Unofficial translation of the table of modules, Annex A of the Specific Rules, M.Sc. Physics

DETAILS OF THE MODULE						COURSES				EXAMINATIONS		
DURATION IN SEMESTER	FREQUENCY	RECOMMENDED SEMESTER	MODULE REQUIREMENTS	MODULE TYPE: MANDATORY (P), COMPLEMENTARY (WP) OR OPTIONAL (W)	MODULE NUMBER/ ABBREVIATION	MODULE / TITLE	TYPE OF EVENT	SWS	PRELIMINARY EXAMINATIONS[1]	TYPE OF EXAM	GRADED	CREDIT POINTS
MANDATORY MODULES (60 CP)												
1	each semester	3.	s. FSBs zu §4	P	PHY-MF-EP	**INTRODUCTORY PROJECT**		15		Project completion	no	15
Learning objectives: In the introductory project, the study of a modern field of research from which the topic of the Master's thesis is to be taken has been deepened, with the aim of familiarising students with the current state of scientific literature. The student learns how to independently gather the necessary information, background knowledge and familiarise himself or herself with a special topic.												
1	each semester	3.	PHY-MF-EP passed	P	PHY-MF-VP	**PREPARATORY PROJECT**		15	PJA	Presentation/Colloquium	no	15
Learning objectives: By working on preparatory tasks, the student has acquired the special experimental and/or theoretical methods and knowledge of the field to such an extent that he or she can successfully apply them to work on issues from which the topic of the Master's thesis is to be derived. Planning and structuring of the intended research project.												
1	each semester	4.	s. FSBs zu §14 Abs. 2	P	PHY-MF-MA	**MASTER'S THESIS**		30		Mastethesis (5/6), Colloquium (1/6)	yes	30
Learning objectives: The candidate is able to familiarise him/herself with a problem of current research in the subject within the specified period, to apply suitable scientific methods increasingly independently and to present the results in a scientifically appropriate form.												
SPECIALISATION PHASE (48 CP)												
ASTRONOMY AND ASTROPHYSICS												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-A-E14	**COSMOLOGY**			none	written or oral examination	yes	6
						Cosmology	V	3				
						Exercises in Cosmology	Ü	1				
Learning objectives: Students know problem-solving strategies; analytical thinking; theory formation in physics; application of mathematical and information technology solution strategies.												
1	anually, WiSe and SoSe	1. or 2.	none	WP	PHY-MV-A-E15	**SEMINAR TOPICS IN LOW FREQUENCY RADIO ASTRONOMY**			none	Presentation and Handout	yes	3
						Seminar Topics in Low Frequency Radio Astronomy	S	2				
Learning objectives: In addition to an introduction to scientific discourse, students will gain insights into current research in low-frequency radio astronomy.												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-A-E17	**EXTRAGALACTIC ASTROPHYSICS**			none	written or oral examination	yes	6
						Extragalactic Astrophysics	V	3				
						Exercises in Extragalactic Astrophysics	Ü	1				
Learning objectives: Students know problem-solving strategies; analytical thinking; theory formation in physics; application of mathematical and information technology solution strategies.												
1	each semester	1. or 2.	none	WP	PHY-MV-A-E19	**SEMINAR EXTRAGALACTIC ASTROPHYSICS**			none	Presentation and Handout	yes	3
						Seminar Extragalactic Astrophysics	S	2				
Learning objectives: Students can present research results; read and understand scientific articles; evaluate astronomical data; have knowledge of theory formation in physics.												

