

# Subdivided Module Catalogue for the Subject

# Physics

as Unterrichtsfach with the degree "Erste Staatsprüfung für das Lehramt an Realschulen"

> Examination regulations version: 2015 Responsible: Faculty of Physics and Astronomy

JMU Würzburg • generated 18-Apr-2025 • exam. reg. data record L3|128|-|-|H|2015

### UNIVERSITÄT WÜRZBURG

# **Learning Outcomes**

German contents and learning outcome available but not translated yet.

## Wissenschaftliche Befähigung

- Die Absolventinnen und Absolventen verstehen die konzeptionellen und experimentellen 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 setzen die erlernten physikalischen Methoden und Konzepte unter Anleitung zur Erlangung neuer Erkenntnisse ein.
- Die Absolventinnen und Absolventen sind in der Lage, physikalische Probleme durch Anwendung der wissenschaftlichen Arbeitsweise und unter Beachtung der Regeln guter wissenschaftlicher Praxis (Dokumentation, Fehleranalyse) zu bearbeiten.
- Die Absolventinnen und Absolventen können ihr Wissen und ihre Erkenntnisse einem Fachpublikum gegenüber darstellen und vertreten.
- Die Absolventinnen und Absolventen können ein breites Grundlagenwissen aus den wichtigsten Teilgebieten der Physik abrufen.
- Die Absolventinnen und Absolventen verstehen die wesentlichen Zusammenhänge und Konzepte der einzelnen Teilgebiete der Physik.
- Die Absolventinnen und Absolventen sind in der Lage, sich mit Hilfe von Fachliteratur punktuell in neue Aufgabengebiete einzuarbeiten, physikalische und physikdidaktische Methoden unter Anleitung auf konkrete Aufgabenstellungen anzuwenden.
- Die Absolventinnen und Absolventen besitzen Abstraktionsvermögen und sind in der Lage komplexe Zusammenhänge zu strukturieren.
- Die Absolventinnen und Absolventen können Konzepte, Prinzipien, Methoden und evidenzbasierte Erkenntnisse aus dem Bereich der Physikdidaktik interpretieren und 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.

# Befähigung zur Aufnahme einer Erwerbstätigkeit

- Die Absolventinnen und Absolventen können fachliche Inhalte und ihre Erkenntnisse didaktisch aufbereiten und adressatengerecht vermitteln.
- Die Absolventinnen und Absolventen sind in der Lage physikalische und physikdidaktische Methoden unter Anleitung auf konkrete Aufgabenstellungen anzuwenden, Lösungswege zu entwickeln und die Ergebnisse zu interpretieren und zu bewerten.
- 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 besitzen die Kompetenz zur Gestaltung eines modernen und zeitgemäßen Physikunterrichts unter Verwendung von passenden Medien und Methoden.
- Die Absolventinnen und Absolventen sind in der Lage Experimente zur Verdeutlichung physikalischer Sachverhalte selbstständig fachgerecht aufzubauen & durchzuführen. Sie verwenden dabei reflektiert die geeigneten analogen oder digitalen Verfahrensweisen.
- Die Absolventinnen und Absolventen besitzen ein breites Spektrum digitaler Grundkompetenzen (Anwendungssoftware, Computergestützte Datenaufnahme & -analyse, Programmiergrundlagen)

# Persönlichkeitsentwicklung

• Die Absolventinnen und Absolventen kennen die Regeln guter wissenschaftlicher Praxis und beachten sie.

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- Die Absolventinnen und Absolventen können ihr Wissen und ihre Erkenntnisse in einer Lehrsituation angemessen und selbstbewusst darstellen und vertreten.
- Die Absolventinnen und Absolventen besitzen ein ausgeprägtes Durchhaltevermögen beim Umgang mit wissenschaftlichen und lehrbezogenen Herausforderungen.
- Die Absolventinnen und Absolventen besitzen die Fähigkeit ihr didaktisches Wirken in der Lehr-/ Lernsituation angemessen zu reflektieren und passende Konsequenzen zu ziehen.

#### Befähigung zum gesellschaftlichen Engagement

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- Die Absolventinnen und Absolventen können naturwissenschaftliche Entwicklungen im Kontext Bildung für nachhaltige Entwicklung kritisch reflektieren und deren Auswirkungen auf die Wirtschaft, Gesellschaft und die Umwelt in Ansätzen erfassen.
- Die Absolventinnen und Absolventen haben ihr Wissen bezüglich wirtschaftlicher, gesellschaftlicher, naturwissenschaftlicher, kultureller etc. Fragestellungen erweitert 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.

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# Abbreviations used

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

### 20-Oct-2015 (2015-220)

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.

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# The subject is divided into

Abbreviation	Abbreviation Module title			Method of grading	page
Scientific Discipline (60 B	CTS credits	3)			
Compulsory Courses (60	ECTS cred	its)			
Classical Physics (16 E	CTS credits	)			
11-E-M-152-m01	Classical P	hysics 1 (Mechanics)	8	NUM	12
11-E-E-152-m01	Classical P	hysics 2 (Heat and Electromagnetism)	8	NUM	9
Optics and Quantum P	hysics I (4 E	CTS credits)			
11-L-OAV-152-m01	Optics and	Quantum Physics	4	NUM	34
Optics and Quantum P	hysics II (9	ECTS credits)			
11-E-OA-152-m01	Optics and	Waves - Exercises	5	NUM	17
11-L-AA-NV-152-m01	Modern Ph	ysics 1 - Exercises (Atoms and Quantum Physics)	4	NUM	18
Modern Physics (12 EC	TS credits)				
11-L-M2-NV-152-m01	1	ysics 2	6	NUM	32
		ysics in Nature and Technology	6	NUM	33
Computational Method			<u> </u>		
11-M-MR-152-m01		cal Methods of Physics	6	B/NB	49
Laboratory Course I (9			, °	57.112	<u> </u>
	1	Course Physics A(Mechanics, Heat, Electromagne-			
11-P-LA-152-m01	tism)	course i mysics A(weenames, neat, electromagne	2	B/NB	53
11-P-FR1-152-m01	Data and E	rror Analysis	2	B/NB	51
	Laboratory	Course Physics B (Electricity, Circuits, Atomic and		5 (115	
11-P-LB-152-m01	Nuclear Ph	ysics)	5	B/NB	55
Laboratory Course II (4	ECTS credi	ts)			
11-P-DP1-152-m01	Demonstra	tion Laboratory Course 1	4	NUM	50
Teaching (12 ECTS credits	5)		ļ		
Compulsory Courses (12	ECTS credi	ts)			
11-L-PD1-152-m01	Physics Tea	aching Concepts 1	2	NUM	36
11-L-PD2-152-m01	Physics Tea	aching Concepts 2	3	NUM	37
11-L-PDS-NV-152-m01	Physics Tea	aching Concepts Seminar	2	B/NB	39
11-L-L3S-152-m01	Student La	b Preparation Course (Physics)	5	NUM	30
hesis (4 ECTS credits)					
studienbegleitendes fachdid subject studied with a focus ations for teaching-degree pr credits obtained are counted	aktisches P on the scien ogrammes) in the subje	Realschule must complete a practical training in dida traktikum) which refers to one of the subjects they sentific discipline) pursuant to Section 34 Subsection 1 . The obligatory accompanying tutorial is offered by tect Erziehungswissenschaften pursuant to Section 10 or teaching-degree programms).	elected as v No. 4 LPO the respect	vertieft studier I (examinatior tive subject. Th	tes Fac 1 regu- 1e ECTS
		actical Training and Theory of Classroom	4	B/NB	40
Freier Bereich (general as we	ll as subjec	t-specific electives)			
eaching degree students mu ect-specific electives) (Sectic o achieve the required numb reier Bereich interdisciplin	ist take mod on 9 LASPO oer of ECTS o ary: The into	dules worth a total of 15 ECTS credits in the area Freie (general academic and examination regulations for t credits, students may take any modules from the are erdisciplinary additional offer for a teaching degree of "Freien Bereich" im Rahmen des Studiums für ein Le	eaching-de as below. can be four	egree program	nes)).
Physics					
	1	ect-specific electives) subject specific)			1.
11-L-EL1-152-m01		eminar Fundamental Principles	3	B/NB	23
11-L-EL2-152-m01	Selected To	opics in Physics Didactics	3	B/NB	25
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11-P-VKM-152-m01	Preparatory Course Mathematics	2	B/NB	57
11-L-L3B-152-m01	Student Lab Supervision (Physics)	2	B/NB	28
11-MIND-Ph1-152-mo1 Low Cost - High Impact. Low-budget Experiments for Science Courses (Physics)		2	B/NB	45
11-L-WPD-152-m01	Scientific Work in Teaching Concepts	3	B/NB	41
11-AP-152-m01	Astrophysics	6	NUM	7
11-ENT-152-m01	Principles of Energy Technologies	6	NUM	15
11-L-APD-152-m01	Current Topics of Teaching Concepts in Physics	3	NUM	19
11-MIND-Ph2-152-m01	Teaching Science with Hands-on-Exhibits (Physics)	2	B/NB	47
11-LX6-152-m01	Current Topics in Physics	6	NUM	43
11-LCS6-152-m01	Selected Topics of Physics	4	NUM	21
Thesis (10 FCTS credits)			•	

#### 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 Realschule may write this thesis in one of the subjects 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.

11-L-HARS-152-m01	Thesis in Physics Intermediate School	10	NUM	27	
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Module	e title				Abbreviation	
Astroph	-				11-AP-152-m01	
Module	e coordi	nator		Module offered by		
Managi and Ast		ctor of the Institute of Tl ics	neoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS		d of grading	Only after succ. con	npl. of module(s)		
6	numer	ical grade				
Duratio	n	Module level	Other prerequisites			
1 semes	ster	undergraduate				
Conten	ts					
telesco um, mo	pes and decular	onomy, coordinates and d detectors, stellar struc clouds, structure of the arge-scale structures, co	ture and atmosphere milky way, the local (	s, stellar evolution a	nd end stages, inter	stellar medi-
Intende	ed learn	ing outcomes				
physica	al obser	re familiar with the moc vations and evaluations amiliar with the physics	. They are able to use	e these methods to p	lan and analyse owr	n observati-
Courses	s (type,	number of weekly conta	act hours, language –	- if other than Germa	n)	
V (2) + I	R (2)	in: German or English				
		<b>essment</b> (type, scope, la on on whether module c			tion offered — if not	every seme-
<ul> <li>b) oral of</li> <li>c) oral of</li> <li>d) projete</li> <li>e) presete</li> <li>lf a writte</li> <li>stead tate</li> <li>of asset</li> </ul>	<ul> <li>a) written examination (approx. 90 to 120 minutes) or</li> <li>b) oral examination of one candidate each (approx. 30 minutes) or</li> <li>c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or</li> <li>d) project report (approx. 8 to 10 pages) or</li> <li>e) presentation/talk (approx. 30 minutes)</li> <li>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.</li> </ul>					If the method
Allocati	-					
	<u> </u>					
Additio	nal info	ormation				
Additio						
Workload						
180 h						
Teaching cycle						
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)						
§ 22    Nr. 1 h) § 22    Nr. 2 f) § 22    Nr. 3 f)						
Module appears in						
Bachelor's degree (1 major) Physics (2015)						
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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)

