

Module Catalogue

for the Subject

Physics

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

Grundschulen"

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

JMU Würzburg • generated 18-Apr-2025 • exam. reg. data record L1|128|-|-|H|2015



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The subject is divided into

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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

I A Gri

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 (2015-217)

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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Scientific Discipline

(54 ECTS credits)

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Compulsory Courses

(54 ECTS credits)

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Classical Physics

(16 ECTS credits)

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Module	title			Abbreviation
Classical Physics 1 (Mechanics) 11-E-M-152-mo1			11-E-M-152-m01	
Module coordinator			Module offered by	
Managin	g Director of the Institute of A	pplied Physics	Faculty of Physics a	nd Astronomy
ECTS	Method of grading	Only after succ. con	pl. of module(s)	
	numerical grade		•	
Duration		Other prerequisites		
1 semes	ter undergraduate	13 exercise sheets p approx. 50% of exer	er semester). Studer cises will qualify for	completion of exercises (approx. nts who successfully completed admission to assessment. The espective details at the beginnin
Contents	5			
2. Point motion, 3. Newto mic scal 4. Work 5. Elastic and bala 6. Conse and pote 7. Rotati gies to li in the ce 8. Tidal f gal force 9. Galile postulat pulse; 10. Rigid their sta tation, th 11. Friction mation; 12. Vibra power ap vibratior 13. Coup non-line 14. Wave at the op relation; 15. Elast 16. Fluid Bernoull pressive 17. Kinet	free fall, slate litter; circular m on's laws: Forces and moment e, isotropic and anisotropic fri and energy: (Kinetic) performa c, inelastic and super-elastic c ance system, rocket equation; ervative and non-conservative ential of gravity (general relation onal motion: Angular moment near translation, applications entral potential; forces: Inertial system, reference; an transformation: Brief digres es, problem of simultaneity, L body and gyroscope: Determ bility, tensor on the example of ne Earth as a spinning top; on: Static and dynamic friction ation: Representation by mean oproach, Taylor expansion, ha (resonant case, Kriechfall, appled vibrations: Eigenvalues ar ar dynamics and chaos; es: Wave equation, transverse been and closed end, speed of a ic deformation of solid bodies s: Hydrostatic pressure and bu i equation; Boyle-Mariotte, ga modulus;	on in 2D and 3D / vect notion in polar coordin um definition, weight iction. Preparation of f ance, examples; collision: Energy and n force fields: Potential ons); um, angular velocity, , satellites (geostation ace systems, apparent ssion to Maxwell's eq orentz transformation ining the centre of ma of the elasticity tensor n, stick-slip motion, ro as of complex e-function periodic limit), forced nd eigenfunctions, do and longitudinal wav sound; interference, E is Elastic modulus, gen uoyancy, surface tens is laws, barometric he eal gas, averages, dis	ors, special cases: U nates; vs. mass forces on t the equations of mot nomentum conserva , potential energy; la torque, rotational en nary and interstellar) : forces, Foucault per uations, ether, Miche , time dilation and le ss, inertia tensor and , physics of the bike olling friction, viscous on, equation of motion ; spring and pendul vibration, Fourier and uble pendulum, dete es, polarisation, prir Doppler effect; phase neral Hooke's law, el ion and contact angli ight formula, air pres	tion, surges in centre of mass aw, weight scale, field strength hergy, moment of inertia, analo- , escape velocities, trajectories indulum, Coriolis force, centrifu- elson interferometer, Einstein's ength contraction, relativistic im- d -ellipsoid, principal axes and ; gyroscope: Precession and nu- s friction, laminar flow, eddy for- on (DGL) on forces, torque and um, physical pendulum, damped alysis; erministic vs. chaotic motion, nciple of superposition, reflection e and group velocity, dispersion astic waves; le, capillary forces, steady flows, ssure, compressibility and com- equipartition theorem, Brownian

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.

 $\mathbf{Courses}$ (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 is creditable for 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

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

§ 53 | Nr. 1 a) § 77 | Nr. 1 a)