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DETAILS OF THE MODULE						COURSES				EXAMINATIONS		
DURATION IN SEMESTER	FREQUENCY	RECOMMENDED SEMESTER	MODULE REQUIREMENTS	MODULE TYPE: MANDATORY (P), COMPLEMENTARY (WP) OR OPTIONAL (W)	MODULE NUMBER/ ABBREVIATION	MODULE / TITLE	TYPE OF EVENT	SWS	PRELIMINARY EXAMINATIONS[1]	TYPE OF EXAM	GRADED	CREDIT POINTS
1	every two years, SoSe	1. or 2.	none	WP	PHY-MV-A-E23	**GALAXY EVOLUTION**			none	written or oral examination	yes	7
						Galaxy Evolution	V	3				
						Exercises in Galaxy Evolution	Ü	2				
Learning objectives: Students gain insight into the evolution of the universe, the linear and non-linear growth of cosmic structures, the formation of elliptical and spiral galaxies, and the observation techniques used to observe galaxies.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-A-E24	**SEMINAR ON GALAXY EVOLUTION**			none	Presentation and Handout	yes	3
						Seminar on Galaxy Evolution	S	2				
Learning objectives: Students can discuss scientific publications on galaxy formation and evolution. Both theoretical and data-related papers are covered.												
1	every two years, SoSe	1. or 2.	none	WP	PHY-MV-A-E27	**CHEMICAL EVOLUTION OF THE UNIVERSE**			none	written or oral examination	yes	5
						Chemical Evolution of the Universe	V	2				
						Exercises in Chemical Evolution of the Universe	Ü	2				
Learning objectives: Students have insight into all astrophysical processes relevant to the chemical evolution of the cosmos.												
1	every two years, WiSe	1. or 2.	none	WP	PHY-MV-A-T01	**COMPUTATIONAL ASTROPHYSICS**			none	written exam	yes	6
						Computational Astrophysics	V	3				
						Exercises in Computational Astrophysics	Ü	1				
Learning objectives: After successfully completing the module, students are able to use numerical methods in a targeted manner and to critically evaluate the results of computer programs.												
1	every two years, WiSe	1. or 2.	none	WP	PHY-MV-A-T02	**STELLAR STRUCTURE & EVOLUTION**			none	written or oral examination	yes	6
						Stellar Structure & Evolution	V	3				
						Exercises in Stellar Structure & Evolution	Ü	1				
Learning objectives: Students know the physical structure of stars and their evolution.												
1	each semester	1. or 2.	very good knowledge of Fortran90 and MPI, proven basic knowledge of PHOENIX	WP	PHY-MV-A-T03	**THEORY AND APPLICATION OF PHOENIX**			active participation	oral examination	yes	3
						Theory and Application of PHOENIX	V	2				
Learning objectives: Students have a better understanding of PHOENIX, including the methods, algorithms and program modules used. Application of PHOENIX to astrophysical simulation problems.												
1	every two years, WiSe	1. or 2.	none	WP	PHY-MV-A-T04	**STELLAR AND PLANETARY ATMOSPHERES**			none	written or oral examination	yes	6
						Stellar and Planetary Atmospheres	V	3				
						Exercises in Stellar and Planetary Atmospheres	Ü	1				
Learning objectives: Students understand the structure of star and planetary atmospheres, radiative transfer and numerical models of atmospheres, formation of spectra and their critical interpretation.												

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DETAILS OF THE MODULE						COURSES				EXAMINATIONS		
DURATION IN SEMESTER	FREQUENCY	RECOMMENDED SEMESTER	MODULE REQUIREMENTS	MODULE TYPE: MANDATORY (P), COMPLEMENTARY (WP) OR OPTIONAL (W)	MODULE NUMBER/ ABBREVIATION	MODULE / TITLE	TYPE OF EVENT	SWS	PRELIMINARY EXAMINATIONS[1]	TYPE OF EXAM	GRADED	CREDIT POINTS
1	each semester	2. or 3.	none	WP	PHY-MV-A-T06	**MHD SIMULATIONS WITH THE FLASH CODE**			successful participation in the exercises	oral examination	yes	3
						MHD Simulations with the FLASH Code	V	2				
Learning objectives: Students know how to use the simulation code FLASH and applications in the astrophysical field.												
1	every two years, WiSe	1. or 2.	none	WP	PHY-MV-A-T10	**THE INTERSTELLAR MEDIUM AND STAR FORMATION**			none	written or oral examination	yes	6
						The Interstellar Medium and Star Formation	V	3				
						Exercises in The Interstellar Medium and Star Formation	Ü	1				
Learning objectives: Students have basic knowledge of the interstellar medium (e.g. composition, physical properties, dynamics) and the formation of stars (e.g. prerequisites, time scales, thermodynamics, evolution of protostars, gas outflows). Students can apply hydrodynamic and magneto-hydrodynamic equations.												
1	every two years, SoSe	1. or 2.	none	WP	PHY-MV-A-T16	**INTRODUCTION TO GENERAL RELATIVITY AND ASTROPHYSICAL APPLICATIONS**			none	written exam	yes	8
						Introduction to General Relativity and Astrophysical Applications	V	4				
						Exercises in Introduction to General Relativity and Astrophysical Applications	Ü	2				
Learning objectives: Students have a basic understanding of general relativity; an understanding of curved spaces in more dimensions and can describe them; an understanding of astrophysical phenomena based on GR.												
ACCELERATOR AND ELEMENTARY PARTICLE PHYSICS												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-BE-E02	**ACCELERATOR PHYSICS II**			none	written or oral examination	yes	5
						Accelerator Physics II	V	2				
						Exercises in Accelerator Physics II	Ü	2				
Learning objectives: Students understand important relationships in the planning and further development of accelerator facilities: influencing beam quality, methods for improving beam properties, limiting attainable energy, luminosity and beam currents, generating high-intensity and coherent X-rays.												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-BE-E05	**EXPERIMENTAL ASTROPARTICLE PHYSICS**			presentation	oral examination	yes	8
						Experimental Astroparticle Physics	V	4				
						Exercises in Experimental Astroparticle Physics	Ü	2				
Learning objectives: The students are able to put concrete experiments and their measurements into context. Students are able to critically question which interpretation of the measurement results is appropriate. Students can understand how a measurement or observation concept is derived from a physical problem in the field of astroparticle physics.												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-BE-E09	**ACCELERATOR PHYSICS I**			none	written or oral examination	yes	5
						Accelerator Physics I	V	2				
						Exercises in Accelerator Physics I	Ü	2				
Learning objectives: Students know the basics of accelerator physics. Students are able to design a simple accelerator facility in its basic elements themselves and calculate its key parameters.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-BE-T02	**PHYSICS OF THE STANDARD MODEL**			none	written or oral examination	yes	6
						Physics of the Standard Model	V	3				