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Module	e title				Abbreviation	
		sics 2 (Heat and Electro	omagnetism)	-	11-E-E-152-m01	
		• .				
Module coordinator				Module offered by	· · · ·	
Managing Director of the Institute of Applied Physics Faculty of Physics and Astronomy			and Astronomy			
ECTS		od of grading	Only after succ. cor	npl. of module(s)		
8	·	rical grade				
Duratio		Module level	Other prerequisites			
1 seme	ster	undergraduate		site to assessment:	•	
				per semester). Stude		•
				rcises will qualify for		
				students about the re	espective details at t	the beginning
			of the semester.			
Conten	ts					
		amics (linked to 11-E-M			ometer, Kelvin scale;	
		ction, heat transfer, dif				
		al theorems of thermoo es, working diagrams, e			aemon;	
		and liquids, states of m			oint, phase transitio	ons. critical
		palescence), coexiste				····, ·····
		cs, basic concepts: Ele	ctrical charge, forces;	electric field, reps. fie	eld concept, field line	es, field of a
point c					<b>c</b>	
		entence, related to Cou es; divergence and GS i		of "river"; Gaussian s	sufface, divergence t	heorem; spe-
		otential, working in the		ial, potential differer	ice, voltage: notenti	al equation.
		surfaces; several impo				
		egner wheel;			•	• •
		e E-field, charge in a h				
		emission, dipole in he				
		mirror charge, definitio acitor; electrical polaris				
		ement; electrolytic capa			sation, meroscopie	initige, ulet
		introduction, current d			ns;	
		and conductivity, resi	stivity, temperature de	pendence; Ohm's lav	w; realisations (resis	tive and non-
ohmic,						
-		ectrical networks, Kirch ients; Wheatstone brid		nodes); internal resis	stance of a voltage s	ource, mea-
0		energy in the circuit; C	0 /	nic element: thermov	voltage:	
		echanisms, conduction				es;
-	-	atics, fundamental law			initions and units; E	arth's ma-
		mper's Law, analogous				
17. Vec Helmho	•	ential, formal derivatio	n, analogous to electri	c scalar potential; ca	lculation of fields, ex	xamples,
			etic field current bala	nce Lorentz force rig	ht-hand rule_electri	c motor· di-
18. Moving charge in the static magnetic field, current balance, Lorentz force, right-hand rule, electric motor; dipole field; movement paths, mass spectrometer, Wien filters, Hall effect; electron: e / m determination;						
19. matter in the magnetic field, effects of the field on matter, relative permeability, susceptibility; para-, dia-,						
ferromagnetism; magn. moment of the electron, behaviour at interfaces;						
20. induction, Faraday's law of induction, Lenz's rule, flux change, eddy electric field, Waltenhofen's pendulum;						
inductance,self-induction; applications: Transformer, generator; 21. Maxwell's displacement current, choice of integration area, displacement current; Maxwell's extension, wave						
equation; Maxwell equations;						
	22. AC: Fundamentals, sinusoidal vibrations, amplitude, period and phase; power and RMS value, ohmic resi-					
stance;	; Capac	itive & inductive resist	or, capacitor and coil,			
Comple	ex resis	tance; performance of	the AC;			
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23. Resonant circuits, combinations of RLC; series and parallel resonant circuit; forced vibration, damped harmonic oscillator (related to 11-E-M);

24: Hertz dipole, characteristics of irradiation, near field, far field; Rayleigh scattering; accelerated charge, synchrotron radiation, X-rays; 25. Electromagnetic waves: Principles, Maxwell's determination to electromagnetism, radiation pressure (Poynting vector, radiation pressure).

#### Intended learning outcomes

The students understand the basic principles and contexts of thermodynamics, science of electricity and magnetism. They know relevant experiments to observe and measure these principles and contexts. They are able to apply mathematical methods to the formulation of physical contexts and autonomously apply their knowledge to the solution of mathematical-physical tasks.

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

V (4) + Ü (2)

Module taught in: Ü: German or English

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

written examination (approx. 120 minutes)

Language of assessment: German and/or English

#### Allocation of places

#### Additional information

Registration: If a student registers for the exercises and obtains the qualification for admission to assessment, this will be considered a declaration of will to seek admission to assessment pursuant to Section 20 Subsection 3 Sentence 4 ASPO (general academic and examination regulations). If the module coordinators subsequently find that the student has obtained the qualification for admission to assessment, they will put the student's registration for assessment into effect. Only those students that meet the respective prerequisites can successfully register for an assessment. Students who did not register for an assessment or whose registration for an assessment was not put into effect will not be admitted to the respective assessment. If a student takes an assessment to which he/she has not been admitted, the grade achieved in this assessment will not be considered.

#### Workload

240 h

#### **Teaching cycle**

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

§ 53 | Nr. 1 a)

§ 77 | Nr. 1 a)

#### 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 Realschule Physics (2015) First state examination for the teaching degree Gymnasium Physics (2015) First state examination for the teaching degree Mittelschule Physics (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 Realschule Physics (2018) First state examination for the teaching degree Gymnasium Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) Bachelor's degree (1 major) Physics (2020) LA Realschulen Physics (2015) JMU Würzburg • generated 18-Apr-2025 • exam. reg. data record Lehramt Realschulen Physik - 2015

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Bachelor's degree (1 major) Nanostructure Technology (2020) Bachelor's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major, 1 minor) Physics (Minor, 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 Mittelschule Physics (2020) First state examination for the teaching degree Mittelschule Physics (2020) Bachelor's degree (1 major) Functional Materials (2021) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024) Bachelor's degree (1 major) Functional Materials (2025)

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Module					Abbreviation		
Classic	al Phy	sics 1 (Mechanics)			11-E-M-152-m01		
Module		linator		Module offered by	<u> </u>		
Managing Director of the Institute of Applied Phy			f Applied Physics	Faculty of Physics a	and Astronomy		
ECTS Method of grading		Only after succ. co					
8		rical grade					
Duratio		Module level	Other prerequisite	c			
1 seme		undergraduate	- i · ·		completion of exercises (approx.		
1 Seme	SICI				ents who successfully completed		
			-	•	r admission to assessment. The		
				Students about the r	respective details at the beginning		
			of the semester.				
Conten	ts						
					nalysis, time / length / mass (de-		
		•	SI), importance of metr	<b>C</b> , ,			
					Jniform and constant accelerated		
			r motion in polar coord				
			c friction. Preparation o		the pendulum, forces on an ato-		
		nergy: (Kinetic) perfor		i the equations of mo	stion and solutions;		
				momentum conserva	ation, surges in centre of mass		
		system, rocket equation					
				al, potential energy; l	aw, weight scale, field strength		
and po	tential	of gravity (general rel	ations);				
					nergy, moment of inertia, analo-		
-			ons, satellites (geostati	onary and interstellar	), escape velocities, trajectories		
		potential;	rongo sustama annora	nt forego, Fourguilt no	ndulum Carialis fares contrifu		
gal for		s: inertial system, rere	rence systems, appare	nt forces, Foucault pe	ndulum, Coriolis force, centrifu-		
		ansformation. Brief die	pression to Maxwell's e	quations ether Mich	elson interferometer, Einstein's		
-				•	length contraction, relativistic im-		
pulse;	, p		,, _0.0	,			
	id body	/ and gyroscope: Dete	rmining the centre of m	ass, inertia tensor ar	nd -ellipsoid, principal axes and		
their st	ability	, tensor on the examp	le of the elasticity tens	or, physics of the bike	e; gyroscope: Precession and nu-		
		rth as a spinning top;					
		tatic and dynamic fric	tion, stick-slip motion,	rolling friction, viscou	is friction, laminar flow, eddy for-		
mation			<b>C</b> 1 <b>C</b>	·· ·· · · ·			
		,	•	· ·	ion (DGL) on forces, torque and Ilum, physical pendulum, dampec		
			, aperiodic limit), force				
			•		erministic vs. chaotic motion,		
-	•	namics and chaos;					
	14. Waves: Wave equation, transverse and longitudinal waves, polarisation, principle of superposition, reflection						
	at the open and closed end, speed of sound; interference, Doppler effect; phase and group velocity, dispersion						
	relation;						
			ies: Elastic modulus, g				
					le, capillary forces, steady flows,		
pressiv			gas laws, barometric r	ieight formula, air pre	essure, compressibility and com-		
•			d real gas averages d	istribution functions	equipartition theorem, Brownian		
					s of freedom, specific heat		
	,						

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	reg. data record Lehramt Realschulen Physik - 2015	

#### Intended learning outcomes

The students understand the basic contexts and principles of mechanics, vibration, waves and kinetic theory of gases. They are able to apply mathematical methods to the formulation of physical contexts and autonomously apply their knowledge to the solution of mathematical-physical tasks.

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

V (4) + Ü (2)

Module taught in: Ü: German or English

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

written examination (approx. 120 minutes)

Language of assessment: German and/or English

#### Allocation of places

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#### **Additional information**

Registration: If a student registers for the exercises and obtains the qualification for admission to assessment, this will be considered a declaration of will to seek admission to assessment pursuant to Section 20 Subsection 3 Sentence 4 ASPO (general academic and examination regulations). If the module coordinators subsequently find that the student has obtained the qualification for admission to assessment, they will put the student's registration for assessment into effect. Only those students that meet the respective prerequisites can successfully register for an assessment. Students who did not register for an assessment or whose registration for an assessment was not put into effect will not be admitted to the respective assessment. If a student takes an assessment to which he/she has not been admitted, the grade achieved in this assessment will not be considered.

#### Workload

240 h

Teaching cycle

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

§ 53 | Nr. 1 a)

§ 77 | Nr. 1 a)

### Module appears in

Bachelor's degree (1 major) Physics	(2015)				
Bachelor's degree (1 major) Nanostructure Technology (2015)					
Bachelor's degree (1 major) Mathem	r's degree (1 major) Mathematical Physics (2015)				
Bachelor's degree (1 major, 1 minor)	Physics (Minor, 2015)				
First state examination for the teach	ing degree Grundschule Physics (2015)				
First state examination for the teach	ing degree Realschule Physics (2015)				
First state examination for the teach	ing degree Gymnasium Physics (2015)				
First state examination for the teach	ing degree Mittelschule Physics (2015)				
Bachelor's degree (1 major) Mathem	atical Physics (2016)				
First state examination for the teach	First state examination for the teaching degree Grundschule Physics (2018)				
First state examination for the teach	ing degree Realschule Physics (2018)				
First state examination for the teaching degree Gymnasium Physics (2018)					
First state examination for the teaching degree Mittelschule Physics (2018)					
Bachelor's degree (1 major) Physics (2020)					
Bachelor's degree (1 major) Nanostructure Technology (2020)					
Bachelor's degree (1 major) Mathematical Physics (2020)					
Bachelor's degree (1 major, 1 minor) Physics (Minor, 2020)					
First state examination for the teaching degree Grundschule Physics (2020)					
First state examination for the teach	First state examination for the teaching degree Gymnasium Physics (2020)				
First state examination for the teach	ing degree Realschule Physics (2020)				
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	reg. data record Lehramt Realschulen Physik - 2015				

First state examination for the teaching degree Mittelschule Physics (2020) Bachelor's degree (1 major) Functional Materials (2021) Bachelor's degree (1 major) Quantum Technology (2021) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024) Bachelor's degree (1 major) Functional Materials (2025)

Julius-Maxin

UNIVERSITÄT

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	reg. data record Lehramt Realschulen Physik - 2015	

Module title				Abbreviation	
Principles of Energy Technologies 11-ENT-152-mo1					
Module coordinator			Module offered by		
Managing Di	rector of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy	
	nod of grading	Only after succ. co	mpl. of module(s)		
6 num	erical grade				
Duration	Module level	Other prerequisites	5		
1 semester	graduate				
Contents					
as renewable ting material students. En verters. Nucl	ciples of energy conserverse e resources of energy. W s, selective layers, highl ergy conservation via the ear power plants. Hydroo iomass. Geothermal ene	e also discuss aspects y activated carbons). 1 ermal insulation. Therr electricity. Wind turbin	of optimising mater he course is especia nodynamic energy ef es. Photovoltaics. Sc	als (e.g. nanostruct lly suitable for teach ficiency. Fossil fired	ured insula- ning degree energy con-
Intended lea	rning outcomes				
	s know the principles of or age. They understand th				
Courses (typ	e, number of weekly con	tact hours, language -	– if other than Germa	n)	
V (3) + R (1)					
Module taug	ht in: German or English				
	<b>ssessment</b> (type, scope, tion on whether module			tion offered — if not	every seme-
<ul> <li>b) oral exami</li> <li>c) oral exami</li> <li>d) project rep</li> <li>e) presentati</li> <li>If a written existead take the of assessme</li> <li>nation date a</li> <li>Language of</li> </ul>	amination (approx. 90 to ination of one candidate nation in groups (groups oort (approx. 8 to 10 pag on/talk (approx. 30 min xamination was chosen to form of an oral examir nt is changed, the lectur at the latest. assessment: German an offered: Once a year, win	e each (approx. 30 min s of 2, approx. 30 minu es) or utes) as method of assessm nation of one candidat er must inform studen d/or English	ites per candidate) o ent, this may be cha e each or an oral exa	nged and assessme mination in groups.	If the method
Allocation of					
Additional in	formation				
Workload					
180 h					
Teaching cyc	le				
Referred to i	n LPO I (examination reg	gulations for teaching-	degree programmes)		
§ 22    Nr. 1 h § 22    Nr. 2 f § 22    Nr. 3 f	)				
Module appe					
	egree (1 major) Physics (	2015)			
A Realschulen Phy	vsics (2015)	IMU Würzb	urg • generated 18-Apr-2025 •	• exam.	page 15 / 58
			ord Lehramt Realschulen Phys		

