Faculty of Physics:

Following the resolutions of the Faculty Council of the Faculty of Physics on 08.07.2020 and 22.07.2020 the presidential board of the University of Göttingen approved the eighth amendment of the examination and study regulations for the consecutive master's degree programme "Physics" on 26.08.2020, in the version published on 05.10.2016 (Official Announcements I No. 52/2016 P. 1384), last amended by decision of the presidential board on 25.02.2020 (Official Announcements I No. 8/2020 p. 197), (§ 44 section 1 sentence 2 NHG in the version published on 26.02.2007 (Nds. GVBl. p. 69), last amended by Article 1 of the Act dated 11.09.2019 (Nds. GVBl. p. 258); § 37 section 1 sentence 3 no. 5 b) NHG, § 44 section 1 sentence 3 NHG).

Examination and study regulations for the consecutive master's degree programme "Physics" of the University of Göttingen

Index

§ 1 Scope

(1) The "General examination regulations for bachelor's and master's degree programmes as well as other courses and degrees offered at the University of Göttingen" (APO) shall apply as amended to the consecutive master's degree programme “Physics” at the University of Göttingen.
(2) This regulation specifies the further provisions for the completion of the course of studies in the consecutive master's degree programme “Physics”.

§ 2 Objectives of the academic programme, purpose of the examination; occupational fields

(1) [1]Building on a bachelor's programme in physics, the academic programme prepares students for independent work in research and application-oriented, physics-related occupational fields. [2]The extensive course of studies provides thorough scientific specialisation as well as the specialised knowledge and methodological skills that can be applied when solving challenging physical problems independently. [3]The methods and contents of physics will be presented in a way that promotes professional application of these proficiencies and skills in very different sectors. [4]The consecutive master's degree programme is principle-oriented and allows for the rapidly changing requirements of professional practice with its selection academic profiles. [5]The training not only enables familiarization with the various problem presentations and varying areas of responsibility of later professional life, it also promotes effective communication with specialists with different orientations.
(2)[1]The master examination determines whether the candidate have acquired the comprehensive specialised knowledge and in-depth special knowledge of the field which is required for transitioning into professional practice as a physicist and the capacity for independent academic work. [2]The master examination provides a professional and research-oriented degree, which, in particular, provides the requirements for independent scientific work as part of doctoral studies.
(3) [1]The objective of master education is the acquisition of scientific competence which facilitates the resolution of problems in the various fields of technology, business, the financial sector and research using the methods of physics. [2]A variety of fields of activity are open to the successful graduate of a master's course of studies, ranging from the application and development of physical methods in the field of high technology and medicine, to complex planning and organisational tasks, to fundamental research at research institutes and universities.

§ 3 Academic degree

Once the master's degree examination is passed, the University of Göttingen awards the university degree "Master of Science" (abbreviated: M.Sc.).

§ 4 Study orientation

[1]Before the termination of each semester, the Faculty of Physics offers an information session about the master's degree programme which provides information about the application process and the various research focuses. [2]An orientation event for the master programme takes place at the beginning of each semester.

§ 5 Start of programme; structure of the academic programme; research focuses

(1) The academic programme starts in the winter or summer semester.

(2) The standard course length is 4 semesters.

(3) The consecutive master's degree programme “Physics” can be attended part-time.

(4) [1]The academic programme includes a total of at least 120 C which are distributed as follows:

a) 12 C for practical/lab course work,
b) 56 C for a research focus (optional required area),
c) 10 C for the area of professionalisation,
d) 12 C for the key competencies,
e) 30 C for the master thesis.

[2]More specific details are regulated in the module overview (Appendix I).

(5) [1]The study and examination components should be completed in compulsory modules, optional required modules and optional modules. [2]These are authoritatively specified and orientation modules are identified in the module overview (appendix I). [3]For recommendation on the appropriate academic programme structure, please refer to the study schedule enclosed in appendix II. [4]The module index is published separately. It forms part of this regulation in as far as the modules are listed in the module overview (appendix I).

(6) One study focus must be successfully completed in one of the following research areas in physics (research focus):

a) Astrophysics and geophysics (AG),
b) Biophysics and the physics of complex systems (BK),
c) Solid-state physics and material physics (FM),
d) Nuclear and particle physics (KT)
e) Theoretical physics.

(7) [1]Interdisciplinary key competencies will be acquired, especially in the area of methodological competencies. [2]Here, in the preliminary stages of the master thesis, the planning, implementation and performance review of scientific projects is learned in a main research practical course. [3]The “Networking” module, in which students take part in a congress or a conference, is intended to give students practice in making independent contact with their professional or scientific milieu. [4]Both modules will be completed before the master thesis and guided by their academic advisor. [5]Other key competence modules can be voluntary selected from the university’s range in addition to these compulsory modules.

§ 6 Course unit types and means of transmission

The modules offered in the master's degree programme are comprised of course units of the following types:

a) lectures (V),
b) tutorials on lectures (Ü),
c) practical/lab courses (P),
d) seminars (S).

a) Lectures are used for conveying fundamental and specialist scientific knowledge and methodological understanding by means of coherent presentation of larger sub-sections of subject area. They open the way to broadening and deepening knowledge in private study.

b) Tutorials will be offered in conjunction with the lectures. They give students the opportunity, in working on illustrative problems, to apply and consolidate the material they have worked on and to self-monitor their level of knowledge.

c) Practical/lab courses have the objective of conveying methodological knowledge, promoting understanding of the interrelations between facts by inductive understanding of physical interrelations and building experience by working on practical tasks. The experimental demonstration, consolidation and application of the material that has been worked on and the transmission of fundamental knowledge and skills in the implementation and evaluation of physical experiments and the interpretation of their results take place in a physics practical course.

d) Seminars address the treatment of special technical problems. In them, the students are expected to learn how to work on complex scientific questions independently and to give a talk on this in front of specialists of their own subject and other subjects in an appropriate manner and also to acquire the ability for critical scientific discussion.

§ 7 Examination board

[1]The Faculty of Physics shall form a joint examination board for the bachelor's degree programme “Physics” and the consecutive master's degree programme “Physics” to organise the examinations and to perform all the responsibilities assigned by the APO and these examination and study regulations. [2]More specific details shall be regulated by the examination and study regulations for the bachelor's degree programme “Physics”.

§ 8 Examination organisation

(1) [1]The implementation and organisation of the examination procedure is delegated to the Examination Office of the Faculties of Mathematics and the Natural Sciences of the University of Göttingen without prejudice to the competencies of the Dean of Studies. [2]It also maintains the examination records.

(2) [1]The location and time of module examinations shall be determined by the Dean of Studies based on proposals from the responsible examiners, communicated to the Examination Office and announced by the Examination Office in the form determined by the examination board. [2]The examination board shall determine a registration and deregistration period for each examination period.