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DETAILS OF THE MODULE						COURSES				EXAMINATIONS			
DURATION IN SEMESTER	FREQUENCY	RECOMMENDED SEMESTER	MODULE REQUIREMENTS	MODULE TYPE: MANDATORY (P), COMPLEMENTARY (WP) OR OPTIONAL (W)	MODULE NUMBER/ ABBREVIATION	MODULE	TITLE	TYPE OF EVENT	SWS	PRELIMINARY EXAMINATIONS[1]	TYPE OF EXAM	GRADED	CREDIT POINTS
							Exercises in Physics of the Standard Model	Ü	1				
Learning objectives: After successful completion of the module, students are prepared for research projects (e.g. master thesis) in theoretical particle physics with emphasis on physics of the Standard Model.													
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-BE-T03	**INTRODUCTION TO SUPERSYMMETRY AND SUPERGRAVITY**				none	written or oral examination	yes	6
							Introduction to Supersymmetry and Supergravity	V	3				
							Exercises in Introduction to Supersymmetry and Supergravity	Ü	1				
Learning objectives: After the course, students are prepared for a research project such as a master or doctoral thesis in theoretical particle physics with a focus on supersymmetry and supergravity.													
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-BE-T11	**INTRODUCTION TO STRING THEORY**				none	written or oral examination	yes	5
							Introduction to String Theory	V	2				
							Exercises in Introduction to String Theory	Ü	2				
Learning objectives: After the course, students are prepared for a research project such as a master or doctoral thesis in string theory.													
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-BE-T12	**PHENOMENOLOGY OF PHYSICS BEYOND THE STANDARD MODEL**				none	written or oral examination	yes	6
							Phenomenology of Physics beyond the Standard Model	V	3				
							Excerises in Phenomenology of Physics beyond the Standard Model	Ü	1				
Learning objectives: After the course, students are prepared for a research project such as a master or doctoral thesis in theoretical particle physics with a focus on physics of the Standard Model.													
1	every two years, WiSe	1. or 2.	none	WP	PHY-MV-BE-T22	**QUANTUM CHROMODYNAMICS (ADVANCED TOPIC IN PARTICLE PHYSICS)**				none	written or oral examination	yes	3
							Quantum Chromodynamics (Advanced Topic in Particle Physics)	V	2				
Learning objectives: Participants know the main features of quantum chromodynamics as quantum field theory, in particular the role played by symmetries and quantum loops. Furthermore, participants will be able to assess the challenges of a quantitative description of the processes involved in modern particle colliders, in particular the LHC.													
1	every two years, SoSe	1. or 2.	none	WP	PHY-MV-BE-T25	**INTRODUCTION TO CONFORMAL FIELD THEORY**				none	written or oral examination	yes	4
							Introduction to Conformal Field Theory	V	2				
							Exercises in Introduction to Conformal Field Theory	Ü	1				
Learning objectives: After the course, students are prepared for a research project such as a master or doctoral thesis in theoretical particle physics with a focus on conformal quantum field theories.													
1	every two years, WiSe	1. or 2.	none	WP	PHY-MV-BE-T29	**COMPUTER ALGEBRA AND PARTICLE PHYSICS**				none	written or oral examination	yes	6
							Computer Algebra and Particle Physics	V	3				
							Exercises in Computer Algebra and Particle Physics	Ü	1				
Learning objectives: Students have basic knowledge of algorithms relevant to theoretical particle physics and experience in working with computer algebra systems.													
BIOMEDICAL PHYSICS													
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-BP-E01	**BIOMEDICAL PHYSICS I**				none	written or oral examination	yes	5
							Biomedical Physics I	V	2				