#### UNIVERSITÄT WÜRZBURG

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)

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	reg. data record Lehramt Realschulen Physik - 2015	

Module	Module title Abbreviation				
Optics	Optics and Waves - Exercises				11-E-OA-152-m01
Module coordinator				Module offered by	
		ector of the Institute of A	nnlind Physics	Faculty of Physics a	and Astronomy
ECTS		od of grading	Only after succ. con		
5		rical grade			
Duratio		Module level	Other prerequisites		
1 seme		undergraduate			
Conten	ts		1		
tical pa films, ir	th, ligh nterfero	t in matter, polarization	, Geometrical Optics, raction optical grating	Optical instruments , Fresnel diffraction,	ncepts, Fermat's principle, op- , wave optics, interference, thin holography, wave packets, wave
Intende	ed leari	ning outcomes			
to apply	y math		formulation of physic		nd quantum optics. They are able onomously apply their knowledge
Course	<b>s</b> (type	, number of weekly conta	act hours, language –	- if other than Germa	an)
Ü (2) Module	taugh	t in: Ü: German or Englis	h		
Method	l of ass		anguage — if other tha		ation offered — if not every seme-
		nation (approx. 120 minu			
		ssessment: German and			
Allocat	ion of p	olaces			
Additio	nal inf	ormation	_		
Worklo	ad				
150 h					
	Teaching cycle				
	3	-	_		
Referre	d to in	LPOI (examination regu	lations for teaching.	egree programmes	
§ 53 I N					
\$ 77 I N					
Module		irs in			
		gree (1 major) Physics (2	.015)		
		gree (1 major) Nanostruc	-	5)	
		mination for the teachin		,	
		mination for the teaching			
		mination for the teachin mination for the teachin			
		gree (1 major) Physics (2		1 1193103 (2015)	
		gree (1 major) Nanostruc		o)	
		gree (1 major) Quantum			
		gram Physics (2023)			

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	reg. data record Lehramt Realschulen Physik - 2015		

Module	Module title Abbreviation					
Moderr	Modern Physics 1 - Exercises (Atoms and Quantum Physics			)	11-L-AA-NV-152-m01	
Module coordinator				Module offered by		
		ector of the Institute of Ap	onlied Physics	Faculty of Physics a	and Astronomy	
ECTS		od of grading	Only after succ. com		and Astronomy	
4		rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Contents						
tion lav experin questic spin, at	Exercises in Atomic and Quantum Physics according to the contents of 11-L-OAV. Among others: Fundamental ex- periments: Atoms: Specification of atomic values, masses and energies, Rutherford scattering; photons: Radia- tion 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					
The stu cular Pl	Intended learning outcomes The students understand the basic principles and contexts of quantum phenomena as well as Atomic and Mole- cular Physics. They are able to mathematically formulate physical contexts of Atomic and Quantum Physics and to autonomously apply their knowledge to the solution of mathematical-physical tasks.					
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	· if other than Germa	n)	
Ü (2) Module	e taugh	t in: Ü: German or Englisł	1			
		<b>sessment</b> (type, scope, la on on whether module ca			tion offered — if not every seme-	
		nation (approx. 120 minu ssessment: German and,				
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
120 h						
Teachir	ıg cycl	e				
Referre	d to in	LPOI (examination regu	lations for teaching-c	legree programmes)		
§ 53   N	r. 1 b)					
Module	e appea	ars in				
First sta	ate exa	mination for the teaching mination for the teaching mination for the teaching	degree Realschule P	Physics (2015)		

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	reg. data record Lehramt Realschulen Physik - 2015	

Module				Abbreviation	
Current	Topics of Teaching Conce	epts in Physics		11-L-APD-152-m01	
Module coordinator			Madula offered by		
			Module offered b		
	son of examination com		Faculty of Physics	and Astronomy	
	Method of grading numerical grade	Unly after succ.	compl. of module(s)		
- 1			•		
Duration		Other prerequis	ites		
	semester undergraduate				
Content	S				
Current	topics in physics education	on.			
Intende	d learning outcomes				
	lents have knowledge of a wledge according to subje			and are able to classify the acqui asses.	
Courses	(type, number of weekly	contact hours, languag	ge — if other than Gern	nan)	
S (2)	(), ), ), ), (), (), (), (), (), (), (),		,		
• •	taught in: German or Eng	lish			
			r than German, exami	nation offered — if not every sem	
	ormation on whether mod				
	n examination (approx. 4				
	xamination of one candid		ninutes) or		
	xamination in groups (gro		inutes per candidate)	or	
	paper (approx. 8 pages) c				
	30 to 45 minutes) with dis	cussion			
Allocati	on of places				
Additior	nal information				
Workloa	ıd				
90 h					
Teachin	g cycle				
	3 .,				
Deferred	to in LPO I (examination	regulations for toachi	na doaroo programma	c)	
			ng-degree programme	5)	
§ 22    N § 22    N	-				
§ 22 II N § 22 II N	-				
	appears in				
	te examination for the tea	ching degree Crunded	hulo Physics (2015)		
			,	ics (Primary School) (2015)	
	te examination for the tea				
	te examination for the tea				
			• -	Physics (Middle School) (2015)	
	te examination for the tea	,		,	
			• -	cs (Middle School) (2015)	
	te examination for the tea			-	
First sta	te examination for the tea	ching degree Grundsc	hule Didactics in Phys	ics (Primary School) (2018)	
	te examination for the tea				
- · ·	te examination for the tea	iching degree Gymnasi	um Physics (2018)		
First sta		terning degree dynniasi	uni i nysics (2010)		
	len Physics (2015)		ürzburg • generated 18-Apr-202	25 • exam. page 19 / 58	

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

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	reg. data record Lehramt Realschulen Physik - 2015	

Module cordinator         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 cordinator         Module cordinator           Contents         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 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 can be chosen to earn a bonus)         a)           a) protect report (approx. 8 to o pages) or         a)         a)           b) oral examination on scosen 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 German and/or English <t< th=""><th>Calented Tanica of Dhussing</th><th>Abbreviation</th></t<>	Calented Tanica of Dhussing	Abbreviation			
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         Contents         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 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) + 8 (0)           Wethod of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a boruls)           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 (approx, 30 minutes) or           b) oral examination mays chosen as method of assessment, this may be changed and assessment may instead take the form of an o	Selected Topics of Physics 11-LCS6-152-m01				
chairperson of examination committee       Faculty of Physics and Astronomy         ECTS       Method of grading       Only after succ. compl. of module(s)         4       numerical grade					
ECTS         Method of grading         Only after succ. compl. of module(s)           4         inumerical grade            Duration         Module level         Other prerequisites           1 semester         undergraduate         Approval from examination committee required.           Conternts             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 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, examination offered — if not every semester, information on whether module can be chosen to eam a bonus)           a) written examination (approx. yo to 120 minutes) or         b) oral examination of groups of 2, approx. 30 minutes) or           b) oral examination on we classify the subject specific condicate each (approx, 30 minutes) or         c) oral examination in groups. (groups of 2, approx. 30 minutes) or           b) oral examination on we classify the subject specific condicate each or an oral examination in groups. If the 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		· ·			
4         numerical grade					
Duration         Module level         Other prerequisites           1 semester         undergraduate         Approval from examination committee required.           Contents         Contents         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 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, examination offered — if not every semester, information on whether module can be chosen to eam a bonus)           a) written examination (approx. 90 to 120 minutes) or or or al examination of one candidate each (approx. 30 minutes) or or or al examination in groups. (If other than German, examination or doe date each (approx. 30 minutes) or do recondidate each (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: German and/or English           Allocation of places		npl. of module(s)			
a 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 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 can be chosen to earn a bonus) a) written examination (approx. 90 to 120 minutes) or b) oral examination in groups (groups of 2, approx. 30 minutes) per candidate) or d) project report (approx. 9 to 120 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) per candidate) or d) project report (approx. 3 to 19 pages) or e) presentation/talk (approx. 30 minutes) and or a 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 adde at the latest. Language of assessment: German and/or English Allocation of places					
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 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 can be chosen to earn a bonus) a) written examination (approx. 9 to 120 minutes) or b) oral examination of ne candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) or c) oral examination on a candidate each (approx. 30 minutes) or b) oral examination on a candidate each (approx. 30 minutes) or c) oral examination on a 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 and 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 at the latest. Language of assessment: German and/or English Allocation of places					
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 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 can be chosen to earn a bonus) a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) coral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) per candidate) or d) project report (approx. 30 to 10 pages) or e) presentation/talk (approx. 30 minutes) if a written examination of an 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 deferee	semester undergraduate Approval from examination committee required.				
study abroad. Intended learning outcomes The students have advanced competencies corresponding to the requirements of a module 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, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus) a) written examination (approx, 90 to 120 minutes) or b) oral examination of one candidate each (approx, 30 minutes) or c) oral examination of one candidate each (approx, 30 minutes) or c) oral examination in groups (groups of 2, approx, 30 minutes) or c) oral examination sethed of assessment, this may be changed and assessment may in- stead 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 the latest. Language of assessment: German and/or English Allocation of places	Contents				
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 seme- ster, information on whether module can be chosen to earn a borus) a) written examination of one candidate each (approx. 30 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) or c) oral examination in groups. If the methor of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination at examination of one candidate each or an oral examination in groups. If the methor 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		achievements, e.g. in case of change of university or			
sics 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. <b>Courses</b> (type, number of weekly contact hours, language — if other than German) V (2) + R (1) <b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a 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 in- stead 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 exami nation date at the latest. Language of assessment: German and/or English <b>Allocation of places</b> 	Intended learning outcomes				
V (2) + R (1)  Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a 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) or e) presentation/talk (approx. 30 to 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 in- stead take the form of an oral examination of one candidate each or an oral examination in groups. If the methoc of assessment is changed, the lecturer must inform students about this by four weeks prior to the original exami- ation date at the latest. Language of assessment: German and/or English Allocation of places	sics of the Bachelor's programme. They have knowledge of a understand the measuring and/or evaluation methods neces	a current subdiscipline of Experimental Physics and essary to acquire this knowledge. They are able to			
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a 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) or e) presentation/talk (approx. 30 to 10 pages) or e) presentation/talk (approx. 30 minutes) fla written examination was chosen as method of assessment, this may be changed and assessment may in- stead 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 exami- nation date at the latest. Language of assessment: German and/or English Allocation of places 	Courses (type, number of weekly contact hours, language —	- if other than German)			
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a 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) or e) presentation/talk (approx. 30 to 10 pages) or e) presentation/talk (approx. 30 minutes) fla written examination was chosen as method of assessment, this may be changed and assessment may in- stead 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 exami- nation date at the latest. Language of assessment: German and/or English Allocation of places 	V (2) + R (1)				
ster, information on whether module can be chosen to earn a 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) or c) oral examination in groups (groups of 2, 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 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 exami nation date at the latest. Language of assessment: German and/or English Allocation of places Additional information Workload Referred to in LPO I (examination regulations for teaching-degree programmes) § 22 ll Nr. 1 h) § 22 ll Nr. 2 f) § 22 ll Nr. 3 f) Module appears in First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015)		an German, examination offered — if not every seme-			
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 in- stead 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 exami- nation date at the latest. Language of assessment: German and/or English Allocation of places  Additional information  Workload 120 h Teaching cycle  Referred to in LPO1 (examination regulations for teaching-degree programmes) § 22 II Nr. 1 h) § 22 II Nr. 2 h) § 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 Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) First state examination for the teaching degree Grundschule Physics (2015) Fir					
Additional information	If a written examination was chosen as method of assessme stead take the form of an oral examination of one candidate of assessment is changed, the lecturer must inform students nation date at the latest.	e each or an oral examination in groups. If the method			
Workload         120 h         Teaching cycle            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 Realschule Didactics in Physics (Primary School) (2015)         First state examination for the teaching degree Gymnasium 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)         ARealschulen Physics (2015)         MU Würzburg • generated 18-Apr-2025 • exam.	Allocation of places				
Workload         120 h         Teaching cycle            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 Realschule Didactics in Physics (Primary School) (2015)         First state examination for the teaching degree Gymnasium 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)         ARealschulen Physics (2015)         MU Würzburg • generated 18-Apr-2025 • exam.					
120 h         Teaching cycle	Additional information				
120 h         Teaching cycle					
Teaching cycle            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 Gymnasium 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)         ARealschulen Physics (2015)         JMU Würzburg • generated 18-Apr-2025 • exam.	Workload				
Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 II Nr. 1 h)         § 22 II Nr. 2 f)         § 21 INr. 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)         ARealschulen Physics (2015)         JMU Würzburg • generated 18-Apr-2025 • exam.         page 21/58	120 h				
Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 II Nr. 1 h)         § 22 II Nr. 2 f)         § 21 INr. 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)         ARealschulen Physics (2015)         JMU Würzburg • generated 18-Apr-2025 • exam.         page 21/58	Teaching cycle				
§ 22 II Nr. 1 h) § 22 II Nr. 2 f) § 22 II Nr. 3 f) <b>Module appears in</b> 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 Gymnasium Physics (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015) ARealschulen Physics (2015) JMU Würzburg • generated 18-Apr-2025 • exam. page 21 / 58					
§ 22 II Nr. 1 h) § 22 II Nr. 2 f) § 22 II Nr. 3 f) <b>Module appears in</b> 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 Gymnasium Physics (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015) ARealschulen Physics (2015) JMU Würzburg • generated 18-Apr-2025 • exam. page 21 / 58	Referred to in LPO L (evamination regulations for toaching d	degree programmes)			
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 Gymnasium Physics (2015)First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)A Realschulen Physics (2015)JMU Würzburg • generated 18-Apr-2025 • exam.page 21 / 58	§ 22    Nr. 1 h)				
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)A Realschulen Physics (2015)JMU Würzburg • generated 18-Apr-2025 • exam.page 21 / 58					
	§ 22    Nr. 3 f)				
reg. data record Lehramt Realschulen Physik - 2015	§ 22 II Nr. 3 f) <b>Module appears in</b> First state examination for the teaching degree Grundschule First state examination for the teaching degree Grundschule First state examination for the teaching degree Realschule PI First state examination for the teaching degree Gymnasium F	e Didactics in Physics (Primary School) (2015) Physics (2015) Physics (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) 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)

