration and pupils experiments.

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

V (3) + Ü (1)

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

a) written examination (approx. 90 minutes) or
b) oral examination of one candidate each (approx. 15 minutes) or
c) oral examination in groups (groups of 2, approx. 15 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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

§ 36 I Nr. 7
§ 38 I Nr. 1

Module appears in

First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)

Module title			Abbreviation
Physics 2 for Primary and Secondary General School			11-L-SP2-152-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

Physical contents (science of electricity, electronics) relevant to classes in Natural Sciences or technical-natural sciences in Grund- and Hauptschule.

Intended learning outcomes

Qualitative knowledge of the physical principles of school-relevant contents of scientific or technical-scientific classes in Grund- and Hauptschule; knowledge of typical approaches to the implementation and evaluation of demonstration and pupils experiments.

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

V (3) + Ü (1)

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

a) written examination (approx. 90 minutes) or
b) oral examination of one candidate each (approx. 15 minutes) or
c) oral examination in groups (groups of 2, approx. 15 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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

§ 36 I Nr. 7
§ 38 I Nr. 1

Module appears in

First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)

Module title			Abbreviation
Physics 3 for Primary and Secondary General School			11-L-SP3-152-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

Physical contents (optics, acoustics, Atomic and Nuclear Physics) relevant to classes in Natural Sciences or technical-natural sciences in Grund- and Hauptschule.

Intended learning outcomes

Qualitative knowledge of the physical principles of school-relevant contents of scientific or technical-scientific classes in Grund- and Hauptschule; knowledge of typical approaches to the implementation and evaluation of demonstration and pupils experiments.

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

V (3) + Ü (1)

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

a) written examination (approx. 90 minutes) or
b) oral examination of one candidate each (approx. 15 minutes) or
c) oral examination in groups (groups of 2, approx. 15 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

150 h

Teaching cycle

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

§ 36 I Nr. 7
§ 38 I Nr. 1

Module appears in

First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)

Extra Skills

(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
Astrophysics	11-AP-152-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

History of astronomy, coordinates and time measurement, the Solar System, exoplanets, astronomical scales, telescopes and detectors, stellar structure and atmospheres, stellar evolution and end stages, interstellar medium, molecular clouds, structure of the milky way, the local universe, the expanding universe, galaxies, active galactic nuclei, large-scale structures, cosmology.

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 are familiar with the physics and development of the main astrophysical objects such as stars and galaxies.

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

V (2) + R (2)
Module taught in: German or English

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

a) written examination (approx. 90 to 120 minutes) or
b) oral examination of one candidate each (approx. 30 minutes) or
c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or
d) project report (approx. 8 to 10 pages) or
e) presentation/talk (approx. 30 minutes)
If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

180 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

Bachelor's degree (1 major) Physics (2015)
Bachelor's degree (1 major) Mathematical Physics (2015)
Bachelor's degree (1 major) Aerospace Computer Science (2015)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015)
First state examination for the teaching degree Grundschule Physics (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Realschule Physics (2015)
First state examination for the teaching degree Gymnasium Physics (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Mittelschule Physics (2015)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015)
Bachelor's degree (1 major) Mathematical Physics (2016)
Master's degree (1 major) Nanostructure Technology (2016)
Bachelor's degree (1 major) Aerospace Computer Science (2017)
First state examination for the teaching degree Grundschule Physics (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
First state examination for the teaching degree Realschule Physics (2018)
First state examination for the teaching degree Gymnasium Physics (2018)
First state examination for the teaching degree Mittelschule Physics (2018)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018)
Master's degree (1 major) Nanostructure Technology (2020)
Bachelor's degree (1 major) Physics (2020)
Bachelor's degree (1 major) Mathematical Physics (2020)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020)
Bachelor's degree (1 major) Aerospace Computer Science (2020)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2020)
First state examination for the teaching degree Grundschule Physics (2020)
First state examination for the teaching degree Gymnasium Physics (2020)
First state examination for the teaching degree Realschule Physics (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)
Master's degree (1 major) Quantum Technology (2021)
exchange program Physics (2023)
Bachelor's degree (1 major) Mathematical Physics (2024)

Module title			Abbreviation
Preparatory Course Mathematics			11-P-VKM-152-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	--	

Contents

Principles of mathematics and elementary calculation methods from school and partially beyond, especially for the introduction to and preparation for 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 (2)

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) exercises (successful completion of approx. 50% of approx. 6 exercise sheets) or
b) talk (approx. 15 minutes)
Assessment offered: Once a year, winter semester

Allocation of places

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Additional information

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Workload

60 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

Bachelor's degree (1 major) Physics (2015)
Bachelor's degree (1 major) Nanostructure Technology (2015)
Bachelor's degree (1 major) Mathematical Physics (2015)
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2015)
First state examination for the teaching degree Grundschule Physics (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Realschule Physics (2015)