Module appears in

Module appears in			
Bachelor's degree (1 major) Physics	(2015)		
Bachelor's degree (1 major) Nanostr	ucture Technology (2015)		
Bachelor's degree (1 major) Mathem	atical 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	ing degree Grundschule Physics (2018)		
First state examination for the teach	ing degree Realschule Physics (2018)		
First state examination for the teach	ing degree Gymnasium Physics (2018)		
First state examination for the teach	ing degree Mittelschule Physics (2018)		
Bachelor's degree (1 major) Physics	(2020)		
Bachelor's degree (1 major) Nanostr	ucture Technology (2020)		
Bachelor's degree (1 major) Mathem	atical 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 teach	ing degree Realschule Physics (2020)		
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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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II-E-E-152-mo1 Module coordinator Module offered by Managing Director of the Institute of Applied Physics Faculty of Physics and Astronomy CTS Method of grading Only after succ. compl. of module(s) Interment of grading Only after succ. compl. of module(s) Interment of grading Only after succ. compl. of module(s) Interment of grading Only after succ. compl. of module(s) Interment of grading Only after succ. compl. of module(s) Interment of grading Only after succ. compl. of module(s) Interment of the summation of the summatin the summation of the summation of the summa	Module ti	tle		-	Abbreviation	
Managing Director of the Institute of Applied Physics Faculty of Physics and Astronomy ECTS Method of grading Only after succ. compl. of module(s) 8 numerical grade Duration Module level Other prerequisite to assessment: completion of exercises (approx. 13 exercise sheets per semester). Students who successfully completed approx. 50% of exercises will qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the semester. Contents In Thermodynamics (linked to 11-E-M); temperature and quantity of heat, thermometer, Kelvin scale; 2. Heat conduction, heat transfer, diffusion, convection, radiant heat; Semester 3. Fundamental theorems of thermodynamics, entrop, inversibility, Maxwell's demon; 4. Heat engines, working diagrams, efficiency, example: Stirling engine; 5. Real gases and liquids, states of matter (also solids), van der Waals, critical point, phase transitions, critical phenomena (opalescence), coexistence region, Joule-Thomson; 6. Electrostatics, basic concepts: Electrical charge, forces; electric field, reps. field concept, field lines, field of a point charge; 7. Gaussian sentence, related to Coulomb's law, definition of "river"; Gaussian surface, divergence theorem; spe cial symmetries; divergence and GS in differential form; 8. Electrical potential, working in the E-box, electric, potential, potential potential guation, internicon, fipole in homogeneous field, Millikan experiment, Braun tube; e	Classical Physics 2 (Heat and Electromagnetism)				11-E-E-152-m01	
ECTS Method of grading Only after succ. compl. of module(s) 8 numerical grade Duration Module level Other prerequisite to assessment: completion of exercises (approx. 13 exercise sheets per semester). Students who successfully completed approx. 50% of exercises will qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the semester. Contents	Module coordinator			Module offered by		
8 numerical grade Duration Module level Other prerequisites 1 semester undergraduate Admission prerequisite to assessment: completion of exercises (approx. 19 exercise sheets per semester). Students who successfully completed approx. 50% of exercises will qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the semester. 1. Thermodynamics (linked to 11-E-M); temperature and quantity of heat, thermometer, Kelvin scale; 2. Heat conduction, heat transfer, diffusion, convection, radiant heat; 3. Fundamental theorems of thermodynamics, entropy, irreversibility, Maxwell's demon; 4. Heat engines, working diagrams, efficiency, example: Stirling engine; 5. Real gases and liquids, states of matter (also solids), van der Waals, critical point, phase transitions, critical phenomena (opalescence), coexistence region, Joule Thomson; 6. Electrostatics, basic concepts: Electrical charge, forces; electric field, reps. field concept, field lines, field of a point charge; 7. Gaussian sentence, related to Coulomb's law, definition of "river"; Gaussian surface, divergence theorem; spe cial symmetries; divergence and GS in differential form; 8. Electrical potential, working in the E-box, electric. potential, potential opherical capacitor; coltage; electric dipole; lace effects, Segner wheel; 9. Matter in the E-field, charge in a homogeneous field, Millikan experiment, Braun tube; electror: Field emissi- on, thermionic emission, dipole in homogeneous field, Millikan experiment, genatitor, s	Managing	Director of the Institute of	Applied Physics	Faculty of Physics a	ind Astronomy	
8 numerical grade	ECTS M	ethod of grading	Only after succ. con	npl. of module(s)		
Duration Module level Other prerequisites 1 semester undergraduate Admission prerequisite to assessment: completion of exercises (approx. 13 exercises sheets per semester). Students who successfully completed approx. 50% of exercises swill qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the semester. Contents 1. Thermodynamics (linked to 11-E-M); temperature and quantity of heat, thermometer, Kelvin scale; 2. Heat conduction, heat transfer, diffusion, convection, radiant heat; 3. Fundamental theorems of thermodynamics, entropy, irreversibility, Maxwell's demon; 4. Heat engines, working diagrams, efficiency, example: Stirling engine; 5. Real gases and liquids, states of matter (also solids), van der Waals, critical point, phase transitions, critical phenomena (opalescence), coexistence region, Jouie-Thomson; 6. Electrostatics, basic concepts: Electrical charge, forces; electric field, reps. field concept, field lines, field of a point charge; 7. Gaussian sentence, related to Coulomb's law, definition of "river"; Gaussian surface, divergence theorem; spe cial symmetries; divergence and GS in differential form; 8. Electrical potential, working in the E-box, electric, potential, potential difference, voltage; potential equation, equipotential surfaces; several important examples: Siphere, hollow sphere, capacitor, fload pacitor; me- cial symmetrie; divergence and GS in differential com; 10. Capacitor, electroid polarisation, displacement and orientation polarisation, microscopic image; diel- ectric displacement; electrolyt				•		
1 semester undergraduate Admission prerequisite to assessment: completion of exercises (approx. 13 exercise sheets per semester). Students who successfully completed approx. 5% of exercises will qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the semester. Contents 			Other prerequisites			
 Thermodynamics (linked to 11-E-M); temperature and quantity of heat, thermometer, Kelvin scale; Heat conduction, heat transfer, diffusion, convection, radiant heat; Fundamental theorems of thermodynamics, entropy, irreversibility, Maxwell's demon; Heat engines, working diagrams, efficiency, example: Stirling engine; Real gases and liquids, states of matter (also solids), van der Waals, critical point, phase transitions, critical phenomena (opalescence), coexistence region, Joule-Thomson; Electrostatics, basic concepts: Electrical charge, forces; electric field, reps. field concept, field lines, field of a point charge; Gaussian sentence, related to Coulomb's law, definition of "river"; Gaussian surface, divergence theorem; spe cial symmetries; divergence and GS in differential form; Electrical potential, working in the E-box, electric. potential, potential difference, voltage; potential equation, equipotential surface; several important examples: Sphere, hollow sphere, capacitor plates, electric field emission, thermionic emission, dipole in homogeneous and inhomogeneous field; induction, Faraday cage; Capacitor, mirror charge, definition, capacity; plate and spherical capacitor; combination of capacitor; media in the capacitor; electrical polarisation, displacement and orientation polarisation, microscopic image; dielectric displacement; electrolytic capacitor; Piezoelectric effect; Electricity, hintoduction, current density, drift velocity, conduction mechanism; Resistance and conductivity, resistivity, temperature dependence; Ohm's law; realisations (resistive and non ohmic, NTC, PTC); Circuits, electricial networks, Kirchhoff's rules (meshes, nodes); internal resistance of a voltage source, measuring instruments; Wheastone bridge; Moving charge in the static magnetic field, current balance, Lorentz force, right-hand rule, electric motor; di-	13 exercise sheets per semester). Students who successfully comple approx. 50% of exercises will qualify for admission to assessment. lecturer will inform students about the respective details at the begin				/ completed sment. The	
 2. Heat conduction, heat transfer, diffusion, convection, radiant heat; 3. Fundamental theorems of thermodynamics, entropy, irreversibility, Maxwell's demon; 4. Heat engines, working diagrams, efficiency, example: Stirling negine; 5. Real gases and liquids, states of matter (also solids), van der Waals, critical point, phase transitions, critical phenomena (opalescence), coexistence region, Joule-Thomson; 6. Electrostatics, basic concepts: Electrical charge, forces; electric field, reps. field concept, field lines, field of a point charge; 7. Gaussian sentence, related to Coulomb's law, definition of "river"; Gaussian surface, divergence theorem; spe cial symmetries; divergence and GS in differential form; 8. Electrical potential, working in the E-box, electric. potential, potential difference, voltage; potential equation, equipotential surfaces; several important examples: Sphere, hollow sphere, capacitor plates, electric dipole; lace effects, Segner wheel; 9. Matter in the E-field, charge in a homogeneous field, Millikan experiment, Braun tube; electron: Field emission, dipole in homogeneous and inhomogeneous field, induction, Faraday cage; 10. Capacitor, miror charge, definition, capacity; plate and spherical capacitor; combination of capacitors; media in the capacitor; electrical polarisation, displacement and orientation polarisation, microscopic image; dielectric displacement; electrolytic capacitor; plezoelectric effect; 11. Electricity, introduction, current density, drift Velotity, conduction mechanisms; 12. Resistance and conductivity, resistivity, temperature dependence; Ohm's law; realisations (resistive and no ohmic, NTC, PTC); 13. Gircuits, electrical networks, Kirchhoff's rules (meshes, nodes); internal resistance of a voltage source, measuring instruments; Wheatstone bridge; 14. Power and energy in the circuit; Capacitor charge; galvanic element; thermovoltage; 15. Transf	Contents					
A Grundschulen Physics (2015) JMU Würzburg • generated 18-Apr-2025 • exam. reg. data re- page 13 / 75	2. Heat co 3. Fundan 4. Heat er 5. Real ga phenome 6. Electros point chai 7. Gaussia cial symm 8. Electric equipoter lace effec 9. Matter on, therm 10. Capac dia in the ectric disp 11. Electric 12. Resist ohmic, NT 13. Circuit suring ins 14. Power 15. Transf 16. Magne gnetic fiel 17. Vector Helmholtz 18. Movin pole field 19. matter ferromagr 20. inductance 21. Maxwe equation; 22. AC: Fu	nduction, heat transfer, di nental theorems of thermo- ngines, working diagrams, ses and liquids, states of r na (opalescence), coexister statics, basic concepts: Ele- rge; an sentence, related to Cou- tetries; divergence and GS al potential, working in the tial surfaces; several impo- ts, Segner wheel; in the E-field, charge in a h ionic emission, dipole in h itor, mirror charge, definiti capacitor; electrical polari olacement; electrolytic cap city, introduction, current of ance and conductivity, resi TC, PTC); is, electrical networks, Kirc truments; Wheatstone brid and energy in the circuit; O er mechanisms, conductio etostatics, fundamental law d; Amper's Law, analogous potential, formal derivatio z coils; g charge in the static magr ; movement paths, mass s r in the magnetic field, effe netism; magn. moment of t tion, Faraday's law of induc te, self-induction; applicatio ell's displacement current, Maxwell equations; andamentals, sinusoidal vi apacitive & inductive resist	ffusion, convection, rac dynamics, entropy, irrev- efficiency, example: Sti natter (also solids), van nce region, Joule-Thom ectrical charge, forces; e alomb's law, definition of in differential form; e E-box, electric. potent ortant examples: Sphere omogeneous field, Mill omogeneous and inhor on, capacity; plate and sation, displacement at acitor; Piezoelectric effi- lensity, drift velocity, co istivity, temperature de hhoff's rules (meshes, n dge; Capacitor charge; galva n in solids: Band mode vs; permanent magnet, s to e-box, magn. river, on, analogous to electric petic field, current balar pectrometer, Wien filter cts of the field on matter he electron, behaviour ction, Lenz's rule, flux c pors: Transformer, gener choice of integration at brations, amplitude, pe- tor, capacitor and coil, p	diant heat; versibility, Maxwell's rling engine; o der Waals, critical p son; electric field, reps. fie of "river"; Gaussian s ial, potential differer e, hollow sphere, cap ikan experiment, Bra mogeneous field; inc spherical capacitor; nd orientation polari ect; onduction mechanism pendence; Ohm's law nodes); internal resist nic element; thermov l, semiconductor; lin field properties, def swirl; c scalar potential; ca nce, Lorentz force, rig rs, Hall effect; electro er, relative permeabi at interfaces; hange, eddy electric rator; rea, displacement cu	demon; point, phase transition eld concept, field line surface, divergence to bace, voltage; potentia bacitor plates, electric aun tube; electron: Fi luction, Faraday cago combination of capa sation, microscopic ms; w; realisations (resis stance of a voltage s voltage; e in liquids and gase initions and units; Ea lculation of fields, ex ght-hand rule, electri on: e / m determinati lity, susceptibility; p field, Waltenhofen's urrent; Maxwell's exto ver and RMS value, o	ons, critical es, field of a cheorem; spe- al equation, ic dipole; ield emissi- e; acitors; me- image; diel- stive and non- ource, mea- es; arth's ma- xamples, ic motor; di- ion; ara-, dia-, s pendulum; ension, wave
	-	-	JMU Würzburg • g		-	page 13 / 75

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 is creditable for 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 to whose 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 l 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) 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 Gymnasium Physics (2018) First state examination for the teaching degree Mittelschule 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 Mittelschule Physics (2018) Bachelor's degree (1 major) Physics (2020)

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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) 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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Optics and Quantum Physics I

(4 ECTS credits)

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module title	Abbreviation					
Optics and Quantum Physics 11-L-OAV-152-mo1						
Module coordinator Module offered by						
Managing Director of the Institute of Applied Physics Faculty o	of Physics and Astronomy					
ECTS Method of grading Only after succ. compl. of mo	dule(s)					
4 numerical grade						
Duration Module level Other prerequisites						
2 semester undergraduate						
Contents						
 Light: (linked to 11-E-E): Basic concepts, the speed of light, Huygen Light in matter: Propagation velocity in the medium; dispersion, co constant; absorption, Kramers-Kronig relation, interfaces, Fresnel equation, birefringence, optical activity (dipole); Geometrical optics: Basic concepts, Fermat's principle, optical path plane interfaces, Snell's law, total reflection, optical tunneling, evane dispersion, curved interfaces, thin and thick lenses, lens systems, ler rors (spherical & chromatic aberration, astigmatism, coma, distortion Optical instruments: Characteristics, camera, eye, magnifying glass am vs. image construction (electron lenses, electron microscope), cor Wave optics: spatial and temporal coherence, double slit, Young's profile), thin layers, parallel layers, wedge-shaped layers, phase shift Mach-Zender, Fabry-Perot); Diffraction in the far field: Fraunhofer diffraction, single slit, intensi Rayleigh & Abbé criterion, Fourier optics, optical grating, n-fold slit, ir and resolution, diffraction off atomic lattices, convolution theorem; Diffraction in the near field: Fresnel diffraction, near-field diffraction plate, near-field microscopy, holography, Huygens-Fresnel concept; v8. Failure of classical physics I - from light wave to photon: Black bod thesis; photoelectric effect and Einstein's explanation, Compton effect quantum structure of nature; Failure of classical physics II - particles as waves: De Broglie's mattices (Davisson-Germer-experiment, double slit interference); Wave mechanics: Wave packets, phase and group velocity (recap quist-Shannon theorem, wave function as probability amplitude, prol in quantum mechanics (double-slit experiment & which-way informat dinger's cat); Mathematical concepts of quantum mechanics: Schrödinger equa son to wave optics, free particle and particles in a potential, time-ind lue equation, harmonic oscillator), box potential in hi	mplex and frequency-dependent dielectric uations, polarisation, generation by absorp- h, Gaussian optics, reflection, refraction, escent waves, prism; normal and anomalous ns grinder formula, aberrations, imaging er- n, correction approaches); s, microscope, telescope types, bundle be- nfocal microscopy; experiment, interference pattern (intensity c, Newton rings, interferometer (Michelson, ity distribution, apertures, resolving power: ntensity distribution, grating spectrometer n at circular apertures/disks, Fresnel zone white light hologram; y radiation and Planck's quantum hypo- ct, light as a particle, wave-particle duality, ter wave concept; diffraction of particle wa- of 11-EM), uncertainty principle, Ny- bability of residence, measurement process tion, collapse of the wave function, Schrö- ntion as wave equation, conceptual compari- ependent Schrödinger equation as eigenva- and tunnel effect, box potential and ener- ions and degeneracy, formal theory of QM					
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 quantum phenomena. They are able to discuss their knowledge and to integrate it into a bigger picture.						
${f Courses}$ (type, number of weekly contact hours, language $-$ if other than German)						
V (4) + V (3)						
LA Grundschulen Physics (2015) JMU Würzburg • generated 18-A	pr-2025 • exam. reg. data re- page 17 / 75					
cord Lehramt Grundschulen (Un						