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	reg. data record Lehramt Realschulen Physik - 2015	

Module	title			Abbreviation	
	ng Seminar Fundamental Princ		11-L-EL1-152-m01		
	coordinator		Module offered by		
	of the Chair of Physics and its		Faculty of Physics a	nd Astronomy	
ECTS	Method of grading	Only after succ. con	pl. of module(s)		
3	(not) successfully completed				
Duratio		Other prerequisites			
1 semes	ster undergraduate				
Content	ts				
ception sed on	I and interdisciplinary aspects s and typical learning difficult specific contents of physics en hool experiments and suitable	ies, elementarisation a ducation, verbalisatior	and didactic reconst	ruction of physical c	ontents ba-
Intende	d learning outcomes				
student Physics	ed, qualitative knowledge of s preconceptions and special r at university and school rega (type, number of weekly con	nedia on relevant topi rding contents and me	cs; awareness of the thods.	differences betwee	
S (2)					
Method	l of assessment (type, scope, ormation on whether module			tion offered — if not	every seme-
e) oral e Langua	examination of one candidate examination in groups (groups ge of assessment: German an i <b>on of places</b>	of 2, approx. 15 minu			
Additio	nal information				
Workloa	ad				
90 h					
Teachin	ig cycle				
	_ /				
Referre	d to in LPO I (examination reg	ulations for teaching.	legree programmes)		
§ 22    N § 22    N § 22    N	Vr. 1 h) Vr. 2 f)				
Module	appears in				
	ite examination for the teaching	ng degree Grundschule	Physics (2015)		
First sta	te examination for the teaching	ng degree Grundschule	Didactics in Physics	s (Primary School) (2	2015)
	te examination for the teaching		• •		
	te examination for the teaching		•		
	te examination for the teaching			nysics (Middle Scho	ol) (2015)
	te examination for the teaching		-		)
	te examination for the teachin te examination for the teachin		•	(MIAAIE SCHOOL) (20	015)
	Ile examination for the teaching lien Physics (2015)		rg • generated 18-Apr-2025 •	• exam.	page 23 / 58
	, , , , , , , , , , , , , , , , , , , ,		ord Lehramt Realschulen Phys		

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

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	reg. data record Lehramt Realschulen Physik - 2015	

Module	e title			Abbreviation	
Selecte	ed Topics in Physics Didactics			11-L-EL2-152-m01	
Module coordinator			Module offered by		
· · ·	erson of examination committe		Faculty of Physics a	nd Astronomy	
ECTS	Method of grading	Only after succ. con	npl. of module(s)		
3	(not) successfully completed				
Duratio	on Module level	Other prerequisites			
1 seme	ster undergraduate				
Conten	ts				
Current	t topics in physics education.				
	ed learning outcomes				
		rrant subdissipling of	abycics adjustion ar	d are able to classif	futho acqui
	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.				
		•	•		
	<b>s</b> (type, number of weekly con			11)	
S (2)			-		
	d of assessment (type, scope,			tion offered — if not	every seme-
-	formation on whether module	can be chosen to earn	a bonus)		
	paper (approx. 8 pages) or				
	entation (approx. 45 minutes)				
	en examination (approx. 45 m examination of one candidate		tes) or		
	examination in groups (groups		-		
	age of assessment: German an		F,		
Allocat	ion of places				
Additio	onal information				
Worklo					
90 h					
-					
Teachi	ng cycle				
Referre	ed to in LPO I (examination reg	gulations for teaching-	degree programmes)		
§ 22	Nr. 1 h)				
§ 22					
§ 22					
Module	e appears in				
	ate examination for the teachi				
	ate examination for the teaching		•	s (Primary School) (2	:015)
	ate examination for the teaching		• •		
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)					
			-	(Drimary Cabaal) (-	2019)
	ate examination for the teaching		•	s (Phillary School) (2	.018)
	ate examination for the teaching ate examination for the teaching ate examination for the teaching aterestication for the teaching attraction for the teaching attraction for the teaching aterestication for the teaching attraction for the teaching attraction for the teaching attraction for teaching attracting attraction for teaching attracting attracting attracting attracting attracting attractin				
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LA Realsch	ulen Physics (2015)		Irg • generated 18-Apr-2025 •		page 25 / 58
		reg. data reco	ord Lehramt Realschulen Phys	IK - 2015	

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

LA Realschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam.	page 26 / 58
	reg. data record Lehramt Realschulen Physik - 2015	

Modul	e title				Abbreviation
Thesis	in Phy	sics Intermediate School			11-L-HARS-152-m01
Modul	Module coordinator			Module offered by	
		f examination committee		Faculty of Physics a	nd Astronomy
ECTS	1	od of grading	Only after succ. con		
10	_	rical grade			
Durati	on	Module level	Other prerequisites		
		undergraduate			
Conter	nts				
Indepe	endent	processing of a topic of P	hysics and/or Didact	ics of Physics, chose	en in consultation with a lecturer
Intend	led lear	ning outcomes			
and m due co	ethods onsidera		degree programme. 1	They are able to pres	while applying the knowledge ent their results in written form in
		signed to module			
ster, ir Hausa prox. 4 Langua ons for	nformati rbeit (th 40 page age of a	ion on whether module ca nesis) pursuant to Sectior s) issessment: German; exco ng-degree programmes)	an be chosen to earn 1 29 LPO I (examinati	a bonus) on regulations for te	ition offered — if not every seme- aching-degree programmes) (ap- on 4 LPO I (examination regulati-
Additi	onal inf	ormation			
Workle	oad				
300 h					
Teachi	ing cycl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-o	legree programmes)	
§ 29			0		
	e appea	ars in			
First st First st	tate exa tate exa	mination for the teaching mination for the teaching mination for the teaching	degree Realschule F	Physics (2018)	

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	reg. data record Lehramt Realschulen Physik - 2015	

Module title					Abbreviation	
		upervision (Physics)			11-L-L3B-152-m01	
Module	e coordi	nator		Module offered by		
holder	of the C	hair of Physics and its	Didactics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	d of grading	Only after succ. con	npl. of module(s)		
2	(not) s	uccessfully completed				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	undergraduate				
Conten						
		ovides an introduction g-learning-laboratory.	to successful supervis	ion of pupils indepe	ndently carrying out	experiments
Intend	ed learn	ing outcomes				
vel of p experir ly and ve beh terns b	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).					
Course	<b>es</b> (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
P (2)						
ster, in	formati	on on whether module	language — if other the can be chosen to earn		tion offered — if not	every seme-
b) oral c) oral	examin examin		inutes) or e each (approx. 10 minu s of 2, approx. 10 minu		r	
Allocat	tion of p	laces				
Additic	onal info	ormation				
			s studying at least one	subject in the natura	lsciences	
Worklo						
	Jau					
60 h						
Teachi	ng cycle	9				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
§ 22    § 22    § 22	-					
Modul	e appea	rs in				
First st	ate exar	nination for the teachi	ng degree Grundschule	e 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)					015)
			ng degree Grundschule			<i></i>
	ulen Physio		JMU Würzbı	urg • generated 18-Apr-2025 • ord Lehramt Realschulen Phys		page 28 / 58

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

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	reg. data record Lehramt Realschulen Physik - 2015	

Student Lab Preparation Course (Physics)       11-L-L3S-152-mo1         Module coordinator       Module offered by         nolder of the Chair of Physics and its Didactics       Faculty of Physics and Astronomy         ECTS       Method of grading       Only after succ. compl. of module(s)         is a marrical grade          Duration       Module level       Other prerequisites         is semester       undergraduate          Contents           The module gives an overview of applicable physical experiments that provide an introduction to science and can be performed in teaching-learning-laboratories (MIND center). In these experiments, different working mehods are employed.         The students know how to prepare and follow-up a visit in a teaching-learning-laboratory (MIND-Center) and have regained an overview of current didactic research topics and further possibilities for development in the field o subject-didactic research. They are able to evaluate and assess the (affective) learning achievements of pupils, on 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 buils upils experiments in a target-oriented manner, and to supervise pupils while experimenting.         Courses (type, number of weekly contact hours, language — if other than German, examination offered — if not every seme ter, information on whether module can be chosen to earn a bonus)         a) written examination in	Modul	e title				Abbreviation	
Module cordinator         Module offered by           nolder of the Chair of Physics and its Didactics         Faculty of Physics and Astronomy           CTS         Method of grading         Only after succ. compl. of module(s)           in numerical grade             Duration         Module level         Other prerequisites           is emester         undergraduate			reparation Course (Phys	ics)	-		
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ECTS       Method of grading       Only after succ. compl. of module(s)         inumerical grade					•		
numerical grade	holder					nd Astronomy	
Module level         Other prerequisites           isemester         undergraduate            Contents             The module gives an overview of applicable physical experiments that provide an introduction to science and can be performed in teaching-learning-laboratories (MIND center). In these experiments, different working mehods are employed.           Intended learning outcomes	ECTS			Only after succ. con	pl. of module(s)		
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Realschulen Physics (2015) JMU Würzburg • generated 18-Apr-2025 • exam. page 30 / 58					-		
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First state examination for the teaching degree Mittelschule Physics (2020)

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Modul	e title				Abbreviation
Moder	n Physi	CS 2			11-L-M2-NV-152-m01
Modul	e coord	inator		Module offered b	y
Manag	ing Dire	ector of the Institute of A	oplied Physics	Faculty of Physics	and Astronomy
ECTS	1	od of grading		ompl. of module(s)	
6		rical grade		•	
Duratio	on	Module level	Other prerequisite	25	
2 seme	ester	undergraduate			
Conten	Its				
	ules, m				tional and electronic excitation of e vibrations, thermal properties of
Intend	ed lear	ning outcomes			
examir	nation o		ling of the structure		e of experimental methods for the , their modelling as translation-in-
Course	<b>s</b> (type	, number of weekly conta	act hours, language	— if other than Gern	nan)
V (4) + Module	• •	t in: Ü: German or Englis	h		
		sessment (type, scope, lation on whether module c			nation offered — if not every seme-
b) oral	examir	mination (approx. 90 to 1 nation of one candidate e ssessment: German and	ach (approx. 20 mi	nutes)	
Allocat	tion of	olaces			
Additio	onal inf	ormation	_		
Worklo	ad				
180 h					
Teachi	ng cvcl	e			
Referre	ed to in	LPOI (examination regu	llations for teaching	g-degree programme	s)
§ 53   N					
Module		ars in			
		mination for the teaching	g degree Grundschu	le Physics (2015)	
		mination for the teaching		•	
		mination for the teaching			