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DURATION IN SEMESTER	FREQUENCY	RECOMMENDED SEMESTER	MODULE REQUIREMENTS	MODULE TYPE: MANDATORY (P), COMPLEMENTARY (WP) OR OPTIONAL (W)	MODULE NUMBER/ ABBREVIATION	MODULE / TITLE	TYPE OF EVENT	SWS	PRELIMINARY EXAMINATIONS[1]	TYPE OF EXAM	GRADED	CREDIT POINTS
						Journal Club	Ü	2				
Learning objectives: After successfully completing the module, students are familiar with modern methods of medical imaging (PET, SPECT, MRI, CT, Multi-modal) and the basic techniques of radiotherapy.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-BP-E02	**BIOMEDICAL PHYSICS II**			none	written or oral examination	yes	5
						Biomedical Physics II	V	2				
						Journal Club	Ü	2				
Learning objectives: Upon successful completion of the module, students will be familiar with the structure of macromolecules, cells and tissues as well as key factors of cellular and extracellular biochemistry related to diseases, including cancer.												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-BP-E03	**BIOMEDICAL PHYSICS III**			none	oral examination	yes	3
						Biomedical Physics III	V	2				
Learning objectives: After successful completion of the module, students are familiar with the basics of radiation transport and its application in radiation therapy and radiation protection. Furthermore, they will have insight into the role of medical imaging in radiation therapy.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-BP-E04	**BIOMEDICAL PHYSICS IV**			none	oral examination	yes	3
						Biomedical Physics IV	V	2				
Learning objectives: The students are familiar with the basics of the physics of radiation therapy. They also have an overview of the physical and biological optimisation of a radiation plan and the application of different radiation techniques and treatment concepts for some tumour entities.												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-BP-E05	**SEMINAR ON BIOMEDICAL PHYSICS I**			none	Presentation and Handout	yes	3
						Seminar on Biomedical Physics I	S	2				
Learning objectives: The students are familiar with modern imaging methods in medicine (PET, SPECT, MRI, CT, multimodal) and basic techniques of radiotherapy.												
SOLID STATE AND NANOSTRUCTURE PHYSICS												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-FN-E01	**ADVANCED SOLID STATE LECTURE**			none	written or oral examination	yes	8
						Advanced Solid State Lecture	V	4				
						Exercises in Advanced Solid State Lecture	Ü	2				
Learning objectives: The students have in-depth knowledge of the scientific state of the art in research in solid state and nanostructure physics. Deepened knowledge is available to successfully complete an experimental master thesis in the field of solid state and nanostructure physics.												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-FN-E02	**NANOSTRUCTURE PHYSICS I**			none	written or oral examination	yes	8
						Nanostructure Physics I	V	4				
						Exercises in Nanostructure Physics I	Ü	2				
Learning objectives: After successful completion of the module, students can summarize the essential research results for the synthesis of and research on semiconductor nanostructures and devices.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-FN-E12	**ADVANCED METHODS FOR SURFACE AND NANOSTRUCTURE CHARACTERIZATION**			none	written or oral examination	yes	5
						Advanced Methods for Surface and Nanostructure Characterization	V	2				
						Exercises in Advanced Methods for Surface and Nanostructure Characterization	Ü	2				