(3) [1]Registration for module examination shall be made using the examination management system within the registration period. [2]Cancellation without statement of reasons (deregistration) is possible within the deregistration period; deregistration is otherwise ruled out.

§ 9 Subject-specific examination types

Besides the examination components allowed according to the provisions of APO, the following subject-specific examination components can be planned:

a) Written report:

Candidates are required to keep a written report to document the contributions they made to the planning, implementation and evaluation of the projects and to keep records of the results in a technically suitable form. The written report will be assessed by the examiner leading the project.

c. Record:

Candidates are expected to keep a record which documents in writing the contributions they have independently made to the planning, implementation and evaluation of the practical course experiments and to present the results in a technically suitable written form. The record will be assessed by the examiner leading the project.

c) Poster presentation:

In a poster presentation, the contributions independently made to the research project shall be initially presented in the form of a large poster in the usual scientific manner (scientific poster). Subsequently, the results will be orally presented on the basis of the poster. The poster presentation will be assessed by the examiner leading the project.

§ 10 Repeatability of examinations

(1) Notwithstanding § 16 a section 1 APO, module examinations for physics modules (module numbers B.Phy.[numerals], M.Phy.[numerals] and M.Phy-AM.[numerals]) which have been failed or are deemed to have been failed can be repeated three times.

(2) [1]In the consecutive master's degree programme "Physics", up to 4 module examinations from the area of physics (module numbers B.Phy.[numerals], M.Phy.[numerals] and M.Phy-AM.[numerals]) which were passed at the first attempt can be repeated once for the purpose of grade improvement within the standard course length. [2]Repetition must take place in the next possible examination period for the corresponding module. [3]Repetition cannot lead to any devaluation of the grade.

§ 11 Voluntary additional module examination

(1) [1]The candidate is entitled to acquire a performance record and take examinations in modules (additional modules) other than those required. [2]They will then be listed in the certificate and in the transcript of records.

(2) Additional modules will not be considered in the calculation of the final grade for the master examination.

§ 12 Master thesis

(1) With the written master thesis, the candidate is expected to prove that he or she is capable of working on a physical question within the selected research focus, using established methods and within the specified time frame, arriving at scientifically substantiated results and presenting the results in a formally as well as linguistically appropriate manner.

(2) Admission to the master thesis shall only be granted upon acquisition of a total of at least 54 C from the compulsory and optional required modules of the degree programme.

(3) [1]The master thesis must be produced in the field of the selected research focus; it should be begun subsequent to the corresponding main research practical course work. [2]The provisional topic for the master thesis is to be coordinated with a person authorised as an examiner by the faculty council, who shall also supervise the work. [3]A research assistant can collaborate in the supervision. [4]If the candidate does not find an academic advisor, this and the topic of the master thesis shall be determined by the examination board upon application

from the candidate. [5]The candidate's view should be considered in choosing the topic. [6]The right to make a proposal for the choice of topic does not result in any legal entitlement.

(4) [1]An application must be made in text format to the examination board for admission to the master thesis. [2]The following material must be enclosed with the application:

a) evidence of fulfilment of the requirements according to section 2, insofar as the required components are not defined in the examination management system,

b) topic proposal for the master thesis,

d) confirmation from the academic advisor,

b) a proposal for two evaluators,

e) a declaration specifying that the master examination has not been failed definitively or registered as definitively failed in the same or comparable Master's degree programme at a domestic or foreign university.

[3]The proposals under letters b) and d) as well as the proof as specified under letter c) are unnecessary if the student provides assurance that he or she has been unable to find an academic advisor.

(5) [1]The examination board shall decide on admission. [2]This should be rejected if the qualifications for entry are not fulfilled or the master examination in the same or similar degree programme at a domestic or foreign university has been definitively failed. [3]The examination board shall determine two evaluators for the master thesis, taking into consideration the proposal provided by the candidate.

(6) [1]Upon admission, the academic advisor will issue the topic for the master thesis. [2]The time of issue must be recorded.

(7) [1]The time to complete the thesis is 6 months. [2]Upon application by the candidate, the examination board can extend the deadline for submitting the thesis by a maximum of 8 weeks in the event of an important reason that cannot be attributed to the candidate. [3]An important reason normally exists in the case of an illness that is to be notified immediately and demonstrated by producing a medical certificate.

(8) [1]The topic can be returned only once and only within the first two months of the time allotted for completing the thesis. [2]A new topic must be agreed on without delay. [3]In the event that the master thesis is repeated, the topic may be returned only in accordance with clause 1 if the examinee has not resorted to this option in the first submission of the master thesis.

(9) [1]The master thesis must be submitted to the Examination Office within the deadline exclusively in digital form (unprotected) via the examination administration system. [2]The time of submission should be recorded. [3]Upon submission, the candidate should declare in writing that he or she has independently compiled the work and has not used any sources and tools other than those specified.

(10) [1]The Examination Office shall forward the master thesis to the evaluator. [2]Each evaluator will award a grade. [3]The duration of the assessment procedure should not exceed 6 weeks.
(11) The master thesis must be written in English or German.

§ 13 Overall result

(1) The master examination is passed, if at least 120 credits were acquired and all of the required module examinations as well as the master thesis have been passed.
(2) The grade point average "with distinction" will be awarded if the master thesis is graded at least 1.3 and the grade point average of the master examination is

a) among the best 10% of the graduates of the previous graduation years and
b) at least 1.3.

§ 14 Study advisory service

(1) The Central Office of Student Affairs for the University of Göttingen offers an advisory service for general questions on study aptitude, course admission and subjects. Student Services also offers psychological counselling for study-related personal difficulties.
(2) [1]Course-related, subject-specific advice is provided by the advisor from the Office of the Dean of Studies or by the subject-specific advisors appointed by the Faculty of Physics and by the lecturers. [2]The course-related, subject-specific advice supports students in particular in questions of academic programme design, study techniques and the selection of study focus and in coping with study difficulties.

§ 15 Joint degree as part of the Erasmus-Mundus-Programme in astrophysics (Astromundus)

(1) [1]The Leopold-Franzens-Universität Innsbruck, Università degli Studi di Padova (Padua, Italy), Università degli Studi di Roma “Tor Vergata” (Rome, Italy), Univerzitet u Beogradu (Belgrade, Serbia) and the University of Göttingen (hereinafter: partner universities) conduct a joint degree programme in astrophysics. [2]The provisions of these examination and study regulations shall apply, provided that the following does not stipulate any other procedure. [3]The regulations in place at the partner university in question shall apply exclusively to the modules offered by the partner universities.
(2) Students of the consecutive master's degree programme “Physics” are eligible to take part in the study and examination components of the joint degree programme in accordance with the following provisions.

(3) Application for consideration in the joint degree programme must be submitted at the same time as the application for admission to the master's degree programme “Physics” (usually for the 3rd subject semester).