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

oral examination of one candidate each (approx. 30 minutes) Language of assessment: German and/or English

Allocation of places

Additional information

--

Workload

Teaching cycle

--

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

 \S 53 l Nr. 1 a) (2 ECTS credits) and b) (2 ECTS credits)

§ 77 I 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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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	



Optics and Quantum Physics II

(9 ECTS credits)

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module title Abbreviation					
Optics	Optics and Waves - Exercises 11-E-OA-152-mo1				
Module coordinator		Module offered by	Module offered by		
Manag	ing Director of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Method of grading	Only after succ. con	npl. of module(s)		
5	numerical grade				
Duratio	on Module level	Other prerequisites			
1 seme	ster undergraduate				
Conter	its				
tical pa films, i equatio	ses in Optics accordingto the c ath, light in matter, polarizatio nterferometers, Fraunhofer dif on and Schrödinger equation,	n, Geometrical Optics, fraction optical grating	Optical instruments, , Fresnel diffraction,	wave optics, interfe	erence, thin
Intend	ed learning outcomes				
to app	Idents understand the basic p ly mathematical methods to th solution of mathematical-phys	e formulation of physi			
Course	S (type, number of weekly contact hours	s, language — if other than Ge	rman)		
Ü (2) Module	e taught in: Ü: German or Engli	sh			
	d of assessment (type, scope, lang s creditable for bonus)	uage — if other than German,	examination offered — if no	t every semester, informati	on on whether
	examination (approx. 120 mir age of assessment: German an				
Allocation of places					
Additio	onal information				
Worklo	ad				
150 h					
	ng cycle				
Referre	ed to in LPO I (examination regulation	ons for teaching-degree progra	ammes)		
§ 53 N § 77 N					
Modul	e appears in				
Bachel First st First st First st First st Bachel Bachel Bachel	or's degree (1 major) Physics (or's degree (1 major) Nanostru ate examination for the teachi ate examination for the teachi ate examination for the teachi ate examination for the teachi or's degree (1 major) Physics (or's degree (1 major) Nanostru or's degree (1 major) Quantum nge program Physics (2023)	cture Technology (201 ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Mittelschule 2020) cture Technology (202	e Physics (2015) Physics (2015) Physics (2015) Physics (2015) Physics (2015)		
LA Grunds	chulen Physics (2015)		enerated 18-Apr-2025 • exam Indschulen (Unterrichtsfach) I	-	page 20 / 75

Module	e title				Abbreviation
Moder	n Physi	cs 1 - Exercises (Atoms a	nd Quantum Physics)	11-L-AA-NV-152-m01
Module coordinator Module offer			Module offered by		
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
4	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	Its				
tion lav experir questio	ws, pho nents, ons of i	toelectric effect, Compto matter wave, Schrödinge	n effect; electrons: E r equation, uncertain eriments; quantum n	lementary charge, e, ty relation, simple q	ford scattering; photons: Radia- /m determination, interference uantum mechanical systems, en atoms, magnetic moment and
Intend	ed lear	ning outcomes			
cular P to auto	hysics. nomou		atically formulate ph e to the solution of m	ysical contexts of At athematical-physica	nena as well as Atomic and Mole- comic and Quantum Physics and al tasks.
Ü (2) Module	e taugh	t in: Ü: German or Englisł	1		
		s essment (type, scope, langua le for bonus)	ge — if other than German,	examination offered — if no	ot every semester, information on whether
		nation (approx. 120 minu ssessment: German and,			
Allocat	ion of _l	olaces			
Additio	onal inf	ormation			
Worklo	ad				
120 h					
Teachi	ng cycl	е			
Referre	ed to in	LPO I (examination regulation	s for teaching-degree progra	ammes)	
§ 53 I №	lr. 1 b)				
Module	e appea	ars in			
First st	ate exa	mination for the teaching mination for the teaching mination for the teaching	g degree Realschule F	Physics (2015)	





Modern Physics (6 ECTS credits)

 LA Grundschulen Physics (2015)
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Modul	e title				Abbreviation	
Moder	n Physi	ics 2			11-L-M2-NV-152-m01	
Modul	e coord	linator		Module offered by	<u> </u>	
Manag	ing Dir	ector of the Institute of Ap	plied Physics	Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Durati	on	Module level	Other prerequisites			
2 seme	ester	undergraduate				
Conter	nts					
	ules, m				onal and electronic excitation of vibrations, thermal properties of	
Intend	ed lear	ning outcomes				
examir	nation o		ing of the structure o		of experimental methods for the heir modelling as translation-in-	
Course	es (type, i	number of weekly contact hours, l	anguage — if other than Gei	rman)		
V (4) + Modul	• •	ıt in: Ü: German or English	1			
		sessment (type, scope, langua ble for bonus)	ge — if other than German,	examination offered — if no	ot every semester, information on whether	
b) oral	examir	mination (approx. 90 to 1 nation of one candidate e ussessment: German and,	ach (approx. 20 minu	utes)		
Alloca	tion of	places				
Additio	onal inf	ormation				
Worklo	ad					
180 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination regulations	for teaching-degree progra	immes)		
§ 53 I №	vr. 1 b)					
Modul	e appea	ars in				
		mination for the teaching	-			
	First state examination for the teaching degree Realschule Physics (2015) First state examination for the teaching degree Mittelschule Physics (2015)					
First st	ate exa	imination for the teaching	aegree Mittelschule	Physics (2015)		





Computational Methods

(6 ECTS credits)

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module	title				Abbreviation	
Mathematical Methods of Physics					11-M-MR-152-m01	
Module coordinator Module offere						
Managing Director of the Institute of Theoretical Physics and Astrophysics				Faculty of Physics a	nd Astronomy	
-		d of grading	Only after succ. con	npl. of module(s)		
6		uccessfully completed				
Duratio	1	Module level	Other prerequisites	•		
2 semes		undergraduate				
Content						
		nathematics and basic of preparation of the mod				
Intende	ed learr	ing outcomes				
		nave knowledge of the p eoretical and Experimer		tics and elementary	calculation methods	which are
Courses	5 (type, n	umber of weekly contact hours	language — if other than Ge	rman)		
• •		√ (2) + Ü (1) t in: German or English				
		essment (type, scope, langu	age — if other than German	examination offered — if no	t every semester informati	on on whether
		le for bonus)	uge in other than oerman,		it every semester, mornal	
a) exerc	ises (s	uccessful completion o	f approx, 50% of appr	ox. 13 exercise sheet	s) or	
		. 15 minutes)				
Allocati						
		ormation				
Additio	natinio	ormation				
			_			
Workloa	ad		_			
180 h						
Teachin	ng cycle	9				
Referre	d to in	LPO I (examination regulatio	ns for teaching-degree progra	ammes)		
§ 53 Ni § 77 Ni	r. 1 a)					
Module		rs in				
		gree (1 major) Physics (2	2015)			
		gree (1 major) Physics (2	-	5)		
	-	gree (1 major) Mathema				
	-	gree (1 major, 1 minor) F				
		mination for the teachir	,	e Physics (2015)		
First sta	ate exa	mination for the teachir	g degree Realschule I	Physics (2015)		
		mination for the teachir	,	-		
		mination for the teachir		e Physics (2015)		
		gree (1 major) Mathema	•	_, , , ,		
		mination for the teachir		•		
		nination for the teachir		•		
First sta	ate exa	mination for the teachir	g degree Gymnasium	Physics (2018)		
	hulen Phy	sics (2015)	IMU Würzburg ● g	enerated 18-Apr-2025 • exam	reg data re-	page 25 / 75



First state examination for the teaching degree Mittelschule Physics (2018)

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	





Laboratory Course I

(9 ECTS credits)