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DETAILS OF THE MODULE						COURSES				EXAMINATIONS		
DURATION IN SEMESTER	FREQUENCY	RECOMMENDED SEMESTER	MODULE REQUIREMENTS	MODULE TYPE: MANDATORY (P), COMPLEMENTARY (WP) OR OPTIONAL (W)	MODULE NUMBER/ ABBREVIATION	MODULE / TITLE	TYPE OF EVENT	SWS	PRELIMINARY EXAMINATIONS[1]	TYPE OF EXAM	GRADED	CREDIT POINTS
Learning objectives: The students have an understanding of different methods for the structural and chemical characterisation of nanostructures and surfaces. The students have developed decision-making competence for the choice of methods for the chemical and structural characterisation of nanostructures and surfaces. Students know how to characterise the atomic structure of surfaces and nanostructures using X-ray and electron diffraction methods.												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-FN-E18	**BIO-NANO-INTERFACES**			none	written or oral examination	yes	3
						Bio-Nano-Interfaces	V	2				
Learning objectives: Students have an overview of important biophysical processes at interfaces; students have basic and interdisciplinary knowledge for further lectures and theses in this interdisciplinary field. After successful completion of the module, students will know how cells transmit electrical signals, how ion channels and nanopores function and what influence an interface has on the conformation of a protein.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-FN-E23	**X-RAY ANALYTICS AND MICROSCOPY IN NANOSCIENCE**			none	housework	yes	3
						X-Ray Analytics and Microscopy in Nanoscience	V	2				
Learning objectives: Students can summarise the main current X-ray analytical and X-ray microscopic methods for the investigation of functional nanomaterials.												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-FN-E33	**MODERN SCATTERING METHODS IN NANOMATERIAL SCIENCE**			none	Presentation and Handout	yes	5
						Modern Scattering Methods in Nanomaterial Science	V	1				
						Sample preparation and synchrotron experiments	P	2				
						Data analysis	Ü	2				
Learning objectives: The students know the theoretical background and have practical experience with synchrotron X-ray scattering techniques relevant for the characterisation of nanoparticles.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-FN-E34	**METHODS IN NANOBIOTECHNOLOGY II**			none	Presentation (50%) and oral exam (50%)	yes	7
						Methods in Nanobiotechnology II	V	2				
						Exercises in Methods in Nanobiotechnology II	Ü	2				
						Practical: Methods in Nanobiotechnology II	P	2				
Learning objectives: The students know modern methods and aspects of nanobiotechnology and are prepared for scientific work in this field.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-FN-E35	**FUNDAMENTALS OF PHOTOVOLTAICS**			none	written draft	yes	3
						Fundamentals of Photovoltaics	V	2				
Learning objectives: The students know the concept of photovoltaic energy production and are prepared for scientific work in this field.												