(4) The entrance requirement is proof of examination components and examination prerequisites from the modules of the joint degree programme with a rating of at least a total 60 C, of which

a) with a rating of 30 C at the Leopold-Franzen University, Innsbruck as well as

b) with a rating of 30 C at the Università degli Studi di Padova or with a rating of at least 30 C at the Università degli Studi di Roma “Tor Vergata”.

(5) [1]Notwithstanding § 5, sections 4 and 5, students within the scope of the joint degree programme must successfully complete special examination components and examination prerequisites in accordance with Appendix I. The study and examination programme is completely in English. [2]Any examination components and examination prerequisites completed at one of the joint degree partner universities will be recognized without an equivalence assessment.

(6) Re-examinations for any module examinations not passed must be offered in such a way that they can be taken before the end of the respective semester.

(7) [1]Notwithstanding § 5, section 4, students within the scope of the joint degree programme must successfully complete the master thesis with a rating of 25 C as well as a colloquium on the master thesis with a rating of 5 C. [2]Authorised examiners from two different partner universities can be appointed as academic advisors for the master thesis who are also responsible for the evaluation of the master thesis. [3]The partner university at which the first academic advisor works is responsible for the appointment and the examination procedure. The respective procedural regulations of this partner university shall apply.

(8) [1]The master thesis must be prepared in English. [2]In the colloquium (in English), the examination candidate must prove that he/she is capable of independently processing interdisciplinary, problem-related questions on a scientific basis and of categorising them within the overall field of physics in a discussion (approx. 30 minutes) following his/her introductory presentation (approx. 30 minutes) on his/her master thesis. [3]In total, the colloquium shall last approximately 60 minutes. [4]For admission to the colloquium, the master thesis must have been evaluated as at least “sufficient” (4.0) by the evaluators and all required module examinations must have been successfully completed. [5]The colloquium must be conducted within six months after submission of the master thesis. The examiners shall be the evaluators of the master thesis.

(9) [1]Once the master examination has been passed, the partner universities at which the examination candidate has successfully completed study and examination components in the joint degree programme with a rating of at least 30 C, differing in the case of the Univerzitet u

Beogradu of at least 15 C, however only the last attended of the Italian partner universities, will jointly award the university degree of 'Master of Science' (abbreviated 'M.Sc.'). [2]The partner universities at which the master thesis colloquium was successfully completed shall issue a degree certificate in English on behalf of the partner universities regarding the jointly awarded university degree in accordance with clause 1. [3]Furthermore, a translation of the degree certificate into German, Italian or Serbian will be issued on application.

§ 16 Entry into force; interim regulations

(1) The present regulations will come into force with retroactive effect to 01.10.2016 after their publication in the Official Announcements I of the Georg-August-Universität Göttingen.

(2) [1]Students who commenced their academic programme before an amendment to these examination and study regulations came into force and who have remained enrolled within this course of studies without interruption, shall be examined, upon application, on the basis of the examination and study regulations in place before the amendments came into force. The application must be made within 6 months of the amendment coming into force. [2]In the event that, upon application according to clause 1, the examination and study regulations are to be applied in the version in place before an amendment to these regulations came into force, this shall not apply to module overviews and the module handbook for examinations that remain to be taken, unless preventing a breach of trust with a student would necessitate a different decision by the examination board. [3]A different decision can be reached especially in cases where an examination component can be repeated, or a compulsory or optional required module has changed significantly or been cancelled. [4]The examination board can draw up general rules for this purpose. [5]Examinations based on a version valid prior to the coming into force of an amendment to the existing examination and study regulations will be conducted for the last time in the fourth semester after the amendment has come into force.

Appendix I Module directory

I. Master's degree programme “Physics”

At least 120 C must be acquired in accordance with the following provisions.

1. Practical/lab courses

The following practical course work with a total rating of 12 C must be successfully completed in accordance with the following provisions.

a. One of the two following optional required modules should be successfully completed with a rating of 6 credits:

M.Phy.1401	Advanced Lab Course I	(6 C / 6 WLH)
M.Phy.1405	Advanced Computational Physics	(6 C / 6 WLH)

b One of the following optional required modules must be successfully completed with a total rating of 6 C. Module B.Phy.606 may not be selected unless it was already provided in the bachelor's programme:

M.Phy.1402	Advanced Lab Course II	(6 C / 6 WLH)
M.Phy.1403	Internship	(6 C / 6 WLH)
M.Phy.1404	Methods of Computational Physics	(6 C / 6 WLH)
B.Phy.606	Electronic Lab Course for Natural Scientists	(6 C / 6 WLH)

2. Research focus

The master's degree programme must be studied with one of the following five study focusses “Astrophysics and geophysics”, “Biophysics and the physics of complex systems”, “Solid-state physics and material physics”, “Nuclear and particle physics” or “Theoretical physics” with a total rating of at least 56 C, in accordance with the following provisions.

a. Research focus “Astrophysics and geophysics”

Modules must be successfully completed with a rating of at least 56 C in accordance with the following provisions.

aa. Introductory courses (1st and 2nd semester)

Modules must be successfully completed with a rating of at least 26 C in accordance with the following provisions.

i. The following module must be successfully completed with a rating of 4 C:

M.Phy.409	Research Seminar Astro-/ Geophysics	(4 C / 2 WLH)

ii. The following module must be successfully completed with a rating of 8 C and included in the certificate. Modules already provided in the bachelor cannot be taken into consideration. If all the modules mentioned here were already provided in the bachelor as part of the 180 C, then all 26 C must be selected from the following numeral iii.

B.Phy.1551	Introduction to Astrophysics	(8 C / 6 WLH)

iii. In addition, the difference of the 26 C must be provided by successfully completing at least two of the following modules. Modules already included in the bachelor cannot be taken into consideration:

B.Phy.1511	Introduction to Particle Physics	(8 C / 6 WLH)
B.Phy.1521	Introduction to Solid State Physics	(8 C / 6 WLH)
B.Phy.1531	Introduction in Materials Physics	(4 C / 4 WLH)
B.Phy.1541	Introduction to Geophysics	(4 C / 3 WLH)
B.Phy.1561	Introduction to Physics of Complex Systems	(8 C / 6 WLH)
B.Phy.1571	Introduction to Biophysics	(8 C / 6 WLH)
B.Phy.5001	Teaching and analysis of flow dynamic processes in physical experiments Part I	(6 C / 4 WLH)
B.Phy.5002	Teaching and analysis of flow dynamic processes in physical experiments Part II	(6 C / 4 WLH)
B.Phy.5003	Collection and museum of physics	(4 C / 2 WLH)
B.Phy.5501	Aerodynamics	(6 C / 4 WLH)
B.Phy.5502	Active galaxies	(3 C / 2 WLH)
B.Phy.5505	Data Analysis in Astrophysics	(3 C / 2 WLH)
B.Phy.5506	Introduction to fluid dynamics	(6 C / 4 WLH)
B.Phy.5508	Geophysical fluid mechanics	(3 C / 2 WLH)
B.Phy.5511	Magnetohydrodynamics	(3 C / 2 WLH)
B.Phy.5513	Numerical fluid dynamics	(6 C / 4 WLH)
B.Phy.5514	Physics of the Interior of the Sun and Stars	(3 C / 2 WLH)
B.Phy.5516	Physics of Galaxies	(3 C / 2 WLH)
B.Phy.5517	Physics of the Sun, Heliosphere and Space Weather: Key Knowledge	(3 C / 2 WLH)
B.Phy.5518	Physics of the Sun, Heliosphere and Space Weather: Space Weather Applications	(3 C / 2 WLH)
B.Phy.5521	Seminar on Geophysics	(4 C / 2 WLH)
B.Phy.5523	General Relativity	(6 C / 6 WLH)
B.Phy.5531	Origin of solar systems	(3 C / 2 WLH)
B.Phy.5538	Stellar Atmospheres	(6 C / 4 WLH)
B.Phy.5539	Physics of Stellar Atmospheres	(3 C / 2 WLH)
B.Phy.5540	Introduction to Cosmology	(3 C / 2 WLH)
B.Phy.5544	Introduction to Turbulence	(3 C / 2 WLH)
B.Phy.5404	Introduction to Statistical Machine Learning	(3 C / 3 WLH)
M.Phy.5401	Advanced Statistical Physics	(6 C / 6 WLH)
B.Phy.5402	Advanced Quantum Mechanics	(6 C / 6 WLH)

M.Phy.5403	Seminar Classical-Quantum Connections in Theoretical Physics	(4 C / 2 WLH)
M.Phy.5406	Current Topics in Theoretical Physics	(6 C / 4 WLH)
B.Phy.5632	Current topics in turbulence research	(4 C / 2 WLH)
B.Phy.5646	Climate Physics	(6 C / 4 WLH)
B.Phy.5665	Processing of Signals and Measured Data	(3 C / 2 WLH)
B.Phy.5805	Quantum field theory I	(6 C / 6 WLH)
B.Phy.5811	Statistical methods of data analysis	(3 C / 3 WLH)
B.Phy.5901	Advanced Algorithms for Computational Physics	(6 C / 4 WLH)
M.Phy.5002	Contemporary Physics	(4 C / 2 WLH)
M.Phy.5501	Compressible flow	(3 C / 2 WLH)
M.Phy.5502	Numerical experiments in stellar astrophysics	(3 C / 2 WLH)
M.Phy.5505	Solar System Exploration through Space Missions	(3 C / 2 WLH)
M.Phy.551	Advanced Topics in Astro- /Geophysics I	(6 C / 6 WLH)
M.Phy.552	Advanced Topics in Astro- /Geophysics II	(6 C / 4 WLH)
M.Phy.556	Seminar Advanced Topics in Astro- /Geophysics	(4 C / 2 WLH)
M.Phy.5609	Turbulence Meets Active Matter	(4 C / 4 WLH)

bb. Second stage of studies (3rd semester)

The following three modules with a total rating of 30 C must be successfully completed:

M.Phy.1601	Development and Realization of Scientific Projects in Astro- /Geophysics	(9 C / Block)
M.Phy.1605	Networking in Astro- /Geophysics	(3 C / Block)
M.Phy.405	Research Lab Course in Astro- and Geophysics	(18 C / Block)

b. Research focus “Biophysics and physics of complex systems”

Modules must be successfully completed with a rating of at least 56 C in accordance with the following provisions.

aa. Introductory courses (1st and 2nd semester)

Modules must be successfully completed with a rating of at least 26 C in accordance with the following provisions.

i. The following module must be successfully completed with a rating of 4 C:

M.Phy.410	Research Seminar Biophysics/ Physics of Complex Systems	(4 C / 2 WLH)

ii. At least one of the following modules must be successfully completed with a rating of 6 C and included in the certificate. Modules already provided in the bachelor cannot be taken into consideration. If all the modules mentioned here were already provided in the bachelor as part of the 180 C, then all 26 C must be selected from the following numeral iii.

B.Phy.1561	Introduction to Physics of Complex Systems	(6 C / 6 WLH)
B.Phy.1571	Introduction to Biophysics	(6 C / 6 WLH)

iii. In addition, the difference of the 26 C must be provided by successfully completing at least two of the following modules. Modules already included in the bachelor cannot be taken into consideration:

B.Phy.1511	Introduction to Particle Physics	(8 C / 6 WLH)
B.Phy.1521	Introduction to Solid State Physics	(8 C / 6 WLH)
B.Phy.1531	Introduction in Materials Physics	(4 C / 4 WLH)
B.Phy.1541	Introduction to Geophysics	(4 C / 3 WLH)
B.Phy.1551	Introduction to Astrophysics	(8 C / 6 WLH)
B.Phy.5001	Teaching and analysis of flow dynamic processes in physical experiments Part I	(6 C / 4 WLH)
B.Phy.5002	Teaching and analysis of flow dynamic processes in physical experiments Part II	(6 C / 4 WLH)
B.Phy.5003	Collection and museum of physics	(4 C / 2 WLH)
B.Phy.5403	Fluctuation theorems, stochastic thermodynamics and molecular machines	(3 C / 3 WLH)
B.Phy.5404	Introduction to Statistical Machine Learning	(3 C / 3 WLH)
B.Phy.5405:	Active Matter	(3 C / 2 WLH)
B.Phy.5501	Aerodynamics	(6 C / 4 WLH)
B.Phy.5506	Introduction to fluid dynamics	(6 C / 4 WLH)
B.Phy.5513	Numerical fluid dynamics	(6 C / 4 WLH)
B.Phy.5523	General Relativity	(6 C / 6 WLH)
B.Phy.5544	Introduction to Turbulence	(3 C / 2 WLH)
B.Phy.5601	Theoretical and Computational Neuroscience I	(3 C / 2 WLH)
B.Phy.5602	Theoretical and Computational Neuroscience II	(3 C / 2 WLH)
B.Phy.5603	Introduction to laserphysics	(3 C / 2 WLH)
B.Phy.5604	Foundations of Nonequilibrium Statistical Physics	(3 C / 2 WLH)
B.Phy.5605	Computational Neuroscience: Basics	(3 C / 2 WLH)
B.Phy.5607	Seminar Mechanics and dynamics of the cytoskeleton	(4 C / 2 WLH)
B.Phy.5608	Micro- and Nanofluidics	(3 C / 2 WLH)
B.Phy.5611	Optical spectroscopy and microscopy	(3 C / 2 WLH)
B.Phy.5613	Soft Matter Physics	(6 C / 4 WLH)
B.Phy.5614	Proseminar Computational Neuroscience	(4 C / 2 WLH)
B.Phy.5617	Seminar: Physics of condensed matter	(4 C / 2 WLH)
B.Phy.5618	Seminar to Biophysics of the cell - physics on small scales	(4 C / 2 WLH)
B.Phy.5619	Seminar on Micro- and Nanofluidics	(4 C / 2 WLH)
B.Phy.5620	Physics of Sports	(4 C / 2 WLH)
B.Phy.5623	Theoretical Biophysics	(6 C / 4 WLH)