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

	e title				Abbreviation	
Labora	tory Co	ourse Physics A(Mechan	ics, Heat, Electromag	gnetism)	11-P-LA-152-m01	
Module coordinator				Module offered by		
Managing Director of the Institute of Applied Physics			pplied Physics	Faculty of Physics	and Astronomy	
ECTS	r -	od of grading	Only after succ. co		,	
2		successfully completed				
Duratio		Module level	Other prerequisite	c		
				5		
1 seme		undergraduate				
rents, ł	neat ca	t tasks in mechanics, the pacity, calorimetry, dens g of graphs and drafting o	sity of bodies, dynam	ic viscosity, elasticit		
Intend	ed lear	ning outcomes				
She is a the me	able to asuren	as knowledge and maste plan experiments indep nent results in a measure number of weekly contact hours,	endently and to perference of the perference of the protocol.	orm well in cooperati		
P (2)	e (type, i					
	dofac	coccmont (• • • • • • • • • • • • • • •
		sessment (type, scope, langu ble for bonus)	age — If other than German,	, examination offered — if n	ot every semester, informat	ion on whether
Prepari	ing, pe	gnment with talk (approx rforming and evaluating	(record of readings o			
Prepari cessful can be candid pleted	ing, pe lly com repeat ate's u can be	rforming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both com	(record of readings o is passed. Exactly or on of all experiments, sics-related contents	ne experiment that w talk (with discussion of the module. Talks	as not successfully c n; approx. 30 minute s that were not succe	ompleted s) to test the ssfully com-
Prepari cessful can be candid	ing, pe lly com repeat ate's u can be	rforming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both com	(record of readings o is passed. Exactly or on of all experiments, sics-related contents	ne experiment that w talk (with discussion of the module. Talks	as not successfully c n; approx. 30 minute s that were not succe	ompleted s) to test the ssfully com-
Prepari cessful can be candid pleted Allocat	ing, pe lly com repeat ate's u can be ion of [rforming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both com places	(record of readings o is passed. Exactly or on of all experiments, sics-related contents	ne experiment that w talk (with discussion of the module. Talks	as not successfully c n; approx. 30 minute s that were not succe	ompleted s) to test the ssfully com-
Prepari cessful can be candid pleted Allocat	ing, pe lly com repeat ate's u can be ion of [rforming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both com	(record of readings o is passed. Exactly or on of all experiments, sics-related contents	ne experiment that w talk (with discussion of the module. Talks	as not successfully c n; approx. 30 minute s that were not succe	ompleted s) to test the ssfully com-
Prepari cessful can be candid pleted Allocat Additio	ing, per lly com repeat ate's u can be cion of pnal inf	rforming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both com places	(record of readings o is passed. Exactly or on of all experiments, sics-related contents	ne experiment that w talk (with discussion of the module. Talks	as not successfully c n; approx. 30 minute s that were not succe	ompleted s) to test the ssfully com-
Prepari cessful can be candid pleted Allocat Additio Worklo	ing, per lly com repeat ate's u can be cion of pnal inf	rforming and evaluating pleted if a Testat (exam) ed once. After completio nderstanding of the phys repeated once. Both com places	(record of readings o is passed. Exactly or on of all experiments, sics-related contents	ne experiment that w talk (with discussion of the module. Talks	as not successfully c n; approx. 30 minute s that were not succe	ompleted s) to test the ssfully com-
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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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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module	e title				Abbreviation	
Data and Error Analysis					11-P-FR1-152-m01	
Module coordinator				Module offered by		
		ector of the Institute of Ap	oplied Physics	Faculty of Physics and Astronomy		
ECTS		od of grading	Only after succ. com		,	
2	<u> </u>	successfully completed				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate	13 exercise sheets p approx. 50% of exer	er semester). Stude cises will qualify for	completion of exercis nts who successfully admission to assess espective details at th	completed ment. The
Conten	ts					
		s, error approximation an deviation.	d propagation, graph	nic representations,	linear regression, me	an values
Intende	ed leari	ning outcomes				
		are able to evaluate meas to draw, present and dis			gation and of the prin	ciples of
Course	S (type, n	umber of weekly contact hours, I	anguage — if other than Ger	rman)		
V (1) + Module	• •	t in: Ü: German or Englisl	n			
		s essment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	ot every semester, informatio	n on whether
		nation (approx. 120 minu				
		ssessment: German and	/or English			
Allocat	ion of p	olaces				
		ormation	-			
this wil 3 Sente find tha gistrati ly regis sessme sessme	l be co ence 4 / at the s on for a ter for a ent was ent to w	f a student registers for t nsidered a declaration of ASPO (general academic tudent has obtained the assessment into effect. O an assessment. Students not put into effect will n which he/she has not bee	f will to seek admission and examination reg qualification for adm only those students the s who did not register ot be admitted to the	on to assessment pu ulations). If the mod ission to assessmer nat meet the respect for an assessment of respective assessment	irsuant to Section 20 ule coordinators subs it, they will put the str ive prerequisites can or whose registration ent. If a student take	Subsection sequently udent's re- successful- for an as- s an as-
Worklo	ad					
60 h						
Teachi	ng cycl	9				
Referre § 53 N § 77 N	lr. 1 c)	LPO I (examination regulation	s for teaching-degree progra	mmes)		
Module		irs in				
Bachel Bachel	or's de or's de	gree (1 major) Mathemati gree (1 major) Physics (20 gree (1 major) Nanostruci	015)	5)		
LA Grundsc			JMU Würzburg • ge	enerated 18-Apr-2025 • exam ndschulen (Unterrichtsfach)		page 30 / 75

UNIVERSITÄT WÜRZBURG

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)

Labora	e title				Abbreviation	
	tory Co	ourse Physics B (Electric	ity, Circuits, Atomic a	and Nuclear Physics)	11-P-LB-152-m01	
Module coordinator				Module offered by	<u>.</u>	
Managing Director of the Institute of Applied Physics			pplied Physics	Faculty of Physics a	and Astronomy	
			Only after succ. cor			
5	<u> </u>	successfully completed				
Duratio	on	Module level	Other prerequisites			
2 seme	ester	undergraduate		recommended to co ting module 11-P-LB.	mplete modules 11	-P-LA and 11-P-
Conten	Its					
Physica	al laws	of the science of electric	city, circuits with elect	trical components ar	d Atomic and Nucle	ear Physics.
Intende	ed lear	ning outcomes				
are able in a me	e to inc easuren	have knowledge and ski lependently plan and co nent protocol.	nduct experiments in	cooperation with ot		
Course	S (type, r	number of weekly contact hours,	language — if other than Ge	rman)		
P (2) +	P (2)					
		sessment (type, scope, langu Ile for bonus)	age — if other than German,	examination offered — if no	ot every semester, informa	ition on whether
				talk (with discussior of the module. Talks	that were not succ	essfully com-
	can be	repeated once. Both co		of the module. Talks	that were not succ	essfully com-
pleted Allocat	can be ion of J	repeated once. Both co		of the module. Talks	that were not succ	essfully com-
pleted Allocat	can be ion of J	repeated once. Both col blaces		of the module. Talks	that were not succ	essfully com-
pleted Allocat Additio 	can be ion of j onal inf	repeated once. Both col blaces		of the module. Talks	that were not succ	essfully com-
pleted Allocat Additio Worklo	can be ion of j onal inf	repeated once. Both col blaces		of the module. Talks	that were not succ	essfully com-
pleted Allocat Additio Worklo 150 h	can be ion of j onal inf	repeated once. Both con olaces ormation		of the module. Talks	that were not succ	essfully com-
pleted Allocat Additio Worklo	can be ion of j onal inf	repeated once. Both con olaces ormation		of the module. Talks	that were not succ	essfully com-
pleted of Allocat Additio Yorklo 150 h Teachin 	can be ion of p onal inf oad	repeated once. Both co olaces ormation e	mponents of the asse	of the module. Talks	that were not succ	essfully com-
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pleted of Allocat Additio Yorklo 150 h Teachin Referre § 53 N § 53 N	can be ion of j onal inf pad ng cycl ed to in Ir. 1 b) Ir. 1 c)	repeated once. Both con olaces ormation e	mponents of the asse	of the module. Talks	that were not succ	essfully com-
pleted / Allocat Morklo 150 h Teachin 8 53 N § 53 N § 53 N § 77 N	can be ion of p onal inf pad ng cycl lr. 1 b) lr. 1 c) lr. 1 c) lr. 1 d)	repeated once. Both con places ormation e LPOI (examination regulation (3 ECTS credits) and c) (2	mponents of the asse	of the module. Talks	that were not succ	essfully com-
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pleted of Allocat Additio Worklo 150 h Teachin Referre § 53 N § 53 N § 53 N § 77 N Module First sta	can be ion of p onal inf oad ng cycl Ir. 1 b) Ir. 1 b) Ir. 1 c) Ir. 1 d) e appea ate exa	repeated once. Both con places ormation e LPOI (examination regulation (3 ECTS credits) and c) (2 ars in mination for the teachin	mponents of the asse	of the module. Talks essment have to be s ammes) e Physics (2015)	that were not succ	essfully com-
Pleted of Allocat Additio 150 h Teachin 8 53 l N § 53 l N § 77 l N Module First sta First sta	can be ion of j onal inf oad ng cycl dr. 1 b) lr. 1 c) lr. 1 d) e appea ate exa ate exa	repeated once. Both con places ormation e LPOI (examination regulation (3 ECTS credits) and c) (2 ars in mination for the teachin mination for the teachin	mponents of the asse	of the module. Talks essment have to be s ammes) e Physics (2015) Physics (2015)	that were not succ	essfully com-
Pleted of Allocat Additio Worklo 150 h Teachin \$ 53 N \$ 53 N \$ 53 N \$ 53 N \$ 77 N Module First sta First sta	can be ion of j onal inf oad ng cycl dr. 1 b) lr. 1 c) lr. 1 d) e appea ate exa ate exa ate exa	repeated once. Both cor places ormation e LPO I (examination regulation (3 ECTS credits) and c) (2 ars in mination for the teachin mination for the teachin mination for the teachin	ns for teaching-degree progra ECTS credits) g degree Grundschule g degree Gealschule I g degree Gymnasium	of the module. Talks essment have to be s ammes) e Physics (2015) Physics (2015) Physics (2015)	that were not succ	essfully com-
pleted of Allocat Additio Yorklo 150 h Teachin \$ 53 N \$ 53 N \$ 53 N \$ 53 N \$ 77 N Module First sta First sta First sta	can be ion of j onal inf oad ed to in Ir. 1 b) Ir. 1 c) Ir. 1 d) e appea ate exa ate exa ate exa ate exa ate exa	repeated once. Both cor places ormation e LPOI (examination regulation (3 ECTS credits) and c) (a ars in mination for the teachin mination for the teachin mination for the teachin mination for the teachin mination for the teachin	mponents of the asse	of the module. Talks essment have to be s ammes) e Physics (2015) Physics (2015) e Physics (2015) e Physics (2015)	that were not succ	essfully com-
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pleted of Allocat Additio Yorklo 150 h Teachin S 53 l N § 77 l N Module First sta First sta First sta First sta First sta	can be ion of j onal inf ad ad ad ad to in lr. 1 d) lr. 1 d) lr. 1 d) lr. 1 d) e appea ate exa ate exa ate exa ate exa ate exa ate exa ate exa ate exa	repeated once. Both cor places ormation e LPOI (examination regulation (3 ECTS credits) and c) (2 ars in mination for the teachin mination for the teachin	ns for teaching-degree progra 2 ECTS credits) g degree Grundschuld g degree Gymnasium g degree Gymnasium g degree Grundschuld g degree Realschuld g degree Realschuld	of the module. Talks essment have to be s ammes) e Physics (2015) Physics (2015) Physics (2015) e Physics (2015) e Physics (2015) e Physics (2018) Physics (2018)	that were not succ	essfully com-
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pleted of Allocat Additio 150 h Teachin \$ 53 N \$ 77 N Module First sta First sta	can be ion of j onal inf onal	repeated once. Both cor places ormation e LPO I (examination regulation (3 ECTS credits) and c) (2 ars in mination for the teachin mination for the teachin	mponents of the asse	of the module. Talks essment have to be s ammes) e Physics (2015) Physics (2015) Physics (2015) e Physics (2015) e Physics (2015) e Physics (2015) e Physics (2018) Physics (2018) Physics (2018) e Physics (2018)	that were not succ	essfully com-





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Laboratory Course II

(4 ECTS credits)