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DURATION IN SEMESTER	FREQUENCY	RECOMMENDED SEMESTER	MODULE REQUIREMENTS	MODULE TYPE: MANDATORY (P), COMPLEMENTARY (WP) OR OPTIONAL (W)	MODULE NUMBER/ ABBREVIATION	MODULE / TITLE	TYPE OF EVENT	SWS	PRELIMINARY EXAMINATIONS[1]	TYPE OF EXAM	GRADED	CREDIT POINTS
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-FN-E36	**COMPLEX MATERIALS**			PjA	Presentation and Handout	yes	6
						Complex Materials	V	3				
						Project	Pj	2				
Learning objectives: The students know the theoretical background and have gained practical experience with complex materials.												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-FN-E39	**METHODS IN NANOBIOTECHNOLOGY I**			none	Presentation (50%) and oral exam (50%)	yes	7
						Methods in Nanobiotechnology I	V	2				
						Exercises in Methods in Nanobiotechnology I	Ü	2				
						Practical: Methods in Nanobiotechnology I	P	2				
Learning objectives: Students know the introduction about modern methods and aspects of nanobiotechnology and are prepared for scientific work on this topic.												
1	every two years, SoSe	1. or 2.	none	WP	PHY-MV-FN-T13	**NONEQUILIBRIUM STATISTICS AND TRANSPORT THEORY**			none	written or oral examination	yes	8
						Nonequilibrium Statistics and Transport Theory	V	4				
						Exercises in Nonequilibrium Statistics and Transport Theory	Ü	2				
Learning objectives: Students know modern concepts of quantum statistics of systems in non-equilibrium and quantum transport theory and are prepared for scientific work in this field.												
1	each semester	1. or 2.	none	WP	PHY-MV-FN-T17	**SEMINAR ON SELECTED TOPICS OF THE QUANTUM THEORY OF CONDENSED MATTER**			none	Presentation and Handout	yes	3
						Seminar on Selected Topics of the Quantum Theory of Condensed Matter	S	2				
Learning objectives: Students have gained insights into modern topics and methods in the theory of condensed matter. Students have learned to compile knowledge from contemporary scientific publications and reproduce it in a scientific presentation. Students have deepened their knowledge in a selected current topic of condensed matter theory and can actively contribute to scientific discussions.												
1	each semester	1. or 2.	none	WP	PHY-MV-FN-T18	**SEMINAR ON MANY-BODY THEORY AND QUANTUM-STATISTICAL METHODS**			none	Presentation and Handout	yes	3
						Seminar on Many-Body Theory and Quantum-Statistical Methods	S	2				
Learning objectives: Students are able to discuss current physical problems in the field of many-particle theory and quantum statistical methods and to develop and present a specialised topic.												
1	each semester	1. or 2.	none	WP	PHY-MV-FN-T19	**SEMINAR ON QUANTUM DYNAMICS OF NONEQUILIBRIUM NANO SYSTEMS**			none	Presentation and Handout	yes	3
						Seminar on Quantum Dynamics of Nonequilibrium Nano Systems	S	2				
Learning objectives: Students know current research topics in the field of quantum statistics of systems in non-equilibrium and quantum transport and are prepared for scientific work.												
1	every two years, SoSe	1. or 2.	none	WP	PHY-MV-FN-T24	**QUANTUM STATISTICS WITH PATH INTEGRALS**			none	written or oral examination	yes	8
						Quantum Statistics with Path Integrals	V	4				
						Exercises in Quantum Statistics with Path Integrals	Ü	2				
Learning objectives: With the advanced introduction to quantum statistics with path integrals, students are familiar with current methods in the field of path integrals for quantum many-particle systems and are prepared for scientific work.												
1	every two years, WiSe	1. or 2.	none	WP	PHY-MV-FN-T25	**SYMMETRY GROUPS IN PHYSICS**			none	written or oral examination	yes	8
						Symmetry Groups in Physics	V	4				

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						Exercises in Symmetry Groups in Physics	Ü	2				
Learning objectives: Students know basic tools of group theory and can apply group theory concepts to basic topics of theoretical physics.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-FN-T28	**CONDENSED-MATTER THEORY: SPECIAL TOPICS**			none	written or oral examination	yes	8
						Condensed-Matter Theory: Special Topics	V	4				
						Exercises in Condensed-Matter Theory: Special Topics	Ü	2				
Learning objectives: Students have insight into modern topics and experience in dealing with special methods of condensed matter theory in the context of current research.												
LASERPHYSICS AND PHOTONICS												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-LP-E11	**ULTRAFAST OPTICAL PHYSICS I**			none	oral examination	yes	5
						Ultrafast Optical Physics I	V	2				
						Exercises in Ultrafast Optical Physics I	Ü	2				
Learning objectives: Students have basic knowledge about the description of ultrashort optical pulses, their generation, manipulation, diagnostics and application in modern methods of nonlinear optics and optical spectroscopy.												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-LP-E16	**MODERN MOLECULAR PHYSICS**			none	written or oral examination	yes	4
						Modern Molecular Physics	V	2				
						Exercises in Modern Molecular Physics	Ü	1				
Learning objectives: Students know the basic concepts of modern experiments in molecular physics. Students have acquired a detailed understanding of atoms and molecules and their interaction with external fields and other particles as well as an understanding of experimental concepts in molecular physics.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-LP-E21	**ULTRAFAST OPTICAL PHYSICS II**			none	written or oral examination	yes	6
						Ultrafast Optical Physics II	V	3				
						Exercises in Ultrafast Optical Physics II	Ü	1				
Learning objectives: The students have advanced knowledge in the field of ultrashort pulse generation, amplification, manipulation and their applications in spectroscopy, metrology and attosecond sciences. Upon successful completion of the course, students will be able to quantitatively model and analyse ultrashort pulse laser oscillators and amplifiers, as well as pulse propagation in linear and non-linear media.												
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-LP-E22	**LIGHT-MATTER INTERACTIONS: ATOMS, MOLECULES & (NON) LINEAR OPTICS**			none	written or oral examination	ja	4
						Light-Matter Interactions: Atoms, Molecules & (Non) Linear Optics	V	2				
						Exercises in Light-Matter Interactions: Atoms, Molecules & (Non) Linear Optics	Ü	1				
Learning objectives: Students will know radiation lifetime, line widths, polarisation and methods to measure them (spectrometers, detectors, TCSPC, etc.) and an understanding of different diffusion mechanisms (pressure, Doppler, transit time, etc.)												
1	annually, WiSe	1. or 2.	none	WP	PHY-MV-LP-E27	**NONLINEAR OPTICS**			none	written or oral examination	yes	6
						Nonlinear Optics	V	3				
						Exercises in Nonlinear Optics	Ü	1				
Learning objectives: Students know the most important nonlinear optical processes. After successful completion of this course, students will be able to simulate and design frequency conversion units, ultrafast parametric optical amplifiers and measurement techniques based on nonlinear optical processes.												