B.Phy.5624	Introduction to Theoretical Neuroscience	(4 C / 2 WLH)
B.Phy.5625	X-ray physics	(6 C / 4 WLH)
B.Phy.5629	Nonlinear dynamics and time series analysis	(6 C / 4 WLH)
B.Phy.5631	Self-organization in physics and biology	(4 C / 2 WLH)
B.Phy.5632	Current topics in turbulence research	(4 C / 2 WLH)
B.Phy.5639	Optical measurement techniques	(3 C / 2 WLH)
B.Phy.5645	Nanooptics and Plasmonics	(3 C / 2 WLH)
B.Phy.5646	Climate Physics	(6 C / 4 WLH)
B.Phy.5647	Physics of Coffee, Tea and other drinks	(4 C / 2 WLH)
B.Phy.5648	Theoretical and Computational Biophysics	(3 C / 2 WLH)
B.Phy.5649	Biomolecular physics and simulations	(3 C / 2 WLH)
B.Phy.5651	Advanced Computational Neuroscience	(3 C / 2 WLH)
B.Phy.5652	Advanced Computational Neuroscience II	(3 C / 2
B.Phy.5655	Complex dynamics of physical and biological systems	(4 C / 2 WLH)
B.Phy.5656	Experimental work at at large scale facilities for X-ray photons	(3 C / 3 WLH)
B.Phy.5657	Biophysics of gene regulation	(3 C / 2 WLH)
B.Phy.5658	Statistical Biophysics	(6 C / 4 WLH)
B.Phy.5659	Seminar on current topics in theoretical biophysics	(4 C / 2 WLH)
B.Phy.5660	Theoretical Biofluid Mechanics	(3 C / 2 WLH)
B.Phy.5662	Active Soft Matter	(4 C / 2 WLH)
B.Phy.5663	Stochastic Dynamics	(6 C / 6 WLH)
B.Phy.5664	Excursion to DESY and the European XFEL, Hamburg	(3 C / 2 WLH)
B.Phy.5665	Processing of Signals and Measured Data	(3 C / 2 WLH)
B.Phy.5666	Molecules of Life – from statistical physics to biological action	(4 C / 2 WLH)
B.Phy.5667	Practical Course on Computer Vision and Robotics	(3 C / 2 WLH)
B.Phy.5668	Introduction to Computer Vision and Robotics	(3 C / 2 WLH)
B.Phy.5669	Seminar on Living Matter Physics	(4 C / 2 WLH)
B.Phy.5701	Weiche Materie: Flüssigkristalle	(3 C / 2 WLH)
B.Phy.5720	Introduction to Ultrashort Pulses and Nonlinear Optics	(3 C / 2 WLH)
B.Phy.5721	Information and Physics	(6 C / 6 WLH)
B.Phy.5725	Renormalization group theory and applications	(6 C / 6 WLH)
B.Phy.5805	Quantum field theory I	(6 C / 6 WLH)
B.Phy.5807	Physics of particle accelerators	(3 C / 3 WLH)
B.Phy.5811	Statistical methods of data analysis	(3 C / 3 WLH)
B.Phy.5901	Advanced Algorithms for Computational Physics	(6 C / 4 WLH)
B.Phy.5402	Advanced Quantum Mechanics	(6 C / 6 WLH)
M.Phy.5401	Advanced Statistical Physics	(6 C / 6 WLH)

M.Phy.5403	Seminar Classical-Quantum Connections in Theoretical Physics	(4 C / 2 WLH)
M.Phy.5404	Computational Quantum Many-Body Physics	(6 C / 4 WLH)
M.Phy.5406	Current Topics in Theoretical Physics	(6 C / 4 WLH)
M.Phy.5002	Contemporary Physics	(4 C / 2 WLH)
M.Phy.5601	Seminar Computational Neuroscience/Neuro-informatics	(4 C / 2 WLH)
M.Phy.5604	Biomedicine imaging physics and medical physics	(6 C / 4 WLH)
M.Phy.5609	Turbulence Meets Active Matter	(4 C / 4 WLH)
M.Phy.561	Advanced Topics in Biophysics/Physics of Complex Systems I	(6 C / 6 WLH)
M.Phy.5610	X-Ray Tomography for Students of Physics and Mathematics	(3 C / 2 WLH)
M.Phy.5613	Lecture: Principles and Applications of Synchrotron and Free Electron Laser Radiation	(3 C / 4 WLH)
M.Phy.5614	Internship: Principles and Applications of Synchrotron and Free Electron Laser Radiation	(3 C / 2 WLH)
M.Phy.562	Advanced Topics in Biophysics/Physics of Complex Systems II	(6 C / 4 WLH)
M.Phy.566	Seminar Advanced Topics in Biophysics/Physics of Complex Systems	(4 C / 2 WLH)
M.MtL1006	Modern Experimental Methods	(6 C / 6 WLH)

bb. Second stage of studies (3rd semester)

The following three modules with a total rating of 30 C must be successfully completed:

M.Phy.1602	Development and Realization of Scientific Projects in Biophysics/Physics of complex systems	(9 C / Block)
M.Phy.1606	Networking in Biophysics/Physics of complex systems	(3 C / Block)
M.Phy.406	Research Lab Course in Biophysics and Physics of Complex Systems	(18 C / Block)

c. Research focus “Solid-state and material physics”

Modules must be successfully completed with a rating of at least 56 C in accordance with the following provisions.

aa. Introductory courses (1st and 2nd semester)

Modules must be successfully completed with a rating of at least 26 C in accordance with the following provisions.

i. The following module must be successfully completed with a rating of 4 C:

M.Phy.411	Research Seminar Solid State/Materials Physics	(4 C / 2 WLH)

ii. At least one of the following modules must be successfully completed with a rating of at least 4 C and included in the certificate. Modules already provided in the bachelor cannot be taken into consideration. If all the modules mentioned here were already provided in the bachelor as part of the 180 C, then all 26 C must be selected from the following numeral iii.