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Module title				Abbreviation	
Demonstration Laboratory Course 1					11-P-DP1-152-m01
Module coordinator				Module offered by	
holder	of the (Chair of Physics and its D	idactics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
4	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
used in hand ex	schoo xperim	l, goal setting and didact ents, model experiments	ic potential of demor , etc.; computer-aide	nstration experiment d experiments; meas	, knowledge of tools typically s, student experiments, free- sured value acquisition, interac- ucation, presentation competen-
Intende	ed learn	ning outcomes			
matic a and the learning	nalysis eir dida g goals	of error sources of own ectic potential; experience	experiments; identifice in choosing, constru	cation of categories of categories of a catego	in commerce and school; syste- of experiments, their functions g experiments according to the ation and pupils experiments;
Course	S (type, n	umber of weekly contact hours, l	anguage — if other than Ger	man)	
P (4)					
		s essment (type, scope, langua) le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether
b) oral	examin	ation of one candidate e ation in groups (groups c ssessment: German and/	of 2, approx. 10 minut		
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
120 h					
Teachir	ng cycl	e			
Referred to in LPO I (examination regulations for teaching-degree programmes)					
§ 53 N § 77 N					
Module	appea	ars in			
		mination for the teaching	-	•	
		mination for the teaching	-	•	
		mination for the teaching mination for the teaching		• -	
			acgree milleisenule	1 11/5105 (2013)	





Teaching

(12 ECTS credits)

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Compulsory Courses

(12 ECTS credits)

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module	Module title Abbreviation					
Physic	s Teach	ing Concepts 1			11-L-PD1-152-m01	
Module	e coord	inator		Module offered by		
Managing Director of the Institute of Applied Physics		Faculty of Physics a	nd Astronomy			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
2	nume	rical grade		· · · · · · · · · · · · · · · · · · ·		
Duratio	·	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	its					
teachir aching physic	ng conc methoo s.	tic study of technical co epts. Student preconce ds, and techniques to c	ptions and typical lear	ning difficulties in so	chool physics, corres	sponding te-
Intend	ed learr	ning outcomes				
learnin proach and go sical te	g diffic es for s als of th aching	rstanding of school-rel ulties; knowledge of ho elected topics; knowle ne school subject Phys and working tools.	w to change student p dge of epistemological ics; knowledge of elem	reconceptions; know methods of Physics entarising and teach	ledge of alternative knowledge of the l	teaching ap- egitimation
	S (type, n	umber of weekly contact hours	s, language — if other than Ger	rman)		
V (2)						
		e ssment (type, scope, lang le for bonus)	uage — if other than German,	examination offered — if no	t every semester, informat	ion on whether
b) oral c) oral	examin examin	nination (approx. 45 m ation of one candidate ation in groups (groups ssessment: German an	each (approx. 10 minu 5 of 2, approx. 10 minu			
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
60 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination regulation	ons for teaching-degree progra	mmes)		
§ 36 N § 38 N § 53 N § 77 N	Vr. 7 Vr. 1 Vr. 2					
Module	e appea	in in				
First st First st First st First st	ate exa ate exa ate exa ate exa	mination for the teachi mination for the teachi	ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Sonderpäda	e Didactics in Physics Physics (2015) Physics (2015) gogik Didactics in Ph		
LA Grundso			JMU Würzburg • g	enerated 18-Apr-2025 • exam	•	page 38 / 75
			cord Lehramt Gru	ndschulen (Unterrichtsfach) F	hysik - 2015	





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

LA Grundschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam. reg. data re-	page 39 / 75
	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module title			Abbreviation			
Physic	Physics Teaching Concepts 2 11-L-PD2-152-m01					
Module coordinator			Module offered by			
Managing Director of the Institute of Applied Physics		pplied Physics	Faculty of Physics a	nd Astronomy		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
3	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	undergraduate				
Conten	nts					
tional ន្ structio	goals of	he basic knowledge of s f physics, qualification r nysical contents, methor rning.	nodels and education	al standards: elemer	ntarisation and dida	ctic recon-
Intend	ed lear	ning outcomes	_			
learnin proach and go	ng diffic nes for s als of t	erstanding of school-rele ulties; knowledge of how selected topics; knowled he school subject Physic and working tools.	w to change student p lge of epistemologica	reconceptions; know I methods of Physics	vledge of alternative ; knowledge of the l	teaching ap- egitimation
Course	S (type, r	number of weekly contact hours,	language — if other than Ge	rman)		
V (2) +	Ü (1)					
		essment (type, scope, langu le for bonus)	age — if other than German,	examination offered — if no	t every semester, informat	ion on whether
b) oral c) oral d) term	examir examin 1 paper	mination (approx. 45 mi nation of one candidate ation in groups (groups (approx. 8 pages) ssessment: German and	each (approx. 10 minu of 2, approx. 10 minu			
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
90 h						
Teachi	ng cycl	e				
		LPO I (examination regulatio	ns for teaching-degree progra	ammes)		
§ 36 N § 38 N § 53 N § 77 N	Vr. 1 Vr. 2					
Module	e appea	nrs in				
First st First st First st	ate exa ate exa ate exa	mination for the teachin mination for the teachin mination for the teachin mination for the teachin mination for the teachin	g degree Grundschule g degree Realschule F g degree Gymnasium	e Didactics in Physics Physics (2015) Physics (2015)		
LA Grundso	chulen Phy	vsics (2015)		enerated 18-Apr-2025 • exam ndschulen (Unterrichtsfach) F		page 40 / 75
			cora cemanit Giu	induction (Uniternitinitistatil) i	11/311 2013	





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

LA Grundschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam. reg. data re-	page 41 / 75
	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module	e title				Abbreviation	
Physics Teaching Concepts Seminar 11-L-PDS-NV-152-m01			01			
Module	e coord	inator		Module offered by		
holder	of the (Chair of Physics and its	Didactics	Faculty of Physics a	ind Astronomy	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
2	(not) s	successfully completed				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ster	undergraduate				
Conten	ts	<u>.</u>				
educati media a	ion, ev and the	cs of current subject-dic aluation, task culture, i eir application for learn v teaching methods.	nterdisciplinary classe	s, language in physic	cs education, effects	s of subject
Intende	ed lear	ning outcomes				
knowle	dge of	selected methods of di didactic physical litera s different prioritisation	ture. Ability to critically			
Course	S (type, r	number of weekly contact hours	s, language — if other than Ge	rman)		
S (2)						
		sessment (type, scope, lang ble for bonus)	uage — if other than German,	examination offered — if no	ot every semester, informati	ion on whether
b) oral c) oral d) term	examir examin paper	mination (approx. 45 m nation of one candidate nation in groups (groups (approx. 8 pages) ssessment: German an	each (approx. 10 minu s of 2, approx. 10 minu	-	r	
Allocat	ion of J	places				
Additio	nal inf	ormation				
Worklo	ad					
60 h						
Teachi	ng cycl	e				
Referre	d to in	LPO I (examination regulation	ons for teaching-degree progra	ammes)		
§ 53 N	lr. 2					
Module	e appea	ars in				
		mination for the teachi				
First state examination for the teaching degree Realschule Physics (2015)						
		mination for the teaching mination for teaching mination for the teaching mination for teachin				
		mination for the teaching				
		mination for the teaching		•		
		mination for the teachi		•		
		mination for the teachi				
First sta	ate exa	mination for the teaching	ng degree Mittelschule	e Physics (2020)		
LA Grundsc	hulen Phy	ysics (2015)		enerated 18-Apr-2025 • exam Indschulen (Unterrichtsfach)		page 42 / 75

Module title			Abbreviation			
Student Lab Preparation Course (Physics) 11-L-L3S-152-m01						
Module coordinator Module offered		Module offered by	у			
holder	of the (Chair of Physics and its	Didactics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5	1	rical grade		•		
Duratio		Module level	Other prerequisites			
1 seme	ster	undergraduate				
	Contents					
	perforr	ves an overview of appl ned in teaching-learnin ployed.				
Intende	ed lear	ning outcomes				
ve gain subject to hold and to pupils	ed an o t-didac scient raise th experin	know how to prepare an overview of current dida tic research. They are at ific-propaedeutic classe heir interest for current p nents in a target-oriente	ctic research topics an ole to evaluate and asses, to positively influen ohysical research ques of manner, and to supe	d further possibilitie sess the (affective) le ce the motivation of tions. The students ervise pupils while e	es for development ir earning achievement pupils in the subjec are able to select, se	n the field of s of pupils, t of Physics
	S (type, r	umber of weekly contact hours	, language — if other than Ger	man)		
S (5)						
		sessment (type, scope, langu le for bonus)	age — if other than German, e	examination offered — if no	t every semester, information	on on whether
 a) written examination (approx. 45 minutes) or b) oral examination of one candidate each (approx. 10 minutes) or c) oral examination in groups (groups of 2, approx. 10 minutes per candidate) or d) term paper (approx. 8 pages) or e) portfolio (10 to 15 hours total) Language of assessment: German and/or English 						
Allocat	ion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	e				
		LPOI (examination regulatio	ns for teaching-degree progra	mmes)		
§ 53 N	lr. 2					
Module						
First sta First sta First sta First sta First sta	ate exa ate exa ate exa ate exa ate exa ate exa	mination for the teachir mination for the teachir ^{rsics (2015)}	ng degree Realschule F ng degree Mittelschule ng degree Grundschule ng degree Realschule F ng degree Mittelschule ng degree Grundschule	Physics (2015) Physics (2015) Physics (2018) Physics (2018) Physics (2018) Physics (2020) Enerated 18-Apr-2025 • exam		page 43 / 75
	,			ndschulen (Unterrichtsfach) F		





First state examination for the teaching degree Realschule Physics (2020) First state examination for the teaching degree Mittelschule Physics (2020)

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	1





Thesis (4 ECTS credits)

Students studying for a teaching degree Grundschule must complete a practical training in didactics and teaching methodology (studienbegleitendes fachdidaktisches Praktikum) which refers to one of the subjects they selected as vertieft studiertes Fach (subject studied with a focus on the scientific discipline) pursuant to Section 34 Subsection 1 No. 4 LPO I (examination regulations for teaching-degree programmes). The obligatory accompanying tutorial is offered by the respective subject. The ECTS credits obtained are counted in the subject Erziehungswissenschaften pursuant to Section 10 Subsection 3 LASPO (general academic and examination regulations for teaching-degree programms).