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Module	e title				Abbreviation
Modern Physics in Nature and Technology			ogy		11-L-MPNT-152-m01
Module coordinator		Module offered by			
		ector of the Institute of Ap	onlied Physics	Faculty of Physics a	and Astronomy
ECTS		od of grading	Only after succ. con		and riscionismy
6	· · · · · · · · · · · · · · · · · · ·	rical grade			
Duratio	on 🛛	Module level	Other prerequisites		
2 seme	ester	undergraduate			
Conten	its				
portant with ot atomis les and	t conce her Nat m, dete d proces	pts and applications of P ural Sciences); aspects c rminism); Applied and T	hysics; interconnecti of the history of ideas echnical Physics: Phy nedical technology; c	ons between the ph of important conce ysics and informatio limate and weather	Astrophysics; introduction of im- ysical subdisciplines (and partly pts and their controversies (e.g. n/communication technology; ru- ; Biophysics; ecology; energy; ce- lisplays
		ning outcomes			1561095
concep of diffe system	ots enab rent us is of nat	oles them to connect diffe age contexts and therefo	erent subdisciplines re have in-depth kno are able to connect	of Physics, they kno wledge of these con	derstanding of important shared w the similarities and differences cepts; they understand complex nowledge in a synergetic manner
Course	<b>s</b> (type	, number of weekly conta	ct hours, language –	- if other than Germa	an)
S (2) + Module	• •	t in: Ü: German or Englisł	1		
		essment (type, scope, la on on whether module ca			ation offered — if not every seme-
b) oral	examin	nination (approx. 90 to 1 ation of one candidate e ssessment: German and,	ach (approx. 20 minu	utes)	
Allocat	ion of p	olaces			
Additio	onal info	ormation			
Worklo	ad				
180 h	180 h				
Teachi	Teaching cycle				
Referre	ed to in	LPO I (examination regu	lations for teaching-	degree programmes)	
§ 53   N	Ir. 1 b)				
Module	e appea	rs in			
First st	ate exa	mination for the teaching mination for the teaching mination for the teaching	g degree Realschule F	Physics (2018)	

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Module title			Abbreviation			
Optics and Quantum Physics			11-L-OAV-152-m01			
Module coordinator			Module offered by			
Manag	ing Dire	ector of the Institute of	Applied Physics	Faculty of Physics and Astronomy		
ECTS		od of grading	Only after succ. con	npl. of module(s)		
4	nume	rical grade				
Duratio		Module level	Other prerequisites	ites		
2 seme	ester	undergraduate				
Conten	-					
		d to 11-E-E): Basic conc				
		ter: Propagation veloci orption, Kramers-Kroni				
		ence, optical activity (d	-	resher equations, po	tansation, generatio	in by absorp
		l optics: Basic concepts		ptical path, Gaussia	n optics, reflection, I	refraction,
		es, Snell's law, total ref				
		rved interfaces, thin ar				, imaging er-
		l & chromatic aberratio ruments: Characteristic				bundle be-
4. Optical instruments: Characteristics, camera, eye, magnifying glass, microscope, telescope types, bundle be- am vs. image construction (electron lenses, electron microscope), confocal microscopy;				, buildle be		
5. Wave optics: spatial and temporal coherence, double slit, Young's experiment, interference pattern (intensity				rn (intensity		
		ayers, parallel layers, w	edge-shaped layers, p	hase shift, Newton ri	ngs, interferometer	(Michelson,
		Fabry-Perot);	for diffusion single o			. I
		n the far field: Fraunho bé criterion, Fourier opi				
		, diffraction off atomic	, – –		inbution, grating op	cettometer
		n the near field: Fresne			r apertures/disks, F	resnel zone
		ld microscopy, hologra				
		assical physics I - from				
	•	electric effect and Einst cture of nature;	ein's explanation, Com	ipton effect, light as	a particle, wave-par	ticle duality,
		assical physics II - part	icles as waves: De Bro	glie's matter wave co	oncept: diffraction of	f particle wa-
-		-Germer-experiment, de		-		parriere rra
10. Wa	ve mec	hanics: Wave packets,	phase and group veloc	ity (recap of 11-EM),		•
		n theorem, wave function				
		echanics (double-slit e	xperiment & which-way	y information, collap	se of the wave funct	lion, Schrö-
dinger's cat); 11. Mathematical concepts of quantum mechanics: Schrödinger equation as wave equation, conceptual compari				tual compari-		
son to wave optics, free particle and particles in a potential, time-independent Schrödinger equation as eigenva-				•		
lue equation, simple examples in 1D (potential step, potential barrier and tunnel effect, box potential and ener-						
gy quantisation, harmonic oscillator), box potential in higher dimensions and degeneracy, formal theory of QM						
(states, operators, observables).						
Intend	ed learı	ning outcomes				
		understand the basic p				
phenomena as well as Atomic and Molecular Physics. They understand the theoretical concepts and know the						
structure and application of important optical instruments and measuring methods. They understand the ideas						
and concepts of quantum theory and Astrophysics and the relevant experiments to observe and measure quan- tum phenomena. They are able to discuss their knowledge and to integrate it into a bigger picture.						
	-	, number of weekly con				
V (4) +		,			,	
Metho	<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme-			every seme-		
		on on whether module				
		ion of one candidate ea				·
LA Realsch	ulen Physi	cs (2015)		urg • generated 18-Apr-2025 • ord Lehramt Realschulen Phys		page 34 / 58

Language of assessment: German and/or English

#### Allocation of places

--

### Additional information

Workload

120 h

#### **Teaching cycle**

--

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

§ 53 | Nr. 1 a) (2 ECTS credits) and b) (2 ECTS credits) § 77 | Nr. 1 a) (2 ECTS credits) and c) (2 ECTS credits)

### Module appears in

First state examination for the teaching degree Grundschule Physics (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 Mittelschule Physics (2015)

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	reg. data record Lehramt Realschulen Physik - 2015	

vsics Teaching Concepts 1 11-L-PD1-152-m01				
dule coordinator Module offered by				
naging Director of the Institute of Applied Physics Faculty of Physics and Astronomy				
S Method of grading Only after succ. compl. of module(s)				
numerical grade				
ation Module level Other prerequisites				
emester undergraduate				
itents				
pject-didactic study of technical contents of the basic studies, student preconceptions and subje ching concepts. Student preconceptions and typical learning difficulties in school physics, corres ing methods, and techniques to change student preconceptions; epistemological and working m rsics.	sponding te-			
ended learning outcomes				
rning difficulties; knowledge of how to change student preconceptions; knowledge of alternative aches for selected topics; knowledge of epistemological methods of Physics; knowledge of the lo I goals of the school subject Physics; knowledge of elementarising and teaching methods; knowl al teaching and working tools.	egitimation			
<b>irses</b> (type, number of weekly contact hours, language — if other than German)				
2)				
t <b>hod of assessment</b> (type, scope, language — if other than German, examination offered — if not r, information on whether module can be chosen to earn a bonus)	every seme-			
vritten examination (approx. 45 minutes) or oral examination of one candidate each (approx. 10 minutes) or ral examination in groups (groups of 2, approx. 10 minutes per candidate) guage of assessment: German and/or English				
ocation of places				
litional information				
rkload				
h				
ching cycle				
erred to in LPO I (examination regulations for teaching-degree programmes)				
5   Nr. 7 8   Nr. 1				
3   Nr. 2				
§ 77   Nr. 2				
dule appears in				
	2015)			
<b>dule appears in</b> t state examination for the teaching degree Grundschule Physics (2015)	2015)			
<b>dule appears in</b> t state examination for the teaching degree Grundschule Physics (2015) t state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2	2015)			
<b>dule appears in</b> t state examination for the teaching degree Grundschule Physics (2015) t state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2 t state examination for the teaching degree Realschule Physics (2015)	-			
<b>dule appears in</b> t state examination for the teaching degree Grundschule Physics (2015) t state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2 t state examination for the teaching degree Realschule Physics (2015) t state examination for the teaching degree Gymnasium Physics (2015)	-			
dule appears in t state examination for the teaching degree Grundschule Physics (2015) t state examination for the teaching degree Grundschule Didactics in Physics (Primary School) (2 t state examination for the teaching degree Realschule Physics (2015) t state examination for the teaching degree Gymnasium Physics (2015) t state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle Schoo	ol) (2015)			

Module	title			Abbreviation	
Physics	s Teaching Concepts 2			11-L-PD2-152-m01	
Modulo	coordinator		Modulo offered by		
			Module offered by		
	ng Director of the Institute of A	<u> </u>	Faculty of Physics a	nd Astronomy	
ECTS	Method of grading numerical grade	Only after succ. cor	npl. of module(s)		
3 Duratio					
1 semes		Other prerequisites			
Conten					
Extensi tional g structio to supp	on of the basic knowledge of s goals of physics, qualification n on of physical contents, metho port learning.	nodels and education	al standards: eleme	ntarisation and dida	ctic recon-
	ed learning outcomes h understanding of school-rele				
learning proache and goa	g difficulties; knowledge of ho es for selected topics; knowled als of the school subject Physi aching and working tools.	w to change student p dge of epistemologica	preconceptions; know l methods of Physics	vledge of alternative ; knowledge of the l	teaching ap- egitimation
Courses	<b>s</b> (type, number of weekly cont	tact hours, language –	– if other than Germa	n)	
V (2) + I	Ü (1)				
	<b>d of assessment</b> (type, scope, formation on whether module			tion offered — if not	every seme-
b) oral e c) oral e d) term	en examination (approx. 45 mi examination of one candidate examination in groups (groups paper (approx. 8 pages) ge of assessment: German and	each (approx. 10 minu of 2, approx. 10 minu			
Allocati	ion of places				
Additio	nal information				
Worklo	ad				
90 h					
,	ng cycle	_			
reaciiii					
Poforro	d to in LPO I (examination reg	ulations for toaching	dagraa programmaa)		
§ 36   N § 38   N § 53   N § 77   N	Ir. 7 Ir. 1 Ir. 2		degree programmes)		
	appears in				
First sta First sta First sta First sta First sta	ate examination for the teachir ate examination for the teachir ate examination for the teachir ate examination for the teachir ate examination for the teachir	ng degree Grundschul ng degree Realschule I ng degree Gymnasium ng degree Sonderpäda	e Didactics in Physics Physics (2015) Physics (2015) Igogik Didactics in Ph		
	ate examination for the teachir	JMU Würzb	urg • generated 18-Apr-2025 •		page 37 / 58
		reg. data rec	ord Lehramt Realschulen Phys	ык - 2015	



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

LA Realschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam.	page 38 / 58
	reg. data record Lehramt Realschulen Physik - 2015	1

Module	e title				Abbreviation
Physics	s Teach	ing Concepts Seminar			11-L-PDS-NV-152-m01
Module	e coord	inator		Module offered by	
		Chair of Physics and its D	idactics	Faculty of Physics a	and Astronomy
ECTS		od of grading	Only after succ. com		
2		successfully completed			
2 Duratio		Module level	Other preveruisites		
			Other prerequisites		
1 seme		undergraduate			
Conten					
educati media a	ion, eva and the	aluation, task culture, int	erdisciplinary classes	s, language in physi	vsics education, girls in physics cs education, effects of subject rs, epistemological and working
		ning outcomes			
knowle	dge of		re. Ability to critically		actic physical research projects, asses in view of different aspect
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	if other than Germa	in)
S (2)		,	, <u> </u>		
Method		<b>sessment</b> (type, scope, la ion on whether module ca			tion offered — if not every seme
d) term	paper	ation in groups (groups c (approx. 8 pages) ssessment: German and,		es per candidate) o	r
Allocat	ion of <sub>l</sub>	olaces			
Additio	nal inf	ormation			
Worklo	ad				
60 h					
Teachii		e			
	- <u>5</u> - y - t	•			
Referre	d to in	LPO I (examination regu	lations for teaching-d	legree programmes)	
§ 53 l N					
Module		ars in			
		mination for the teaching	r degree Grundschule	Physics (2015)	
		mination for the teaching	-	• •	
		mination for the teaching	-	-	
		mination for the teaching	-	•	
		mination for the teaching	-	•	
		mination for the teaching	-	-	
		mination for the teaching	-		
		mination for the teaching	-	•	
		mination for the teaching	-	•	
			Segree milleschule		