B.Phy.1521	Introduction to Solid State Physics	(8 C / 6 WLH)

B.Phy.1522	Solid State Physics II	(6 C / 6 WLH)
B.Phy.1531	Introduction in Materials Physics	(4 C / 4 WLH)

iii. In addition, the difference of the 26 C must be provided by successfully completing at least one of the following modules. Modules already included in the bachelor cannot be taken into consideration:

B.Phy.1511	Introduction to Particle Physics	(8 C / 6 WLH)
B.Phy.1541	Introduction to Geophysics	(4 C / 3 WLH)
B.Phy.1551	Introduction to Astrophysics	(8 C / 6 WLH)
B.Phy.1561	Introduction to Physics of Complex Systems	(8 C / 6 WLH)
B.Phy.1571	Introduction to Biophysics	(8 C / 6 WLH)
B.Phy.5403	Fluctuation theorems, stochastic thermodynamics and molecular machines	(3 C / 3 WLH)
B.Phy.5404	Introduction to Statistical Machine Learning	(3 C / 3 WLH)
B.Phy.5603	Introduction to laserphysics	(3 C / 2 WLH)
B.Phy.5618	Seminar to Biophysics of the cell - physics on small scales	(4 C / 2 WLH)
B.Phy.5660	Theoretical Biofluid Mechanics	(3 C / 2 WLH)
B.Phy.5664	Excursion to DESY and the European XFEL, Hamburg	(3 C / 2 WLH)
B.Phy.5665	Processing of Signals and Measured Data	(3 C / 2 WLH)
B.Phy.5702	Thin Layers	(3 C / 2 WLH)
B.Phy.5709	Seminar on Nanoscience	(4 C / 2 WLH)
B.Phy.5714	Introduction to Solid State Theory	(6 C / 6 WLH)
B.Phy.5716	Nano-Optics meets Strong-Field Physics	(6 C / 4 WLH)
B.Phy.5717	Mechanisms and Materials for Renewable Energy	(6 C / 4 WLH)
B.Phy.5718	Mechanisms and Materials for Renewable Energy: Photovoltaics	(4 C / 2 WLH)
B.Phy.5719	Mechanisms and Materials for Renewable Energy: Solar heat, Thermoelectric, solar fuel	(4 C / 2 WLH)
B.Phy.5720	Introduction to Ultrashort Pulses and Nonlinear Optics	(3 C / 2 WLH)
B.Phy.5721	Information and Physics	(6 C / 6 WLH)
B.Phy.5722	Seminar on Topics in Nonlinear Optics	(4 C / 2 WLH)
B.Phy.5723	Hands-on course on Density-Functional calculations 1	(3 C / 3 WLH)
B.Phy.5724	Hands-on course on Density-Functional calculations 1+2	(6 C / 6 WLH)
B.Phy.5725	Renormalization group theory and applications	(6 C / 6 WLH)
B.Phy.5805	Quantum field theory I	(6 C / 6 WLH)
B.Phy.5811	Statistical methods of data analysis	(3 C / 3 WLH)
B.Phy.5901	Advanced Algorithms for Computational Physics	(6 C / 4 WLH)
M.Phy.5002	Contemporary Physics	(4 C / 2 WLH)

B.Phy.5402	Advanced Quantum Mechanics	(6 C / 6 WLH)
M.Phy.5401	Advanced Statistical Physics	(6 C / 6 WLH)
M.Phy.5403	Seminar Classical-Quantum Connections in Theoretical Physics	(4 C / 2 WLH)
M.Phy.5404	Computational Quantum Many-Body Physics	(6 C / 4 WLH)
M.Phy.5406	Current Topics in Theoretical Physics	(6 C / 4 WLH)
M.Phy.5613	Lecture: Principles and Applications of Synchrotron and Free Electron Laser Radiation	(3 C / 4 WLH)
M.Phy.5614	Internship: Principles and Applications of Synchrotron and Free Electron Laser Radiation	(3 C / 4 WLH)
M.Phy.5701	Advanced Solid State Theory	(6 C / 6 WLH)
M.Phy.5703	Materials research with electrons	(6 C / 4 WLH)
M.Phy.5705	Materials Physics I: Microstructure-Property-Relations	(4 C / 3 WLH)
M.Phy.5706	Materials Physics II: Kinetics and Phase Transformations	(4 C / 3 WLH)
M.Phy.5707	Materials research with electrons	(3 C / 2 WLH)
M.Phy.5708	Physics of Semiconductor Devices	(4 C / 2 WLH)
M.Phy.5709	Physics of Semiconductors	(3 C / 2 WLH)
M.Phy.5710	Physics of Semiconductors and Semiconductor Devices	(6 C / 4 WLH)
M.Phy.5711	Surface Physics	(3 C / 2 WLH)
M.Phy.5712	Topology in Condensed Matter Physics	(6 C / 4 WLH)
M.Phy.571	Advanced Topics in Solid State/Materials Physics I	(6 C / 6 WLH)
M.Phy.572	Advanced Topics in Solid State/Materials Physics II	(6 C / 4 WLH)
M.Phy.576	Seminar Advanced Topics in Solid State/Materials Physics	(4 C / 2 WLH)
M.Phy.5810	Physics and Applications of Ion solid interaction	(6 C / 6 WLH)
M.Phy.5811	Nuclear Solid State Physics	(4 C / 2 WLH)

bb. Second stage of studies (3rd semester)

The following three modules with a total rating of 30 C must be successfully completed:

M.Phy.1603	Development and Realization of Scientific Projects in Solid State/Materials Physics	(9 C / Block)
M.Phy.1607	Networking in Solid State/Materials Physics	(3 C / Block)
M.Phy.407	Research Lab Course in Solid State/Materials Physics	(18 C / Block)

d. Research focus “Nuclear and particle physics”

Modules must be successfully completed with a rating of at least 56 C in accordance with the following provisions.

aa. Introductory courses (1st and 2nd semester)

Modules must be successfully completed with a rating of at least 26 C in accordance with the following provisions.

i. The following module must be successfully completed with a rating of 4 C:

M.Phy.412 Research Seminar Particle Physics (4 C / 2 WLH)

ii. The following module must be successfully completed with a rating of 8 C and included in the certificate. Modules already provided in the bachelor cannot be taken into consideration. If the following module was already included in the bachelor as part of the 180 C, 8 C from iii and iv must be selected also.

B.Phy.1511 Introduction to Particle Physics (8 C / 6 WLH)

iii. At least one of the following modules must be successfully completed with a rating of 6 C and included in the certificate. Modules already provided in the bachelor cannot be taken into consideration. If both of the modules mentioned here were already included in the bachelor as part of the 180 C, then a further 6 C must be selected from the following numeral iii. The provisions regarding ii shall remain unaffected by this.