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module	e title				Abbreviation
Physics: Practical Training and Theory of Classroom				11-L-SBPGS-152-m01	
Module	e coord	inator		Module offered by	
holder	of the (Chair of Physics and its D	idactics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
4	(not) s	successfully completed			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten					
cal prac holding sed in a lyse cla sequen transpa	ctice of g classe agreem asses; b aces an arency s	Physics by observing an es themselves. In the corr ent with the teachers: In basics of general school a d models; introduction to	d discussing classes. responding seminar, troduction to the curr and class pedagogics o the usage of moder	They consolidate the the following topics iculum of Grundschu ; subject-specific wo n media; developme	dagogical, didactic and methodi- neir knowledge by preparing and (among others) will be discus- ule; criteria to observe and ana- ork methods; planning of class ent of blackboard pictures and ling seminar also helps the stu-
Intende	ed learı	ning outcomes			
are able lect and school	e to im d use m pedago	plement the contents of t nedia, methods and socia	the curricula for differ al forms according to	rent grades in a prac learning goals; they	ing and organising classes; they tical manner; they are able to se- are able to connect findings of ad to integrate these findings into
Course	S (type, n	number of weekly contact hours, l	anguage — if other than Ger	man)	
P (o) +	S (2)				
		sessment (type, scope, langua le for bonus)	ge — if other than German, e	examination offered — if no	t every semester, information on whether
Conten regulat tasks a	ts and ions fo s speci		mmes); participation		ntence 1 No. 4 LPO I (examination ing practice, completion of all set
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
120 h					
Teachi	ng cycl	e			
		LPO I (examination regulation	s for teaching-degree progra	mmes)	
§34 1		•			
Module					
First sta	ate exa	mination for the teaching	g aegree Grundschule	Equcational Scienc	e (2015)

LA Grundschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam. reg. data re-	page 46 / 75
	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	



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

(ECTS credits)

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

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

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	





Physics (ECTS credits)

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

LA Grundschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam. reg. data re-	page 48 / 75
	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module	title				Abbreviation		
Astroph	nysics				11-AP-152-m01		
Module	coord	inator		Module offered by			
Managi and Ast	-	ector of the Institute of ics	Theoretical Physics	Faculty of Physics a	nd Astronomy		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)			
6	nume	rical grade					
Duratio	n	Module level	Other prerequisites				
1 semes	ster	undergraduate					
Conten	ts						
telesco um, mo	pes an lecular	onomy, coordinates an d detectors, stellar stru r clouds, structure of th arge-scale structures, c	cture and atmosphere e milky way, the local i	s, stellar evolution a	nd end stages, inter	stellar medi-	
Intende	ed learr	ning outcomes					
physica	al obse	are familiar with the mo rvations and evaluatior familiar with the physic	ns. They are able to use	e these methods to p	lan and analyse owr	n observati-	
Courses	S (type, n	umber of weekly contact hours	s, language — if other than Ge	rman)			
V (2) + I Module		t in: German or English					
Method	l of ass	essment (type, scope, lang	uage — if other than German,	examination offered — if no	t every semester, informati	ion on whether	
		le for bonus)					
b) oral e c) oral e d) proje e) prese If a writ stead ta of asse nation e	examin examin ect repo entatio ten exa ake the ssment date at	nination (approx. 90 to ation of one candidate ation in groups (groups ort (approx. 8 to 10 pag n/talk (approx. 30 mini mination was chosen a form of an oral examin t is changed, the lectur the latest. ssessment: German an	each (approx. 30 minu s of 2, approx. 30 minu es) or utes) as method of assessmu 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	
Allocati	ion of p	olaces					
Additio	nal info	ormation					
Worklo	ad						
180 h							
Teachir	ng cycl	9					
Referre	d to in	LPO I (examination regulation	ons for teaching-degree progra	immes)			
§ 22 N § 22 N § 22 N	Nr. 2 f)						
Module	e appea	rs in					
LA Grundsc	hulen Phy	sics (2015)		enerated 18-Apr-2025 • exam ndschulen (Unterrichtsfach) I		page 49 / 75	

UNIVERSITÄT WÜRZBURG



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



Module	title				Abbreviation	
Preparatory Course Mathematics				11-P-VKM-152-m01		
Module coordinator Module o			Module offered by			
		ectors of the Institute of f Theoretical Physics ar		Faculty of Physics a	nd Astronomy	
I		od of grading	Only after succ. con	npl. of module(s)		
2	(not) s	successfully completed				
Duratio	n	Module level	Other prerequisites			
1 semes	ster	undergraduate				
Content			_ <u>I</u>			
the intro 1. Basic 2. Coord 3. Vecto	oductio geom dinate ors - ve rential	nathematics and eleme on to and preparation fo etry and algebra systems and complex r ctored values calculus culus	or the modules of Expe			specially for
		ning outcomes				
The stu	dents l	know the principles of r tudying Theoretical and			ethods which are red	quired for
		umber of weekly contact hours				
T (2)						
module is a) exerc b) talk (creditab cises (s (appro)	sessment (type, scope, lang le for bonus) successful completion c K. 15 minutes) ffered: Once a year, wir	f approx. 50% of appr			on on whether
Allocati		· ·				
Additio	nal inf	ormation				
Workloa	ad					
60 h						
Teachin	ıg cycl	e				
Teachin	ıg cycl	e				
		e LPO I (examination regulation	ons for teaching-degree progra	ummes)		
	d to in Nr. 1 h) Nr. 2 f)		ons for teaching-degree progra	ummes)		
Referre § 22 II N § 22 II N § 22 II N § 22 II N § 20 II N	d to in Nr. 1 h) Nr. 2 f) Nr. 3 f) appea	LPO I (examination regulation reg		ımmes)		
First sta	d to in Nr. 1 h) Nr. 2 f) Ar. 3 f) appea or's deg or's deg or's deg or's deg or's deg the exa	LPO I (examination regulation	2015) cture Technology (201 itical Physics (2015) Physics (Minor, 2015) ng degree Grundschule ng degree Grundschule	5) e Physics (2015) e Didactics in Physics	s (Primary School) (2	015)

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

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

First state examination for the teaching degree Realschule Physics (2018)

First state examination for the teaching degree Gymnasium Physics (2018)

First state examination for the teaching degree Mittelschule Physics (2018)

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

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module title				Abbreviation	
Principles of Energy Technologies 11-ENT-152-mo1					
Module coo	rdinator		Module offered by		
Managing Director of the Institute of Applied Physics		Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS Met	thod of grading Only after succ. compl. of module(s)				
6 nun	nerical grade				
Duration	Module level	Other prerequisites			
1 semester	graduate				
Contents					
as renewab ting materia students. Er verters. Nuc	nciples of energy conserv le resources of energy. We ils, selective layers, highl nergy conservation via the lear power plants. Hydroe Biomass. Geothermal ene	e also discuss aspects y activated carbons). T ermal insulation. Thern electricity. Wind turbing	of optimising materi he course is especia nodynamic energy ef es. Photovoltaics. So	als (e.g. nanostructu lly suitable for teach ficiency. Fossil fired	ured insula- ing degree energy con-
Intended lea	arning outcomes				
	s know the principles of o prage. They understand th				
Courses (type	e, number of weekly contact hours	s, language — if other than Ge	rman)		
V (3) + R (1) Module tau	ght in: German or English				
Method of a	ssessment (type, scope, lang	uage — if other than German,	examination offered — if no	t every semester, informati	ion on whether
module is credi					
 b) oral exam c) oral exam d) project re e) presentat If a written existence stead take t of assessmentation date Language o 	camination (approx. 90 to nination of one candidate nination in groups (groups port (approx. 8 to 10 pag cion/talk (approx. 30 minute examination was chosen a he form of an oral examination ent is changed, the lectur at the latest. f assessment: German an t offered: Once a year, win	each (approx. 30 minu s of 2, approx. 30 minu es) or utes) as method of assessme ation of one candidate er must inform student d/or English	tes per candidate) of ent, this may be char e each or an oral exa	nged and assessmer mination in groups.	If the method
Allocation o					
	•				
Additional i	nformation				
Workload					
180 h					
Teaching cy	cle				
Referred to	in LPO I (examination regulation	ons for teaching-degree progra	immes)		
§ 22 Nr. 1 § 22 Nr. 2 § 22 Nr. 3	f) f)				
Module app	ears in				
LA Grundschulen	Physics (2015)		enerated 18-Apr-2025 • exam ndschulen (Unterrichtsfach) I	-	page 53 / 75

UNIVERSITÄT WÜRZBURG

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

Module	title				Abbreviation	
Low Co	st - Hig	h Impact. Low-budget	Experiments for Scienc	e Courses (Phy-	11-MIND-Ph1-152-m	01
sics)				-		
Module	coord	inator		Module offered by		
holder	of the C	Chair of Physics and its	Didactics	Faculty of Physics a	nd Astronomy	
ECTS		od of grading	Only after succ. com		,	
2		successfully completed		,		
Duratio	ľ	Module level	Other prerequisites			
1 semes		undergraduate				
Conten			<u> </u>			
		d vealing the start of	and at the second	dimanu a d. i		alaasta (
		Id realisation of experin and secondary level I.	nental stations with or	ainary and inexpens	ive consumables for	classes of
Intende	d learr	ning outcomes				
ry level	I for sn	develop simple scientif nall groups from differe ant to the curriculum ir	nt types of schools. In	doing so, they learn		
Courses	5 (type, n	umber of weekly contact hours	, language — if other than Ger	man)		
S (2)						
Method		essment (type, scope, lang	uage — if other than German, e	examination offered — if no	t every semester, informati	on on whether
		le for bonus)				
b) oral (c) oral (examin examin	nination (approx. 45 m ation of one candidate ation in groups (groups (approx. 8 pages)	each (approx. 10 minu			
Allocati	ion of p	olaces				
Additio	nal info	ormation				
This mo	dule is	designed for students	studying at least one s	subject in the natura	l sciences.	
Worklo						
60 h						
	Teaching cycle					
	3	-				
Referre	d to in	LPO I (examination regulation	one for teaching-dograp progra	mmec)		
§ 22 N § 22 N § 22 N	Nr. 1 h) Nr. 2 f)					
Module	appea	rs in				
First sta	ate exa	mination for the teaching mination for teaching mination for the teaching mination for teaching mination f		,	s (Primary School) (2	015)
		mination for the teachi		•		
		mination for the teaching	,	• -		
		mination for the teaching			iysics (Middle Schoo	01) (2015)
		mination for the teaching		•	(Middle Scheel) (11 C)
		mination for the teaching		•	(Milaale School) (20	¹⁵)
		mination for the teaching		-	(Driman, School) (a	010)
		mination for the teaching mination for te		•	s (riiiiaiy School) (2	010)
LA Grundscl				enerated 18-Apr-2025 • exam	reg data re-	page 55 / 75
en orunusci	nuteri Fily	3103 (2013)		ndschulen (Unterrichtsfach) F		puse 55 / /5