LA Realschulen Physics (2015)	JMU Würzburg ● generated 18-Apr-2025 ● exam. reg. data record Lehramt Realschulen Physik - 2015	page 39 / 58
	reg. data record zemaint redischaten mysik zorj	

Module	e title				Abbreviation
Physic	s: Pract	tical Training and Theory	of Classroom		11-L-SBPRS-152-m01
Module	e coord	inator		Module offered by	
holder	of the (	Chair of Physics and its D	idactics	Faculty of Physics a	and Astronomy
ECTS Method of grading Only after succ. cor		npl. of module(s)			
4	(not) s	successfully completed			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	Its				
dical p and ho cussed lyse cla sequer transpa	ractice Iding c I in agre asses; I aces an arency s	of Physics by observing a lasses themselves. In the eement with the teachers basics of general school a d models; introduction to	and discussing classe e corresponding semi and class pedagogics o the usage of moder	es. They consolidate nar, the following to curriculum of Realsc s; subject-specific wo n media; developme	edagogical, didactic and metho- their knowledge by preparing pics (among others) will be dis- hule; criteria to observe and ana- ork methods; planning of class ent of blackboard pictures and ding seminar also helps the stu-
		ning outcomes			
are abl lect an school	e to im d use n pedago	plement the contents of the contents of the contents of the content of the conten	the curricula for differ al forms according to	rent grades in a prac learning goals; they	ring and organising classes; they stical manner; they are able to se- are able to connect findings of ad to integrate these findings into
Course	<b>s</b> (type	, number of weekly conta	act hours, language –	- if other than Germa	an)
P (o) +	S (2)				
		sessment (type, scope, la on on whether module c			ation offered — if not every seme-
Conten regulat tasks a	its and ions fo is speci		mmes); participation		ntence 1 No. 4 LPO I (examination ing practice, completion of all set
Allocat	ion of p	olaces			
Additio	onal inf	ormation			
Worklo	ad				
120 h					
	ng cycl	e			
			-		
Referre	ed to in	LPOI (examination regu	llations for teaching-o	legree programmes)	
9 34 1 1	111. //				
§ 34   1 Module	e appea	urs in			

LA Realschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam.	page 40 / 58
	reg. data record Lehramt Realschulen Physik - 2015	

Module title				Abbreviation	
	rk in Teaching Concept	5		11-L-WPD-152-m01	
				11 E WI B 152 mor	
Module coord	linator		Module offered by		
Managing Dir	ector of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS Meth	od of grading	Only after succ. con	npl. of module(s)		
3 (not)	successfully completed				
Duration	Module level	Other prerequisites			
1 semester	undergraduate				
Contents	•				
Current tonics	in scientific work in pł	hysics education			
	ning outcomes				
				1 11 /	
	have knowledge of a cu ucation on the basis of		physics education ar	id are able to proces	s questions
			if a the set the set of a second		
	, number of weekly cor	itact nours, language –	- If other than Germa	n)	
S (2) Madula taugh	tin. Cormon or Frail-1				
	t in: German or English				
	<b>sessment</b> (type, scope, ion on whether module			tion offered — if not	every seme-
			a DUIIUS)		
talk (30 to 45					
Allocation of	places				
Additional inf	ormation				
Workload					
90 h					
Teaching cycl	0				
Teaching cycl					
	LPOI (examination re	gulations for teaching-	degree programmes)		
§ 22    Nr. 1 h)					
§ 22    Nr. 2 f) § 22    Nr. 3 f)					
	•				
Module appea					
	mination for the teaching		-		)
	mination for the teaching		•	6 (Primary School) (2	015)
	mination for the teachi mination for the teachi		•		
	mination for the teach		• -	weice (Middlo Schoo	)) (2015)
	mination for the teach				)() (2015)
	mination for the teachi			(Middle School) (20	15)
			•		15)
	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 exa			Didactics in Physics	s (Primary School) (2	018)
First state exa First state exa	mination for the teachi	ng degree Grundschule	•	s (Primary School) (2	018)
First state exa First state exa First state exa		ng degree Grundschule ng degree Realschule F	Physics (2018)	s (Primary School) (2	018)
First state exa First state exa First state exa First state exa	mination for the teachi mination for the teachi	ng degree Grundschule ng degree Realschule F ng degree Gymnasium	Physics (2018) Physics (2018)	s (Primary School) (2	018)
First state exa First state exa First state exa First state exa First state exa	mination for the teachi mination for the teachi mination for the teachi	ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Mittelschule	Physics (2018) Physics (2018) Physics (2018)		
First state exa First state exa First state exa First state exa First state exa First state exa	mination for the teachi mination for the teachi mination for the teachi mination for the teachi	ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Mittelschule ng degree Sonderpäda	Physics (2018) Physics (2018) Physics (2018) gogik Didactics in Ph	nysics (Middle Schoo	ol) (2018)
First state exa First state exa	mination for the teachi mination for the teachi mination for the teachi mination for the teachi mination for the teachi	ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Mittelschule ng degree Sonderpäda ng degree Mittelschule	Physics (2018) Physics (2018) Physics (2018) gogik Didactics in Ph Didactics in Physics	nysics (Middle Schoo (Middle School) (20	ol) (2018) 018)
First state exa First state exa	mination for the teach mination for the teach	ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Mittelschule ng degree Sonderpäda ng degree Mittelschule ng degree Grundschule	Physics (2018) Physics (2018) Physics (2018) gogik Didactics in Ph Didactics in Physics	nysics (Middle Schoo (Middle School) (20 5 (Primary School) (2	ol) (2018) 018)

## Julius-Maximilians-UNIVERSITÄT WÜRZBURG

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)

reg. data record Labrant Dealschulen Dhysik, and	LA Realschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam.	page 42 / 58
leg. data lecold Lemanic Realschulen Physik - 2015		reg. data record Lehramt Realschulen Physik - 2015	

Module	e title			Abbreviation	
Current	t Topics in Physics			11-LX6-152-m01	
	e coordinator		Module offered by		
· · ·	erson of examination committe		Faculty of Physics a	nd Astronomy	
ECTS	Method of grading	Only after succ. con	npl. of module(s)		
6	numerical grade				
Duratio		Other prerequisites		• •	
1 seme		Approval from exam	ination committee re	equired.	
Conten	ts				
Current	topics in physics.				
Intende	ed learning outcomes				
lation r	dents have knowledge of a cu nethods necessary to acquire he application areas.				
Course	<b>s</b> (type, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (3) +	R (1)				
	<b>d of assessment</b> (type, scope, formation on whether module			tion offered — if not	every seme-
<ul> <li>c) oral (</li> <li>d) projection</li> <li>e) pressed</li> <li>lf a write</li> <li>stead tag</li> <li>of assed</li> <li>nation</li> </ul>	examination of one candidate examination in groups (groups ect report (approx. 8 to 10 page entation/talk (approx. 30 minu tten examination was chosen a ake the form of an oral examinu ssment is changed, the lecture date at the latest. ge of assessment: German an	of 2, approx. 30 minu es) or utes) as method of assessm ation of one candidate er must inform student	tes per candidate) o ent, this may be char e each or an oral exa	nged and assessmer mination in groups.	If the method
Allocat	ion of places				
Additio	nal information				
Worklo					
	au				
180 h					
Teachi	ng cycle				
Referre	d to in LPO I (examination reg	ulations for teaching-	degree programmes)		
§ 22      § 22      § 22	Nr. 2 f)				
Module	e appears in				
	ate examination for the teaching	ng degree Grundschule	Physics (2015)		
First sta First sta	ate examination for the teachin ate examination for the teachin ate examination for the teachin ate examination for the teachin	ng degree Realschule F ng degree Gymnasium	Physics (2015) Physics (2015)		
	ate examination for the teaching	,		., sies (maare senoe	, (LUU)
	ate examination for the teaching			(Middle School) (20	015)
	ulen Physics (2015)	JMU Würzbi	irg • generated 18-Apr-2025 •	exam.	page 43 / 58
		reg. data reco	ord Lehramt Realschulen Phys	ык - 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 (Middle School) (2020) First state examination for the teaching degree Grundschule Physics (2020) First state examination for the teaching degree Grundschule Physics (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 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 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 Didactics in Physics (Middle School) (2020) First state examination for the teaching degree Mittelschule Physics (2020)

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	reg. data record Lehramt Realschulen Physik - 2015	

Low Co	e title				Abbreviation	
	st - Hig	h Impact. Low-budget	Experiments for Sciend	ce Courses (Phy-	11-MIND-Ph1-152-m	01
sics)						
Module	e coord	inator		Module offered by		
holder	of the C	hair of Physics and its	Didactics	Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. com	npl. of module(s)		
2	(not) s	uccessfully completed				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	its					
Concer	otion an	d realisation of experir	nental stations with or	dinary and inexpens	ive consumables for	classes of
		nd secondary level I.		,		
Intende	ed learr	ning outcomes				
		levelop simple scientifi	c experimenting statio	ons to use for the tra	nsition from primary	to seconda-
ry level	l for sn	nall groups from differe	nt types of schools. In	doing so, they learn		
		ant to the curriculum in				
Course	<b>s</b> (type,	number of weekly con	tact hours, language –	- if other than Germa	in)	
S (2)						
	d of ass	essment (type, scope,	language — if other tha	an German, examina	tion offered — if not	every seme-
		on on whether module				···· <b>,</b> ····
a) writt	en exar	nination (approx. 45 m	nutes) or			
		ation of one candidate		ites) or		
		ation in groups (groups	of 2, approx. 20 minu	tes) or		
	· · ·	(approx. 8 pages)				
Allocat	ion of p	laces				
Additio	onal info	ormation				
This mo	odule is	designed for students	studying at least one s	subject in the natura	l sciences.	
Worklo	ad					
60 h						
0011						
Teachi	ing cycu	a				
Teachi		9				
 Referre		e LPO I (examination reg	ulations for teaching-o	legree programmes)		
 <b>Referre</b> § 22	Nr. 1 h)		ulations for teaching-c	degree programmes)		
 <b>Referre</b> § 22      § 22	Nr. 1 h) Nr. 2 f)		ulations for teaching-o	degree programmes)		
 <b>Referre</b> § 22      § 22      § 22	Nr. 1 h) Nr. 2 f) Nr. 3 f)	LPOI (examination reg	ulations for teaching-o	legree programmes)		
 Referre § 22      § 22      § 22      Module	Nr. 1 h) Nr. 2 f) Nr. 3 f) <b>e appea</b>	LPOI (examination reg				
 <b>Referre</b> § 22      § 22      § 22      <b>Module</b> First sta	Nr. 1 h) Nr. 2 f) Nr. 3 f) <b>e appea</b> ate exal	LPO I (examination reg rs in mination for the teachin	ng degree Grundschule	Physics (2015)		015)
 <b>Referre</b> § 22      § 22      § 22      <b>Module</b> First sta First sta	Nr. 1 h) Nr. 2 f) Nr. 3 f) <b>e appea</b> ate exal ate exal	LPO I (examination reg rs in mination for the teachin mination for the teachin	ng degree Grundschule ng degree Grundschule	e Physics (2015) e Didactics in Physic		015)
 <b>Referre</b> § 22      § 22      § 22      <b>Module</b> First sta First sta	Nr. 1 h) Nr. 2 f) Nr. 3 f) e appea ate exal ate exal ate exal	LPO I (examination reg rs in mination for the teachin mination for the teachin mination for the teachin	ng degree Grundschule ng degree Grundschule ng degree Realschule F	e Physics (2015) e Didactics in Physics Physics (2015)		015)
 <b>Referre</b> § 22      § 22      § 22      <b>Module</b> First sta First sta First sta First sta	Nr. 1 h) Nr. 2 f) Nr. 3 f) e appea ate exal ate exal ate exal ate exal	LPOI (examination reg rs in mination for the teachin mination for the teachin mination for the teachin mination for the teachin	ng degree Grundschule ng degree Grundschule ng degree Realschule F ng degree Gymnasium	e Physics (2015) e Didactics in Physics Physics (2015) Physics (2015)	s (Primary School) (2	-
 <b>Referre</b> § 22      § 22      <b>§</b> 22      <b>Module</b> First sta First sta First sta First sta First sta	Nr. 1 h) Nr. 2 f) Nr. 3 f) e appea ate exal ate exal ate exal ate exal ate exal	LPO I (examination reg rs in mination for the teachin mination for the teachin mination for the teachin	ng degree Grundschule ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Sonderpäda	e Physics (2015) e Didactics in Physics Physics (2015) Physics (2015) gogik Didactics in Pl	s (Primary School) (2	-
 <b>Referre</b> § 22      § 22      § 22      <b>Module</b> First sta First sta First sta First sta First sta First sta	Nr. 1 h) Nr. 2 f) Nr. 3 f) e appea ate exal ate exal ate exal ate exal ate exal ate exal ate exal	LPO I (examination reg rs in mination for the teachin mination for the teachin mination for the teachin mination for the teachin mination for the teachin	ng degree Grundschule ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Sonderpäda ng degree Mittelschule	e Physics (2015) e Didactics in Physic Physics (2015) Physics (2015) gogik Didactics in Pl Physics (2015)	s (Primary School) (2 nysics (Middle Schoo	ol) (2015)
 <b>Referre</b> § 22      § 22      § 22      <b>Module</b> First sta First sta First sta First sta First sta First sta First sta First sta First sta	Nr. 1 h) Nr. 2 f) Nr. 3 f) e appea ate exal ate exal ate exal ate exal ate exal ate exal ate exal ate exal	LPO I (examination reg rs in mination for the teachin mination for the teachin	ng degree Grundschule ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Sonderpäda ng degree Mittelschule ng degree Mittelschule	e Physics (2015) e Didactics in Physics Physics (2015) Physics (2015) gogik Didactics in Pl Physics (2015) Didactics in Physics	s (Primary School) (2 nysics (Middle Schoo	ol) (2015)
<b>Referre</b> § 22              § 22              § 22              § 22              § 22      <b>Module</b> First sta         First sta	Nr. 1 h) Nr. 2 f) Nr. 3 f) e appea ate exal ate exal ate exal ate exal ate exal ate exal ate exal ate exal ate exal	LPO I (examination reg rs in mination for the teachin mination for the teachin	ng degree Grundschule ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Sonderpäda ng degree Mittelschule ng degree Mittelschule ng degree Grundschule ng degree Grundschule	e Physics (2015) e Didactics in Physics Physics (2015) Physics (2015) gogik Didactics in Pl Physics (2015) Didactics in Physics e Physics (2018) e Didactics in Physics	s (Primary School) (2 hysics (Middle Schoo s (Middle School) (20	ol) (2015) 015)
 <b>Referre</b> § 22      § 22      § 22      <b>Module</b> First sta First sta	Nr. 1 h) Nr. 2 f) Nr. 3 f) e appea ate exal ate exal	LPO I (examination reg rs in mination for the teachin mination for the teachin	ng degree Grundschule ng degree Grundschule ng degree Realschule F ng degree Sonderpäda ng degree Sonderpäda ng degree Mittelschule ng degree Grundschule ng degree Grundschule ng degree Realschule F	e Physics (2015) e Didactics in Physics Physics (2015) Physics (2015) gogik Didactics in Pl Physics (2015) Didactics in Physics e Physics (2018) e Didactics in Physics Physics (2018)	s (Primary School) (2 hysics (Middle Schoo s (Middle School) (20	) (2015) (2015)
 <b>Referre</b> § 22      § 22      § 22      <b>Module</b> First sta First sta	Nr. 1 h) Nr. 2 f) Nr. 3 f) e appea ate exal ate exal	LPO I (examination reg rs in mination for the teachin mination for the teachin	ng degree Grundschule ng degree Grundschule ng degree Realschule F ng degree Sonderpäda ng degree Sonderpäda ng degree Mittelschule ng degree Grundschule ng degree Grundschule ng degree Realschule F	e Physics (2015) e Didactics in Physics Physics (2015) Physics (2015) gogik Didactics in Pl Physics (2015) Didactics in Physics e Physics (2018) e Didactics in Physics Physics (2018)	s (Primary School) (2 hysics (Middle Schoo s (Middle School) (20	ol) (2015) 015)