First state examination for the teaching degree Gymnasium Physics (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Mittelschule Physics (2015)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015)
Bachelor's degree (1 major) Mathematical Physics (2016)
First state examination for the teaching degree Grundschule Physics (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
First state examination for the teaching degree Realschule Physics (2018)
First state examination for the teaching degree Gymnasium Physics (2018)
First state examination for the teaching degree Mittelschule Physics (2018)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018)

Module title			Abbreviation
Principles of Energy Technologies			11-ENT-152-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Applied Physics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
6	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

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

Intended learning outcomes

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

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

V (3) + R (1)
Module taught in: German or English

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

a) written examination (approx. 90 to 120 minutes) or
b) oral examination of one candidate each (approx. 30 minutes) or
c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or
d) project report (approx. 8 to 10 pages) or
e) presentation/talk (approx. 30 minutes)
If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.
Language of assessment: German and/or English
Assessment offered: Once a year, winter semester

Allocation of places

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Additional information

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Workload

180 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

Bachelor's degree (1 major) Physics (2015)
Bachelor's degree (1 major) Nanostructure Technology (2015)
First state examination for the teaching degree Grundschule Physics (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Realschule Physics (2015)
First state examination for the teaching degree Gymnasium Physics (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Mittelschule Physics (2015)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015)
Master's degree (1 major) Functional Materials (2016)
First state examination for the teaching degree Grundschule Physics (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
First state examination for the teaching degree Realschule Physics (2018)
First state examination for the teaching degree Gymnasium Physics (2018)
First state examination for the teaching degree Mittelschule Physics (2018)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018)
Bachelor's degree (1 major) Physics (2020)
Bachelor's degree (1 major) Nanostructure Technology (2020)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2020)
First state examination for the teaching degree Grundschule Physics (2020)
First state examination for the teaching degree Gymnasium Physics (2020)
First state examination for the teaching degree Realschule Physics (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)
Bachelor's degree (1 major) Quantum Technology (2021)
Master's degree (1 major) Functional Materials (2022)
exchange program Physics (2023)
Master's degree (1 major) Functional Materials (2025)

Module title			Abbreviation
Low Cost - High Impact. Low-budget Experiments for Science Courses (Physics)			11-MIND-Ph1-152-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	--	

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 (2)

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) oral examination of one candidate each (approx. 10 minutes) or
c) oral examination in groups (groups of 2, approx. 20 minutes) or
d) term paper (approx. 8 pages)

Allocation of places

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Additional information

This module is designed for students studying at least one subject in the natural sciences.

Workload

60 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

First state examination for the teaching degree Grundschule Physics (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Realschule Physics (2015)
First state examination for the teaching degree Gymnasium Physics (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Mittelschule Physics (2015)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Grundschule Physics (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
First state examination for the teaching degree Realschule Physics (2018)

First state examination for the teaching degree Gymnasium Physics (2018)
First state examination for the teaching degree Mittelschule Physics (2018)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2020)
First state examination for the teaching degree Grundschule Physics (2020)
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First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)

Module title			Abbreviation
Teaching Science with Hands-on-Exhibits (Physics)			11-MIND-Ph2-152-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	--	

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 (2)

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) oral examination of one candidate each (approx. 10 minutes) or
c) oral examination in groups (groups of 2, approx. 20 minutes) or
d) term paper (approx. 8 pages)

Allocation of places

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Additional information

This module is designed for students studying at least one subject in the natural sciences.

Workload

60 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

First state examination for the teaching degree Grundschule Physics (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Realschule Physics (2015)
First state examination for the teaching degree Gymnasium Physics (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Mittelschule Physics (2015)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Grundschule Physics (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
First state examination for the teaching degree Realschule Physics (2018)
First state examination for the teaching degree Gymnasium Physics (2018)

First state examination for the teaching degree Mittelschule Physics (2018)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2018)
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First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2020)
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First state examination for the teaching degree Gymnasium Physics (2020)
First state examination for the teaching degree Realschule Physics (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)

Module title			Abbreviation
Teaching Seminar Fundamental Principles			11-L-EL1-152-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)**	
3	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

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 (2)

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) or
b) 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. 15 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

90 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

First state examination for the teaching degree Grundschule Physics (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Realschule Physics (2015)
First state examination for the teaching degree Gymnasium Physics (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Mittelschule Physics (2015)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015)

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First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
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First state examination for the teaching degree Gymnasium Physics (2020)
First state examination for the teaching degree Realschule Physics (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)

Module title			Abbreviation
Selected Topics in Physics Didactics			11-L-EL2-152-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)**	
3	(not) successfully completed	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Current topics in physics education.

Intended learning outcomes

The students have knowledge of a current subdiscipline of physics education and are able to classify the acquired knowledge according to subject-specific contexts and implement it into classes.