/ 75

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 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 Grundschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam. reg. data re-	page 56
	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module	e title				Abbreviation	
Teachi	ng Scie	nce with Hands-on-Exhi	bits (Physics)		11-MIND-Ph2-152-m	101
Module coordinator Module offered by						
				Module offered by		
_		Chair of Physics and its I	F	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
2	(not) s	successfully completed				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
Design	ing and	l creating hands-on exhi	bits for STEM subjects			
		ning outcomes				
				f the bende on enny		
tents in	and o	evaluate the advantages ut of school. They plan a vork with pupils of seco	ind implement an inte			
Course	S (type, r	number of weekly contact hours,	language — if other than Ger	man)		
S (2)						
	l of ass	Sessment (type, scope, langu	age — if other than German, 6	examination offered — if no	t every semester, informati	ion on whether
		le for bonus)			every semester, mornal	
b) oral	examir	mination (approx. 45 min nation of one candidate ation in groups (groups	each (approx. 10 minu	-		
		(approx. 8 pages)	or 2, approx. 20 mmu			
Allocat			-			
Allocal		Jaces				
 A .] .]!!!!			-			
		ormation		1	, ·	
		s designed for students	studying at least one s	subject in the natura	l sciences.	
Worklo	ad					
60 h			-			
Teachir	ng cycl	e				
Referre	d to in	LPO I (examination regulation	ns for teaching-degree progra	mmes)		
§ 22						
§ 22						
§ 22	Nr. 3 f)					
Module	e appea	ars in				
First sta	ate exa	mination for the teachin	g degree Grundschule	Physics (2015)		
First sta	ate exa	mination for the teachin	g degree Grundschule	Didactics in Physics	s (Primary School) (2	.015)
First sta	ate exa	mination for the teachin	g degree Realschule P	hysics (2015)		
		mination for the teachin	,	•		
		mination for the teachin			nysics (Middle Schoo	ol) (2015)
		mination for the teachin		-)
		mination for the teachin		•	(WIIaale School) (20	015)
		mination for the teachin		•	(Driman, School) (a	018)
		mination for the teachin			s (Filliary School) (2	010)
		mination for the teachin mination for the teachin		•		
11131 310			5 active dynnasium			
LA Grundsc	hulen Phy	vsics (2015)		enerated 18-Apr-2025 • exam	-	page 57 / 75
			cord Lenramt Gru	ndschulen (Unterrichtsfach) I	- IIYSIK - 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 Grundschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam. reg. data re-	page 58 / 75
	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module	title				Abbreviation
Experin	Experiments for science courses in primary schools				11-L-NEGS-152-m01
Module coordinator			Module offered by		
holder of the Chair of Physics and its Didactics Faculty of Physics and Astronomy		nd Astronomy			
ECTS Method of grading Only after succ. compl. of module(s)					
2	(not) s	successfully completed			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts		Ļ		
	curricu	ılum of Grundschule; pu			chemical contexts suitable for the l contexts; characteristic student
Intende	ed learı	ning outcomes			
experin	nents s				g difficulties; knowledge of pupils competencies in developing and
Course	S (type, n	number of weekly contact hours, l	anguage — if other than Gei	rman)	
S (2)					
a) writte b) oral c) oral e	ereditab en exar examin examin	^{le for bonus)} mination (approx. 45 min ation of one candidate e ation in groups (groups c	utes) or ach (approx. 10 minu	ites) or	nt every semester, information on whether
		(approx. 8 pages)			
	es. Sh	ould the number of appli			laces, places will be allocated as ntained and places re-allocated
as they	becom) Places will be alloca	ated according to the	number of subject semesters.
Additio	nal inf	ormation			
Worklo	ad				
60 h					
Teachir	ng cycl	e			
Referre	d to in	LPO I (examination regulation	s for teaching-degree progra	ammes)	
§ 22					
Module		urs in			
First sta First sta First sta First sta	ate exa ate exa ate exa ate exa ate exa	mination for the teaching mination for the teaching	g degree Grundschule g degree Grundschule g degree Grundschule g degree Grundschule	e Didactics in Physics e Physics (2018) e Didactics in Physics e Didactics in Physics	5 (Primary School) (2015) 5 (Primary School) (2018) 5 (Primary School) (2020)

Teaching Seminar Fundamental Principles 11-L-EL1-152-mo1 Module coordinator Module offered by holder of the Chair of Physics and its Didactics Faculty of Physics and Astronomy ECTS Method of grading Only after succ. compl. of module(s) 3 (not) successfully completed Duration Module level Other prerequisites 1 semester undergraduate Contents Physical and interdisciplinary aspects of selected topics of physics education, corresponding student preceptions and typical learning difficulties, elementarisation and didactic reconstruction of physical contents of physics education, verbalisation of physical contents, possible teaching method pical school experiments and suitable media. Intended learning outcomes Advanced, qualitative knowledge of school-relevant areas of Physics; knowledge of common methods, typ student preconceptions and special media on relevant topics; awareness of the differences between teach Physics at university and school regarding contents and methods. Courses (type, number of weekly contact hours, language – if other than German) S (2) Method of assessment (type, scope, language – if other than German, examination offered – if not every semester, information on whore module is creditable for bonus) a) term paper (approx. 45 minutes) or e) oral examination of active capprox. 45 minutes) or e) oral examination of one can
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Additional information
Workload
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 Realschule Physics (2015) First state examination for the teaching degree Gymnasium Physics (2015)
First state examination for the teaching degree Gynnastdin Physics (2015) First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (201 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 (Middle School) (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 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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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module	title				Abbreviation	
Selecte	d Topi	cs in Physics Didactics			11-L-EL2-152-m01	
		• •				
Module				Module offered by		
-		f examination committe		Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
3	(not) s	successfully completed				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
		in physics education.				
		ning outcomes				
		-		- h		
		nave knowledge of a cu e according to subject-s				y the acqui-
		umber of weekly contact hours	<u>·</u>	•		
S (2)	• (type, I	amper of weekly colldct hours		inulij		
		• •				
		essment (type, scope, lang le for bonus)	uage — if other than German,	examination offered — if no	t every semester, informati	on on whether
a) term	paper	(approx. 8 pages) or				
b) pres	entatio	n (approx. 45 minutes)				
		nination (approx. 45 m				
		ation of one candidate				
		ation in groups (groups ssessment: German an		tes per candidate)		
Allocat						
Allocal		Jaces				
Additio		ormation				
Auuitio						
Worklo						
	<u>au</u>					
90 h						
Teachir	ig cycl	9				
Referre	d to in	LPO I (examination regulation	ons for teaching-degree progra	immes)		
§ 22	-					
§ 22	-					
§ 22		•				
Module						
		mination for the teachi				`
		mination for the teachi			s (Primary School) (2	015)
		mination for the teachi		•		
		mination for the teachi mination for the teachi			weice (Middle Scher	(2015)
		mination for the teachi	,		iysics (minute Schoo	n) (2015)
		mination for the teachi			(Middle School) (20)15)
		mination for the teachi		•		
		mination for the teachi			s (Primary School) (2	018)
		mination for the teachi				
				-		
LA Grundsc	hulen Phy	sics (2015)		enerated 18-Apr-2025 • exam ndschulen (Unterrichtsfach) I	-	page 62 / 75
				(======================================	,,	

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 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 Grundschulen Physics (2015)	JMU Würzburg • generated 18-Apr-2025 • exam. reg. data re-	page 63 / 75
	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module title			Abbreviation			
Studen	Student Lab Supervision (Physics) 11-L-L3B-152-m01					
Module	e coord	inator		Module offered by		
holder	of the (Chair of Physics and its I	Didactics	Faculty of Physics a	nd 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	its					
		rovides an introduction g-learning-laboratory.	to successful supervis	ion of pupils indepe	ndently carrying out	experiments
Intende	ed lear	ning outcomes				
vel of p experir ly and o ve beha terns b	oerform menting criticall aviour J y repea	earn to classify differen ance, to support the pu g (supervision competer y evaluate their own act patterns and to support itedly working on the sa etencies).	pils according to their incies in open classroo ions. A lecturer gives i the students' strength	needs and age and t m situations). The st ndividual feedback t is. The students deve	o help them during i udents are able to m to the students to av elop professional be	ndependent ethodical- oid negati- haviour pat-
Course	S (type, r	number of weekly contact hours,	, language — if other than Gei	rman)		
P (2)						
		Sessment (type, scope, langu le for bonus)	age — if other than German,	examination offered — if no	t every semester, informati	on on whether
b) oral c) oral	examir examin	mination (approx. 45 mi nation of one candidate ation in groups (groups (approx. 8 pages)	each (approx. 10 minu			
Allocat	ion of p	olaces				
Additio	onal inf	ormation				
This mo	odule is	s designed for students	studying at least one	subject in the natura	l sciences.	
Worklo	ad					
60 h						
Teachi	ng cycl	e				
Referre	ed to in	LPO I (examination regulatio	ns for teaching-degree progra	mmes)		
§ 22 § 22 § 22	Nr. 1 h) Nr. 2 f)					
Module appears in						
First sta First sta First sta First sta First sta First sta	ate exa ate exa ate exa ate exa ate exa ate exa	mination for the teachir mination for the teachir	ng degree Grundschule og degree Realschule F og degree Gymnasium og degree Sonderpäda og degree Mittelschule og degree Mittelschule	e Didactics in Physics Physics (2015) Physics (2015) gogik Didactics in Ph Physics (2015) Didactics in Physics	nysics (Middle Schoo (Middle School) (20	ol) (2015) 015)
LA Grundso	chulen Phy	vsics (2015)		enerated 18-Apr-2025 • exam ndschulen (Unterrichtsfach) F		page 64 / 75