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

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	reg. data record Lehramt Realschulen Physik - 2015	

Module	e title			Abbreviation		
	ng Science with Hands-on-Exhi	ibits (Physics)	11-MIND-Ph2-152-m01			
Module	e coordinator		Module offered by			
holder	of the Chair of Physics and its I	Didactics	dactics Faculty of Physics and Astronomy			
ECTS	Method of grading	Only after succ. con	pl. of module(s)			
2	(not) successfully completed					
Duratio	on Module level	Other prerequisites				
1 seme	ster undergraduate					
Conten	its					
			-			
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 con- tents in and out of school. They plan and implement an interdisciplinary science exhibition as an example of pro-						
			rdisciplinary science	e exhibition as an example of pro-		
	ject-oriented work with pupils of secondary level I and II.					
	<b>Courses</b> (type, number of weekly contact hours, language — if other than German)					
S (2)						
	<b>d of assessment</b> (type, scope, l formation on whether module of			tion offered — if not every seme-		
a) writt	en examination (approx. 45 mi	nutes) or				
	examination of one candidate		ites) or			
	examination in groups (groups	of 2, approx. 20 minu	tes) or			
d) term	paper (approx. 8 pages)	_				
Allocat	ion of places					
Additio	onal information					
This mo	odule is designed for students	studving at least one	subject in the natura	lsciences		
Worklo						
60 h						
		_				
Teachi	ng cycle					
		_				
Referre	ed to in LPO I (examination reg	ulations for teaching-	degree programmes)			
§ 22	Nr. 1 h)					
§ 22						
§ 22	Nr. 3 f)					
Module	e appears in					
First sta	ate examination for the teachin	ig degree Grundschule	Physics (2015)			
First sta	ate examination for the teachin	ig degree Grundschule	Didactics in Physics	s (Primary School) (2015)		
First sta	ate examination for the teachin	ig degree Realschule F	hysics (2015)			
	ate examination for the teachin	,	-			
	First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)					
	ate examination for the teachin		•			
	ate examination for the teachin		•	s (Middle School) (2015)		
	ate examination for the teachin		-			
	ate examination for the teachin			5 (Filmary School) (2018)		
	ate examination for the teachin		•			
	ate examination for the teachin ate examination for the teachin					
11131 310			-			
LA Realsch	ulen Physics (2015)		ırg • generated 18-Apr-2025 • Ird Lehramt Realschulen Phys			
		ieg. uala fell	nu Lemanni Keaischulen Pflys	DIN - 2012		

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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)

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	reg. data record Lehramt Realschulen Physik - 2015	

Module	e title				Abbreviation	
Mather	natical	Methods of Physics			11-M-MR-152-m01	
Module	coordi	nator		Module offered by	<u> </u>	
		ctor of the Institute of	heoretical Physics	Faculty of Physics and Astronomy		
and Ast			neoretical injoites		ind Astronomy	
ECTS	Metho	d of grading	Only after succ. cor	Only after succ. compl. of module(s)		
6	(not) s	uccessfully completed				
Duratio	n	Module level	Other prerequisites	<b>i</b>		
2 seme	ster	undergraduate				
Conten	ts					
•		nathematics and basic preparation of the mo				
Intende	ed learn	ing outcomes				
		nave knowledge of the peoretical and Experime	•	tics and elementary	calculation methods	which are
Course	<b>s</b> (type,	number of weekly con	act hours, language -	- if other than Germa	in)	
• •		/ (2) + Ü (1)				
		in: German or English				
		<b>essment</b> (type, scope, on on whether module			tion offered — if not	every seme-
		uccessful completion o	f approx. 50% of appr	ox. 13 exercise sheet	ts) or	
b) talk	(approx	. 15 minutes)				
Allocat	ion of p	laces				
			_			
Additio	nal info	ormation				
			_			
Worklo	ad					
180 h						
Teachi	ng cycle	9				
Referre	d to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
§ 53   N § 77   N						
Module		rs in				
Bachel	or's deg	gree (1 major) Physics (	2015)			
Bachel	or's deg	gree (1 major) Nanostru	cture Technology (201	5)		
	-	gree (1 major) Mathema	,			
	-	gree (1 major, 1 minor) l	• -			
		nination for the teaching				
		mination for the teachin mination for the teachin				
		mination for the teaching		-		
		gree (1 major) Mathema		2 1 11 9 10 9 (2015)		
	_	mination for the teaching	-	e Physics (2018)		
		nination for the teaching				
		nination for the teachi				
First sta	ate exar	mination for the teachi	ng degree Mittelschule	e Physics (2018)		
A Realsch	ulen Physio	cs (2015)	JMU Würzb	urg • generated 18-Apr-2025 •	• exam.	page 49 / 58
			reg. data rec	ord Lehramt Realschulen Phys	sik - 2015	

Modul	e title				Abbreviation	
Demon	stratio	n Laboratory Course 1			11-P-DP1-152-m01	
Modul	e coord	inator		Module offered by		
holder	of the (	Chair of Physics and its D	idactics	Faculty of Physics and Astronomy		
		Only after succ. com	· · · · ·	,		
4		rical grade		• • • •		
Duratio	on	Module level	Other prerequisites			
1 seme		undergraduate				
Conten	Its					
used ir hand e	n schoo xperim	l, goal setting and didact ents, model experiments	ic potential of demor , etc.; computer-aide	nstration experiment d experiments; mea	l, knowledge of tools typically is, student experiments, free- sured value acquisition, interac ucation, presentation competer	
	ed learı	ning outcomes				
matic a and the learnin	analysis eir dida g goals	of error sources of own ctic potential; experience	experiments; identifice in choosing, constru	cation of categories ucting and presentin	in commerce and school; syste of experiments, their functions g experiments according to the ation and pupils experiments;	
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	- if other than Germa	n)	
P (4)						
		e <b>ssment</b> (type, scope, la on on whether module ca			tion offered — if not every seme	
b) oral	examin	ation of one candidate e ation in groups (groups ( ssessment: German and,	of 2, approx. 10 minu			
	ion of p					
	· · · ·					
Additic	nal inf	ormation				
Worklo	au					
120 h						
	ng cycl	e				
Teachi						
 Referre	ed to in	LPOI (examination regu	lations for teaching-c	degree programmes)		
 <b>Referre</b> § 53   N	<b>ed to in</b> Vr. 1 c)	LPOI (examination regu	lations for teaching-o	degree programmes)		
 <b>Referre</b> § 53   N § 77   N	<b>ed to in</b> Vr. 1 c)		lations for teaching-c	degree programmes)		
 Referre § 53   N § 77   N Module	ed to in Ir. 1 c) Ir. 1 d) e appea					
 Referre § 53   N § 77   N Module First st	ed to in Vr. 1 c) Vr. 1 d) e appea ate exa	ars in	g degree Grundschule	Physics (2015)		
 Referre § 53   N § 77   N Module First st First st First st	ed to in Nr. 1 c) Nr. 1 d) e appea ate exa ate exa ate exa ate exa	r <b>s in</b> mination for the teaching	g degree Grundschule g degree Realschule F g degree Gymnasium	e Physics (2015) Physics (2015) Physics (2015)		

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	reg. data record Lehramt Realschulen Physik - 2015	1

Module title				Abbreviation			
Data and Erro	r Analysis		_	11-P-FR1-152-m01			
Module coord	linator		Module offered by				
	ector of the Institute of A	· · · · · · · · · · · · · · · · · · ·					
	od of grading	Only after succ. compl. of module(s)					
	successfully completed						
Duration	Module level	Other prerequisites					
1 semester undergraduate		Admission prerequi 13 exercise sheets p approx. 50% of exe	site to assessment: o per semester). Stude rcises will qualify for students about the re	nts who successfully admission to assess	completed		
Contents							
and standard		nd propagation, grap	nic representations,	inear regression, me	ean values		
	ning outcomes						
	are able to evaluate me to draw, present and di			ation and of the prin	nciples of		
Courses (type	e, number of weekly cont	act hours, language –	- if other than Germa	n)			
V (1) + Ü (1) Module taugł	nt in: Ü: German or Engli	sh					
	<b>sessment</b> (type, scope, ion on whether module			tion offered — if not	every seme-		
	nation (approx. 120 min assessment: German an						
Allocation of							
Additional in	formation						
this will be co 3 Sentence 4 find that the s gistration for ly register for sessment wa	If a student registers for onsidered a declaration of ASPO (general academic student has obtained the assessment into effect. an assessment. Studen s not put into effect will which he/she has not be	of will to seek admissi c and examination reg e qualification for adm Only those students th ts who did not register not be admitted to the	on to assessment pu ulations). If the mod lission to assessmen nat meet the respect for an assessment of respective assessm	rsuant to Section 20 ule coordinators sub it, they will put the s ve prerequisites car or whose registration ent. If a student take	Subsection sequently tudent's re- successful- for an as- es an as-		
Workload							
60 h							
Teaching cyc	le						
Referred to in	LPOI (examination reg	ulations for teaching-	degree programmes)				
§ 53   Nr. 1 c) § 77   Nr. 1 d)							
Module appe	ars in						
Bachelor's de Bachelor's de	gree (1 major) Mathema gree (1 major) Physics (2 gree (1 major) Nanostru	2015)	5)				
A Realschulen Phys							