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

S (2)

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) or
b) 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. 15 minutes per candidate)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

90 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

First state examination for the teaching degree Grundschule Physics (2015)
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First state examination for the teaching degree Gymnasium Physics (2015)
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First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
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First state examination for the teaching degree Gymnasium Physics (2020)
First state examination for the teaching degree Realschule Physics (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)

Module title			Abbreviation
Student Lab Supervision (Physics)			11-L-L3B-152-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	--

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)

P (2)

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) oral examination of one candidate each (approx. 10 minutes) or
c) oral examination in groups (groups of 2, approx. 10 minutes per candidate) or
d) term paper (approx. 8 pages)

Allocation of places

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Additional information

This module is designed for students studying at least one subject in the natural sciences.

Workload

60 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

First state examination for the teaching degree Grundschule Physics (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
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First state examination for the teaching degree Grundschule Physics (2018)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2018)
First state examination for the teaching degree Realschule Physics (2018)
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First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)

Module title			Abbreviation
Current Topics of Teaching Concepts in Physics			11-L-APD-152-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)**	
3	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	--	

Contents

Current topics in physics education.

Intended learning outcomes

The students have knowledge of a current subdiscipline of physics education and are able to classify the acquired knowledge according to subject-specific contexts and implement it into classes.

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

S (2)
Module taught in: German or English

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

a) written examination (approx. 45 minutes) or
b) oral examination of one candidate each (approx. 10 minutes) or
c) oral examination in groups (groups of 2, approx. 10 minutes per candidate) or
d) term paper (approx. 8 pages) or
e) talk (30 to 45 minutes) with discussion

Allocation of places

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Additional information

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Workload

90 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

First state examination for the teaching degree Grundschule Physics (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Realschule Physics (2015)
First state examination for the teaching degree Gymnasium Physics (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
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First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)

Module title			Abbreviation
Scientific Work in Teaching Concepts			11-L-WPD-152-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

Current topics in scientific work in physics education

Intended learning outcomes

The students have knowledge of a current subdiscipline of physics education and are able to process questions of physics education on the basis of scientific methods.

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

S (2)
Module taught in: German or English

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

talk (30 to 45 minutes)

Allocation of places

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Additional information

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Workload

90 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

First state examination for the teaching degree Grundschule Physics (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Realschule Physics (2015)
First state examination for the teaching degree Gymnasium Physics (2015)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)
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First state examination for the teaching degree Realschule Physics (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)

Module title			Abbreviation
Current Topics in Physics			11-LX6-152-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	Approval from examination committee required.	

Contents

Current topics in physics.

Intended learning outcomes

The students have knowledge of a current subdiscipline of Physics and understand the measuring and/or calculation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas.

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

V (3) + R (1)

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 to 120 minutes) or
b) oral examination of one candidate each (approx. 30 minutes) or
c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or
d) project report (approx. 8 to 10 pages) or
e) presentation/talk (approx. 30 minutes)
If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

180 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

First state examination for the teaching degree Grundschule Physics (2015)
First state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2015)
First state examination for the teaching degree Realschule Physics (2015)
First state examination for the teaching degree Gymnasium Physics (2015)
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First state examination for the teaching degree Mittelschule Physics (2015)

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First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)

Module title			Abbreviation
Selected Topics of Physics			11-LCS6-152-m01
Module coordinator		**Module offered by**	
chairperson of examination committee		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
4	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	undergraduate	Approval from examination committee required.	

Contents

Current topics in experimental physics. Credited academic achievements, e.g. in case of change of university or study abroad.

Intended learning outcomes

The students have advanced competencies corresponding to the requirements of a module of Experimental Physics of the Bachelor's programme. They have knowledge of a current subdiscipline of Experimental Physics and understand the measuring and/or evaluation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas.

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

V (2) + R (1)

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 to 120 minutes) or
b) oral examination of one candidate each (approx. 30 minutes) or
c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or
d) project report (approx. 8 to 10 pages) or
e) presentation/talk (approx. 30 minutes)
If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.
Language of assessment: German and/or English

Allocation of places

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Additional information

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Workload

120 h

Teaching cycle

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

§ 22 II Nr. 1 h)
§ 22 II Nr. 2 f)
§ 22 II Nr. 3 f)

Module appears in

First state examination for the teaching degree Grundschule Physics (2015)
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First state examination for the teaching degree Realschule Physics (2020)
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)
First state examination for the teaching degree Mittelschule Physics (2020)

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 Mittelschule may write this thesis in the subject Didaktik einer Fächergruppe der Mittelschule (Didactics of a Group of Subjects of Mittelschule), in the subject they selected as Unterrichtsfach (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 Secondary General School			11-L-HA-MS-DF-152-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**	
1-2 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 to module

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

Hausarbeit (thesis) pursuant to Section 29 LPO I (examination regulations for teaching-degree programmes) (approx. 40 pages)
Language of assessment: German; exceptions pursuant to Section 29 Subsection 4 LPO I (examination regulations for teaching-degree programmes)

Allocation of places

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Additional information

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Workload

300 h

Teaching cycle

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

§ 29

Module appears in

First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2015)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2018)
First state examination for the teaching degree Mittelschule Didactics in Physics (Middle School) (2020)