Unofficial translation of the table of modules, Annex A of the Specific Rules, M.Sc. Physics

DETAILS OF THE MODULE						COURSES				EXAMINATIONS		
DURATION IN SEMESTER	FREQUENCY	RECOMMENDED SEMESTER	MODULE REQUIREMENTS	MODULE TYPE: MANDATORY (P), COMPLEMENTARY (WP) OR OPTIONAL (W)	MODULE NUMBER/ ABBREVIATION	MODULE	TITLE	TYPE OF EVENT	SWS	PRELIMINARY EXAMINATIONS[1]	TYPE OF EXAM	GRADED	CREDIT POINTS
1	annually, SoSe	1. or 2.	none	WP	PHY-MV-LP-E29	**NEW EXPERIMENTS WITH XFEL SOURCES**				none	written or oral examination	yes	4
							New Experiments with XFEL Sources	V	2				
							Exercises in New Experiments with XFEL Sources	Ü	1				
Learning objectives: Students can better understand XFEL publications and develop their own ideas for the implementation of XFEL experiments.													
1	each semester	1. or 2.	none	WP	PHY-MV-LP-T02	**SEMINAR: MANY-BODY THEORY OF ULTRACOLD ATOMS AND SOLID STATE SYSTEMS**				none	Presentation and Handout	yes	3
							Seminar: Many-body Theory of Ultracold Atoms and Solid State Systems	S	2				
Learning objectives: Students can give a competent lecture on a topic of modern atomic physics, solid state physics or quantum optics.													

Unofficial translation of the table of modules, Annex A of the Specific Rules, M.Sc. Physics

DETAILS OF THE MODULE						COURSES				EXAMINATIONS		
DURATION IN SEMESTER	FREQUENCY	RECOMMENDED SEMESTER	MODULE REQUIREMENTS	MODULE TYPE: MANDATORY (P), COMPLEMENTARY (WP) OR OPTIONAL (W)	MODULE NUMBER/ ABBREVIATION	MODULE	TITLE	TYPE OF EVENT	SWS	PRELIMINARY EXAMINATIONS[1]	TYPE OF EXAM	GRADED	CREDIT POINTS
	every two years, WiSe	1. or 2.	none	WP	PHY-MV-LP-T03	**THEORY OF PHOTON-MATTER INTERACTIONS**				none	written exam (60%) and written draft (40%)	yes	8
							Theory of Photon-Matter Interactions	V	2				
							Exercises in Theory of Photon-Matter Interactions	Ü	2				
							Seminar on Theory of Photon-Matter Interactions	S	2				
Learning objectives: Students can develop a precise quantum mechanical description for practically relevant situations of light-matter interaction. The students have achieved a conceptual and quantitative understanding of experiments in which the behaviour of electrons in the electromagnetic field is the main focus. In general, this includes experiments with optical lasers as well as with X-ray sources.													
ELECTIVES (12 CP)													
1	each semester	1. or 2.		W		**WAHLBEREICH**					module exam	yes	12
								V, Ü, S oder P					
Learning objectives: There are no restrictions in the choice of subject area. Students should follow their inclinations and interests. The aim of the module is to acquire basic knowledge in a subject area of their free choice to mediate. To develop skills for interdisciplinary cooperation.													

[1] ÜA: Exercise completion; PA: Practical completion; SA: Seminar completion; PJA: Project completion; Pj: Project work