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Bachelor's degree (1 major) Mathematical Physics (2015) Bachelor's degree (1 major) Computational Mathematics (2015) Bachelor's degree (1 major) Aerospace Computer Science (2015) Bachelor's degree (1 major) Functional Materials (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 Realschule Physics (2015) First state examination for the teaching degree Gymnasium Physics (2015) First state examination for the teaching degree Mittelschule Physics (2015) Bachelor's degree (1 major) Mathematical Physics (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 Realschule Physics (2018) First state examination for the teaching degree Gymnasium Physics (2018) First state examination for the teaching degree Mittelschule Physics (2018) Bachelor's degree (1 major) Physics (2020) Bachelor's degree (1 major) Nanostructure Technology (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 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 Mittelschule Physics (2020) Bachelor's degree (1 major) Functional Materials (2021) Bachelor's degree (1 major) Quantum Technology (2021) Bachelor's degree (1 major) Mathematics (2023) exchange program Physics (2023) Bachelor's degree (1 major) Mathematical Physics (2024) Bachelor's degree (1 major) Functional Materials (2025)

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	reg. data record Lehramt Realschulen Physik - 2015	

Module	title			Abbreviation		
Laborat	tory Course Physics A(Mech	anics, Heat, Electromag	netism)	11-P-LA-152-m01		
Madula	coordinator		Module offered			
		f Ameliad Direct	1			
	ng Director of the Institute o		· · · · · ·	cs and Astronomy		
	Method of grading		Only after succ. compl. of module(s)			
2	(not) successfully complete					
Duratio		Other prerequisites	S			
1 semes						
Content	ts					
rents, h		ensity of bodies, dynam	ic viscosity, elasti	g. measurement of voltages and cu city, surface tension, spring con-		
Intende	ed learning outcomes					
She is a		ependently and to perfe		and experimental techniques. He/ ration with others, and to document		
Courses	<b>s</b> (type, number of weekly co	ontact hours, language -	– if other than Ge	rman)		
P (2)						
	l of assessment (type, scope	e, language — if other th	ian German. exam	ination offered — if not every seme		
	formation on whether modul					
cessfull can be r	ly completed if a Testat (exa repeated once. After comple	m) is passed. Exactly or tion of all experiments,	ne experiment tha talk (with discuss	xperiments will be considered suc- t was not successfully completed sion; approx. 30 minutes) to test the		
cessfull can be r candida pleted c	ly completed if a Testat (exa repeated once. After comple	m) is passed. Exactly or tion of all experiments, hysics-related contents	ne experiment tha talk (with discuss of the module. Ta	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com-		
cessfull can be r candida pleted c Allocati	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both <b>ion of places</b>	m) is passed. Exactly or tion of all experiments, hysics-related contents	ne experiment tha talk (with discuss of the module. Ta	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com-		
cessfull can be r candida pleted c Allocati	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both	m) is passed. Exactly or tion of all experiments, hysics-related contents	ne experiment tha talk (with discuss of the module. Ta	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com-		
cessfull can be r candida pleted c Allocati  Addition 	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information	m) is passed. Exactly or tion of all experiments, hysics-related contents	ne experiment tha talk (with discuss of the module. Ta	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com-		
cessfull can be r candida pleted c Allocati  Addition  Workloa	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information	m) is passed. Exactly or tion of all experiments, hysics-related contents	ne experiment tha talk (with discuss of the module. Ta	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com-		
cessfull can be r candida pleted c Allocati  Addition  Workloa 60 h	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information ad	m) is passed. Exactly or tion of all experiments, hysics-related contents	ne experiment tha talk (with discuss of the module. Ta	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com-		
cessfull can be r candida pleted c Allocati  Addition  Workloa	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information ad	m) is passed. Exactly or tion of all experiments, hysics-related contents	ne experiment tha talk (with discuss of the module. Ta	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com-		
cessfull can be r candida pleted c Allocati  Addition  Workloa 60 h	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information ad	m) is passed. Exactly or tion of all experiments, hysics-related contents	ne experiment tha talk (with discuss of the module. Ta	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com-		
cessfull can be r candida pleted c Allocati  Addition  Workloa 60 h Teachin 	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information ad	m) is passed. Exactly or tion of all experiments, hysics-related contents components of the asse	ne experiment tha talk (with discuss of the module. Ta essment have to b	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com- e successfully completed.		
cessfull can be r candida pleted c Allocati  Addition  Workloa 60 h Teachin  Referree § 53 l Ni	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information ad ad to in LPO I (examination r r. 1 c)	m) is passed. Exactly or tion of all experiments, hysics-related contents components of the asse	ne experiment tha talk (with discuss of the module. Ta essment have to b	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com- e successfully completed.		
cessfull can be r candida pleted c Allocati  Addition  Workloa 60 h Teachin  Referree § 53   Ni § 77   Ni	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information ad ad to in LPO I (examination r r. 1 c)	m) is passed. Exactly or tion of all experiments, hysics-related contents components of the asse	ne experiment tha talk (with discuss of the module. Ta essment have to b	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com- e successfully completed.		
cessfull can be r candida pleted c Allocati  Addition  Workloa 60 h Teachin  § 53 I Ni § 77 I Ni Module First sta	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information ad ad ad to in LPO I (examination r r. 1 c) r. 1 d) appears in ate examination for the teach	m) is passed. Exactly or tion of all experiments, hysics-related contents components of the asse egulations for teaching-	e Physics (2015)	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com- e successfully completed.		
cessfull can be r candida pleted o Allocati  Addition  Workloa 60 h Teachin  § 53   Ni § 77   Ni Module First sta First sta	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information ad ad ad ad ad ad ad ad ad ad ad ad ad	m) is passed. Exactly or tion of all experiments, hysics-related contents components of the asse egulations for teaching- ning degree Grundschul ning degree Realschule	e Physics (2015) Physics (2015)	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com- e successfully completed.		
cessfull can be r candida pleted c Allocati  Addition  Workloa 60 h Teachin  § 53 l Ni § 77 l Ni Module First sta First sta First sta	ly completed if a Testat (exa repeated once. After comple ate's understanding of the p can be repeated once. Both ion of places nal information ad ad ad ad ad ad ad ad ad ad ad ad ad	m) is passed. Exactly or tion of all experiments, hysics-related contents components of the asse egulations for teaching- ning degree Grundschul ning degree Gymnasium	e Physics (2015) Physics (2015) Physics (2015)	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com- e successfully completed.		
cessfull can be r candida pleted c Allocati  Addition  Workloa 60 h Teachin  § 53 l Ni § 77 l Ni Module First sta First sta First sta First sta	ly completed if a Testat (exa repeated once. After complete ate's understanding of the p can be repeated once. Both ion of places nal information ad ad ad ad ad ad to in LPO I (examination reference) r. 1 c) r. 1 d) e appears in ate examination for the teach ate examination for the teach	m) is passed. Exactly or tion of all experiments, hysics-related contents components of the asse egulations for teaching- ning degree Grundschul ning degree Realschule ning degree Mittelschul	e Physics (2015) Physics (2015) Physics (2015) Physics (2015)	t was not successfully completed sion; approx. 30 minutes) to test the lks that were not successfully com- e successfully completed.		
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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 Mittelschule Physics (2020)

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	reg. data record Lehramt Realschulen Physik - 2015	

Module	e title				Abbreviation	
		urse Physics B (Electric	ity, Circuits, Atomic a	nd Nuclear Physics)	11-P-LB-152-m01	
		- · ·				
Module	e coord	inator		Module offered by		
Managi	ing Dire	ector of the Institute of A	pplied Physics	plied Physics Faculty of Physics and Astronomy		
ECTS	Metho	od of grading	Only after succ. con	Only after succ. compl. of module(s)		
5 (not) successfully completed						
Duratio	n	Module level	Other prerequisites			
2 seme	ster	undergraduate		recommended to co	mplete modules 11-F	P-LA and 11-P-
5		FR1 prior to complet				
Conten	ts		, , <u>,</u>	-		
		of the science of electri		rical components an	d Atomic and Nucles	ar Dhucicc
		of the science of electri	city, circuits with elect	ncal components an	a Alomic and Nuclea	ar Physics.
Intende	ed learr	ning outcomes				
		nave knowledge and sk				
		ependently plan and co	onduct experiments in	cooperation with oth	hers, and to docume	nt the results
		nent protocol.				
Courses	<b>s</b> (type,	number of weekly cont	act hours, language –	- if other than Germa	n)	
P (2) + F	P (2)		_			
Method	d of ass	essment (type, scope,	anguage — if other th	an German, examina	tion offered — if not	every seme-
ster, inf	formati	on on whether module	can be chosen to earn	a bonus)		·
practica	al assig	nment with talk (appro	x. 30 minutes)			
		forming and evaluating		lab report) the expe	riments will be consi	idered suc-
		oleted if a Testat (exam)				
can be	repeate	ed once. After completion	on of all experiments,	talk (with discussion	; approx. 30 minutes	s) to test the
		nderstanding of the phy				
pleted o	can be	repeated once. Both co	mponents of the asse	ssment have to be su	uccessfully complete	ed.
Allocati	ion of p	olaces				
Additio	nal info	ormation				
Worklo	ad					
150 h						
Teachin	ng cycl	e				
Referre	d to in	LPOI (examination reg	 ulations for teaching-	degree programmes)		
		3 ECTS credits) and c) (		203.00 p.03.00)		
§ 53 I N						
\$ 77 I N						
Module		rc in				
			a dogroo Crupdoshul	Dhysics (2017)		
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LA Realschu	ulen Physi	cs (2015)		urg • generated 18-Apr-2025 •		page 55 / 58
			reg. data reco	ord Lehramt Realschulen Phys	SIK - 2015	



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 Mittelschule Physics (2020)

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	reg. data record Lehramt Realschulen Physik - 2015	

Module	e title				Abbreviation	
Prepara	atory C	ourse Mathematics			11-P-VKM-152-m01	
Module	a coord	inator		Module offered by		
			Applied Dhusics and	· · · ·	nd Actronomic	
		ectors of the Institute of f Theoretical Physics and		Faculty of Physics a	na Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
2	(not) s	successfully completed				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts		•			
the intr 1. Basic 2. Coor 3. Vector 4. Diffe 5. Integ Intender The stur succes Course T (2) Method ster, in a) exerc	roduction c geom rdinate ors - veo rrential gral calo ed learn idents i sfully s s (type d of ass formation	nathematics and elemer on to and preparation fo etry and algebra systems and complex no ctored values calculus culus <b>ning outcomes</b> know the principles of m tudying Theoretical and , number of weekly conta sessment (type, scope, la ion on whether module of successful completion of x. 15 minutes)	r the modules of Expe umbers athematics and elem Experimental Physics act hours, language – anguage – if other the an be chosen to earn	rimental and Theore entary calculation m - if other than Germa an German, examina a bonus)	ethods which are re n) tion offered — if not	quired for
Allocat 	ion of <sub>l</sub>	ffered: Once a year, wint olaces ormation				
Worklo	ad					
60 h						
Teachi	ng cvcl	e				
	3	-				
Referre	d to in	LPO I (examination reg	lations for teaching-	degree programmes)		
§ 22      § 22      § 22      § 22	Nr. 1 h) Nr. 2 f)					
Module	e appea	ars in				
Bachel Bachel Bachel First sta First sta	or's de or's de or's de ate exa ate exa	gree (1 major) Physics (2 gree (1 major) Nanostruc gree (1 major) Mathemat gree (1 major, 1 minor) P mination for the teachin mination for the teachin	ture Technology (201 ical Physics (2015) hysics (Minor, 2015) g degree Grundschule g degree Grundschule	e Physics (2015) e Didactics in Physics	5 (Primary School) (2	2015)
		mination for the teachin mination for the teachin	g degree Realschule F g degree Gymnasium	• •		

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)

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