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 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 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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Module	e title				Abbreviation	
Current	t Topics	s of Teaching Concepts	in Physics		11-L-APD-152-m01	
		• •	-			
Module				Module offered by		
-		f examination committe	-	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
3	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
Current	topics	in physics education.				
	· · · ·	ning outcomes				
		-	 Irrent subdiscipline of p	hysics adjugation ar	ad are able to classif	iv the acqui
			specific contexts and in			y the acqui-
			s, language — if other than Ger			
S (2)	.,, .,.	,				
• •	e taugh	t in: German or English				
			uage — if other than German, e	examination offered — if no	t every semester. informati	on on whether
		le for bonus)			, ended and a second	
a) writt	en exai	nination (approx. 45 m	inutes) or			
b) oral	examin	ation of one candidate	e each (approx. 10 minu			
			s of 2, approx. 10 minut	es per candidate) or	ſ	
		(approx. 8 pages) or				
		5 minutes) with discus	sion			
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
90 h						
Teachi	ng cycl	e				
Referre	d to in	LPO I (examination regulati	ons for teaching-degree progra	mmes)		
§ 22						
§ 22	-					
§ 22	Nr. 3 f)					
Module	e appea	ars in				
First sta	ate exa	mination for the teachi	ng degree Grundschule	Physics (2015)		
First sta	ate exa	mination for the teachi	ng degree Grundschule	Didactics in Physics	s (Primary School) (2	015)
First sta	ate exa	mination for the teachi	ng degree Realschule P	hysics (2015)		
			ng degree Gymnasium	-		
First state examination for the teaching degree Sonderpädagogik Didactics in Physics (Middle School) (2015)						
			ng degree Mittelschule	• -		`
			ng degree Mittelschule	•	s (Middle School) (20	015)
			ng degree Grundschule	•	(Drimary Cabaal) (-	o49)
			ng degree Grundschule ng degree Realschule P		s (Phillary School) (2	018)
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LA Grundsc	hulen Phy	sics (2015)		enerated 18-Apr-2025 • exam		page 66 / 75
			cord Lehramt Gru	ndschulen (Unterrichtsfach) I	Physik - 2015	

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 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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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module	e title				Abbreviation	
Scienti	ific Wor	k in Teaching Concept	5		11-L-WPD-152-m01	
Module	e coord	inator		Module offered by		
		ector of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	1	od of grading	Only after succ. con		ind Astronomy	
	<u> </u>					
3		successfully completed				
Duratio	on	Module level	Other prerequisites			
1 seme		undergraduate				
Conten						
Current	t topics	in scientific work in pl	ysics education			
Intend	ed learı	ning outcomes				
		have knowledge of a cu ucation on the basis of	rrent subdiscipline of scientific methods.	physics education ar	nd are able to proces	ss questions
Course	S (type, n	number of weekly contact hour	s, language — if other than Ge	rman)		
S (2) Modula	o tough	t in. Cormon or English				
		t in: German or English				
		Sessment (type, scope, lang le for bonus)	uage — if other than German,	examination offered — if no	ot every semester, informati	ion on whether
		minutes)				
Allocat		Jiaces				
Additio	onal info	ormation				
Worklo	ad					
90 h						
Teachi	ng cycl	е				
Referre	ed to in	LPO I (examination regulati	ons for teaching-degree progra	ammes)		
§ 22	Nr. 1 h)					
§ 22	,					
§ 22						
Module						
			ng degree Grundschule	•		
			ng degree Grundschule ng degree Realschule F	•	5 (Primary School) (2	2015)
			ng degree Gymnasium	•		
			ng degree Sonderpäda	,	nysics (Middle Schoo	ol) (2015)
			ng degree Mittelschule		.,	
			ng degree Mittelschule	•	s (Middle School) (20	015)
First sta	ate exa	mination for the teachi	ng degree Grundschule	e Physics (2018)		
			ng degree Grundschule		s (Primary School) (2	2018)
			ng degree Realschule F	-		
			ng degree Gymnasium	•		
			ng degree Mittelschule ng degree Sonderpäda		nysics (Middle Schor	nl) (2018)
			ng degree Sonderpada ng degree Mittelschule			
		vsics (2015)		enerated 18-Apr-2025 • exam		page 68 / 75
				ndschulen (Unterrichtsfach)	-	Page 00 / / 5

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

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Modul	e title				Abbreviation	
Curren	t Topics	s in Physics			11-LX6-152-m01	
Modul	e coord	inator		Module offered by		
chairpe	erson o	f examination committe	e	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)		
6	1	rical grade		•		
Duratio	· · · · · ·	Module level	Other prerequisites			
1 seme		undergraduate		ination committee re	equired	
Conter						
Curren	t topics	in physics.				
Intend	ed learı	ning outcomes				
lation ı	method	nave knowledge of a cu s necessary to acquire ication areas.				
Course	es (type, n	umber of weekly contact hours	, language — if other than Gei	man)		
V (3) +	R (1)					
		s essment (type, scope, langu le for bonus)	uage — if other than German,	examination offered — if no	t every semester, informati	on on whether
d) proj e) pres If a wri stead t of asse nation Langua	ect repo sentatio tten exa take the essmen date at	ation in groups (groups ort (approx. 8 to 10 page n/talk (approx. 30 minu amination was chosen a form of an oral examin t is changed, the lecture the latest. ssessment: German an blaces	es) or utes) as method of assessmo ation of one candidate er must inform student	ent, this may be char e each or an oral exar	nged and assessmer mination in groups.	If the method
Additio	nal inf	ormation				
Auun						
Worklo						
180 h		-				
Teachi	ng cycl	e				
	Nr. 1 h) Nr. 2 f)	LPOI (examination regulation	ns for teaching-degree progra	mmes)		
	e appea	ars in				
First st First st First st First st First st	ate exa ate exa ate exa ate exa ate exa	mination for the teachir mination for the teachir	ng degree Grundschule ng degree Realschule F ng degree Gymnasium ng degree Sonderpäda	e Didactics in Physics Physics (2015) Physics (2015) gogik Didactics in Ph	. ,	
		sics (2015)	JMU Würzburg • g	enerated 18-Apr-2025 • exam ndschulen (Unterrichtsfach) F	•	page 70 / 75

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 Grundschule 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 Didactics in Physics (Primary 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 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 Didactics in Physics (Middle School) (2020)

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	cord Lehramt Grundschulen (Unterrichtsfach) Physik - 2015	

Module title Abbreviation			Abbreviation		
Selecte	ed Topics of Physics			11-LCS6-152-m01	
Module	e coordinator		Module offered by		
chairpe	erson of examination committe	e	Faculty of Physics a	nd Astronomy	
ECTS	Method of grading	Only after succ. con	pl. of module(s)		
4	numerical grade				
Duration Module level Other prerequisites					
1 seme	ster undergraduate	Approval from exam	ination committee re	equired.	
Conten	ts				
Current study a	t topics in experimental physic broad.	s. Credited academic a	achievements, e.g. in	α case of change of ι	iniversity or
Intende	ed learning outcomes				
sics of unders	idents have advanced compete the Bachelor's programme. Th tand the measuring and/or eve y the subject-specific contexts	ey have knowledge of aluation methods nece	a current subdiscipli ssary to acquire this	ne of Experimental F	Physics and
Course	S (type, number of weekly contact hours	s, language — if other than Ger	man)		
V (2) +	R (1)				
	d of assessment (type, scope, lange s creditable for bonus)	uage — if other than German, o	examination offered — if no	t every semester, informati	on on whether
d) proje e) pres If a writ stead t of asse nation	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 examin essment is changed, the lecture date at the latest. age of assessment: German an	es) or utes) as method of assessme ation of one candidate er must inform student	ent, this may be char e each or an oral exar	nged and assessmer mination in groups.	If the method
	ion of places				
	· · · · ·	-			
Additio	onal information				
Worklo	ad				
120 h					
Teachi	ng cycle				
Referre	ed to in LPO I (examination regulation	ons for teaching-degree progra	mmes)		
§ 22 § 22 § 22	Nr. 2 f)				
Module	e appears in				
First sta First sta	ate examination for the teachir ate examination for the teachir ate examination for the teachir ate examination for the teachir	ng degree Grundschule ng degree Realschule F	Didactics in Physics Physics (2015)	s (Primary School) (2	.015)
	chulen Physics (2015)	JMU Würzburg • ge	enerated 18-Apr-2025 • exam ndschulen (Unterrichtsfach) F	-	page 72 / 75

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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 Grundschule may write this thesis in the subject Didaktik der Grundschule (Didactics of Grundschule), in the subject they selected as Unterrichtsfach (subject studied with a focus on the scientific discipline) or in the subject Erziehungswissenschaften (Educational Science). Pursuant to Section 29 Subsection 1 Sentence 2 LPO I, students may also choose to write an interdisciplinary thesis.

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Module title				Abbreviation
Thesis in Physics Primary General School				11-L-HA-GS-UF-152-m01
Module coordinator			Module offered by	
chairperson of examination committee		Faculty of Physics and Astronomy		
ECTS Method of grading		Only after succ. compl. of module(s)		
10 nume	rical grade			
Duration	Module level	Other prerequisites		
1-2 semester	undergraduate	ndergraduate		
Contents				
Independent processing of a topic of Physics and/or Didactics of Physics, chosen in consultation with a lecturer.				
Intended learning outcomes				
The students are able to independently work on a predetermined physical topic while applying the knowledge and methods acquired in the teaching degree programme. They are able to present their results in written form in due consideration of didactic aspects.				
Courses (type, number of weekly contact hours, language — if other than German)				
No courses assigned to module				
Method of assessment (type, scope, language – if other than German, examination offered – if not every semester, information on whether module is creditable for bonus)				
Hausarbeit (thesis) pursuant to Section 29 LPO I (examination regulations for teaching-degree programmes) (ap- prox. 40 pages) Language of assessment: German; exceptions pursuant to Section 29 Subsection 4 LPO I (examination regulati- ons for teaching-degree programmes)				
Allocation of places				
Additional information				
Workload				
300 h				
Teaching cycle				
Referred to in LPO I (examination regulations for teaching-degree programmes)				
§ 29				
Module appears in				
First state examination for the teaching degree Grundschule Physics (2015)				
First state examination for the teaching degree Grundschule Physics (2018)				
First state examination for the teaching degree Grundschule Physics (2020)				