B.Phy.1512 Particle physics II - of and with quarks (6 C / 6 WLH)

M.Phy.5807 Particle Physics III - of and with leptons (6 C / 6 WLH)

iv. In addition, the difference of the 26 C must be provided by successfully completing at least one of the following modules. Modules already included in the bachelor cannot be taken into consideration:

B.Phy.1521 Introduction to Solid State Physics (8 C / 6 WLH)

B.Phy.1531 Introduction in Materials Physics (6 C / 5 WLH)

B.Phy.1541 Introduction to Geophysics (4 C / 3 WLH)

B.Phy.1551 Introduction to Astrophysics (8 C / 6 WLH)

B.Phy.1561 Introduction to Physics of Complex Systems (8 C / 6 WLH)

B.Phy.1571 Introduction to Biophysics (8 C / 6 WLH)

B.Phy.5402 Advanced Quantum Mechanics (6 C / 6 WLH)

B.Phy.5523 General Relativity (6 C / 6 WLH)

B.Phy.5665 Processing of Signals and Measured Data (3 C / 2 WLH)

B.Phy.5725 Renormalization group theory and applications (6 C / 6 WLH)

B.Phy.5805 Quantum field theory I (6 C / 6 WLH)

B.Phy.5807 Physics of particle accelerators (3 C / 3 WLH)

B.Phy.5808 Interactions between radiation and matter - detector physics (3 C / 3 WLH)

B.Phy.5810 Physics of the Higgs boson (3 C / 3 WLH)

B.Phy.5811	Statistical methods in data analysis	(3 C / 3 WLH)
B.Phy.5812	Physics of the top-quark	(3 C / 3 WLH)
B.Phy.5815	Seminar on Introductory Topics in Particle Physics	(4 C / 2 WLH)
B.Phy.5816	Phenomenology of Physics Beyond the Standard Model	(3 C / 2 WLH)
B.Phy.5901	Advanced Algorithms for Computational Physics	(6 C / 4 WLH)
M.Phy.5002	Contemporary Physics	(4 C / 2 WLH)
M.Phy.5801	Detectors for particle physics and imaging	(3 C / 3 WLH)
M.Phy.5804	Simulation methods for theoretical particle physics	(3 C / 3 WLH)
M.Phy.5810	Physics and Applications of Ion solid interaction	(6 C / 6 WLH)
M.Phy.5811	Nuclear Solid State Physics	(4 C / 2 WLH)
M.Phy.5812	Nuclear Reactor Physics	(4 C / 4 WLH)
M.Phy.581	Advanced Topics in Nuclear and Particle Physics I	(6 C / 6 WLH)
M.Phy.582	Advanced Topics in Nuclear and Particle Physics II	(6 C / 4 WLH)
M.Phy.586	Seminar Advanced Topics in Nuclear and Particle Physics	(4 C / 2 WLH)

bb. Second stage of studies (3rd semester)

The following three modules with a total rating of 30 C must be successfully completed:

M.Phy.1604	Development and Realization of Scientific Projects in Nuclear and Particle Physics	(9 C / Block)
M.Phy.1608	Networking in Nuclear and Particle Physics	(3 C / Block)
M.Phy.408	Research Lab Course in Nuclear and Particle Physics	(18 C / Block)

e. Research focus “Theoretical physics”

Modules must be successfully completed with a rating of at least 56 C in accordance with the following provisions.

aa. Introductory courses (1st and 2nd semester)

Modules must be successfully completed with a rating of at least 26 C in accordance with the following provisions.

i. The following module must be successfully completed with a rating of 4 C:

M.Phy.415	Research Seminar Theoretical Physics	(4 C / 2 WLH)

ii. Both of the following modules must be successfully completed with a rating of 12 C and included in the certificate. Modules already provided in the bachelor cannot be taken into consideration. If these modules were already included in the bachelor as part of the 180 C, other modules are to be selected in the scope of the modules already included in the bachelor in accordance with the following provisions.

M.Phy.5401	Advanced Statistical Physics	(6 C / 6 WLH)
B.Phy.5402	Advanced Quantum Mechanics	(6 C / 6 WLH)

iii. The difference of at least 20 C to maximal 26 C must be provided by successful completion of a selection from the following modules:

B.Phy.1522	Solid State Physics II	(6 C / 6 WLH)
B.Phy.5403	Fluctuation theorems, stochastic thermodynamics and molecular machines	(3 C / 3 WLH)
B.Phy.5404	Introduction to Statistical Machine Learning	(3 C / 3 WLH)
B.Phy.5405	Active Matter	(3 C / 2 WLH)
B.Phy.5523	General Relativity	(6 C / 6 WLH)
B.Phy.5540	Introduction to Cosmology	(3 C / 2 WLH)
B.Phy.5604	Foundations of Nonequilibrium Statistical Physics	(3 C / 2 WLH)
B.Phy.5613	Soft Matter Physics	(6 C / 4 WLH)
B.Phy.5623	Theoretical Biophysics	(6 C / 4 WLH)
B.Phy.5648	Theoretical and Computational Biophysics	(3 C / 2 WLH)
B.Phy.5658	Statistical Biophysics	(6 C / 4 WLH)
B.Phy.5659	Seminar on current topics in theoretical biophysics	(4 C / 2 WLH)
B.Phy.5660	Theoretical Biofluid Mechanics	(3 C / 2 WLH)
B.Phy.5663	Stochastic Dynamics	(6 C / 6 WLH)
B.Phy.5714	Introduction to Solid State Theory	(6 C / 6 WLH)
B.Phy.5721	Information and Physics	(6 C / 6 WLH)
B.Phy.5723	Hands-on course on Density-Functional calculations 1	(3 C / 3 WLH)
B.Phy.5724	Hands-on course on Density-Functional calculations 1+2	(6 C / 6 WLH)
B.Phy.5805	Quantum field theory I	(6 C / 6 WLH)
B.Phy.5901	Advanced Computer Simulation	(6 C / 4 WLH)
M.Phy.5403	Seminar Classical-Quantum Connections in Theoretical Physics	(4 C / 2 WLH)
M.Phy.5404	Computational Quantum Many-Body Physics	(6 C / 4 WLH)
M.Phy.5405	Non-equilibrium statistical physics	(6 C / 6 WLH)
M.Phy.5406	Current Topics in Theoretical Physics	(6 C / 4 WLH)
M.Phy.541	Advanced Topics in Classical Theoretical Physics I (6C)	(6 C / 6 WLH)
M.Phy.542	Advanced Topics in Classical Theoretical Physics II	(6 C / 6 WLH)
M.Phy.543	Advanced Topics in Theoretical Quantum Physics I	(6 C / 6 WLH)
M.Phy.544	Advanced Topics in Theoretical Quantum Physics II	(6 C / 6 WLH)
M.Phy.546	Seminar Advanced Topics in Theoretical Physics	(4 C / 2 WLH)
M.Phy.5701	Advanced Solid State Theory	(6 C / 6 WLH)
M.Phy.5712	Topology in Condensed Matter Physics	(6 C / 4 WLH)
M.Phy.5804	Simulation methods for theoretical particle physics	(6 C / 6 WLH)

iv. If less than 26 C is provided from numerals i-iii, the difference can be provided by successful completion of one of the following modules:

B.Phy.1521	Introduction to Solid State Physics	(8 C / 6 WLH)
B.Phy.1531	Introduction in Materials Physics	(6 C / 5 WLH)

B.Phy.1541	Introduction to Geophysics	(4 C / 3 WLH)
B.Phy.1551	Introduction to Astrophysics	(8 C / 6 WLH)
B.Phy.1561	Introduction to Physics of Complex Systems	(8 C / 6 WLH)
B.Phy.1571	Introduction to Biophysics	(8 C / 6 WLH)
B.Phy.1511	Introduction to Particle Physics	(8 C / 6 WLH)

- or the modules listed under letters a/aa/iii with module numbers in the format M.Phy.55X, M.Phy.55XX or B.Phy.55XX,
- the modules listed under letters b/aa/iii with module numbers in the format M.Phy.56X, M.Phy.56XX or B.Phy.56XX,
- the modules listed under letters c/aa/ii+iii with module numbers in the format M.Phy.57X, M.Phy.57XX or B.Phy.57XX, or
- the modules listed under letters d/aa/iii+iv with module numbers in the format M.Phy.58X, M.Phy.58XX or B.Phy.58XX

with a rating of 6 C. Modules already successfully completed in the bachelor cannot be taken into consideration.

bb. Second stage of studies (3rd semester)

The following three modules with a total rating of 30 C must be successfully completed:

M.Phy.1610	Development and Realization of Scientific Projects in Theoretical Physics	(9 C / Block)
M.Phy.1609	Networking in Theoretical Physics	(3 C / Block)
M.Phy.414	Research Lab Course in Theoretical Physics	(18 C / Block)

3. Area of professionalisation

Modules must be successfully completed with a rating of at least 10 C in accordance with the following provisions.

a. Professionalisation seminar

M.Phy.413	General Seminar	(4 C/ 2 WLH)

b. Area of professionalisation, mathematics - natural sciences

Modules from the range of courses of the faculties of mathematics and natural sciences (including the faculty of physics must be successfully completed with a total rating of at least 6 C. In particular, the modules not included according to number 2 can be selected, furthermore an index of selectable modules will be announced by the faculty of physics. Bachelor modules may only be included if they have not already been successfully completed as part of the bachelor's programme.

B.Che.2301	Kinetics of Chemical Reactions	(6 C / 4 WLH)
B.Che.4104	Introduction to General and Inorganic Chemistry	(6 C / 6 WLH)
B.Che.8002	Introduction to Physical Chemistry for Biology and Geosciences	(10 C / 7 WLH)

B.Che.9107	Laboratory course in General and Inorganic Chemistry for Physisists and Geologists	(8 C / 10 WLH)
B.Inf.1101	Introduction to Computer Science and Programming	(10 C / 6 WLH)
B.Inf.1102	Introduction to Computer Systems	(10 C / 6 WLH)
B.Phy.1603	Procurement of scientific phenomena via new media	(4 C / 2 WLH)
B.Phy.1609	Foundations of the Unity of Human and Nature	(4 C / 2 WLH)
B.Phy.5902	Physics for presidents and citizens	(3 C / 2 WLH)
B.Phy.606	Electronic Lab Course for Natural Scientists	(6 C / 6 WLH)
B.Phy.607	Academic Writing for Physicists	(4 C / 2 WLH)
B.Phy.608	Scientific Literacy	(4 C / 2 WLH)
M.Phy.603	Writing scientific articles	(6 C / 2 WLH)
M.Che.1314	Biophysical Chemistry	(6 C / 4 WLH)

c. Alternative modules

On application (which must be directed to the Dean of Studies for the Faculty of Physics), other modules (alternative modules) can be completed in place of the modules according to letter b in accordance with the following provisions. The approval by the Dean of Studies of the faculty or teaching body which offers the alternative module must be enclosed with the application. The decision will be made by the Dean of Studies of the Faculty of Physics. The application can be rejected without stating any reasons. The applicant does not have a legal right to approval of an alternative module.

4. Key competencies

Modules must be successfully completed with a rating of at least 12 C in accordance with the following provisions.

a. Modules from the university's range of courses must be successfully completed with a total rating of at least 12 C. The following modules in particular can be selected as well as courses based on the examination regulations for courses and degrees offered of the Central Institution for Languages and Key Competencies (ZESS); further selectable modules will be announced by the Faculty of Physics in a suitable manner:

B.Che.2301	Kinetics of Chemical Reactions	(6 C / 4 WLH)
B.Che.8002	Introduction to Physical Chemistry for Biology and Geosciences	(10 C / 7 WLH)
B.Che.4104	Introduction to General and Inorganic Chemistry	(6 C / 6 WLH)
B.Che.9107	Laboratory course in General and Inorganic Chemistry for Physisists	(8 C / 10 WLH)
B.Inf.1101	Introduction to Computer Science and Programming	(10 C / 6 WLH)
B.Inf.1102	Introduction to Computer Systems	(10 C / 6 WLH)

B.SK-Phy.9001 Papers, Proposals, Presentations: Skills of Scientific Communication (4 C / 2 WLH)

M.Che.1314 Biophysical Chemistry (6 C / 4 WLH)

b. On application (which must be directed to the Dean of Studies for the Faculty of Physics), other modules (alternative modules) can be completed in place of the modules according to letter a in accordance with the following provisions. The approval by the Dean of Studies of the faculty or teaching body which offers the alternative module must be enclosed with the application. The decision will be made by the Dean of Studies of the Faculty of Physics. The application can be rejected without stating any reasons. The applicant does not have a legal right to approval of an alternative module.

5. Master thesis

30 C are awarded for successful completion of the master thesis.

Appendix II Sample curricula

1. Research focus “Astrophysics and geophysics”

Sem. **Σ C**	**Lab courses (12 C)**	**Research focus “Astrophysics and geophysics” (56 C)**			**Area of professionalisa-tion (10 C)**	**Key competencies (12 C)**
	Module	Module	Module	Module	Module	Module
1. **Σ 30 C**	M.Phy.1401 Advanced Lab Course I (Optional required) 6 C	B.Phy.1551 Introduction to Astrophysics (Optional required) 8 C	B.Phy.XXXX bzw. M.Phy.XXXX (Optional) 6 C		M.Phy.413 General Seminar (Compulsory) 4 C	Key competencies (Optional required) 6 C
2. **Σ 30 C**	M.Phy.1402 Advanced Lab Course II (Optional required) 6 C	M.Phy.409 Research Seminar Astro-/Geophysics (Compulsory) 4 C	B.Phy.XXXX bzw. M.Phy.XXXX (Optional) 8 C		Mathematics/ natural sciences (Optional required) 6 C	Key competencies (Optional required) 6 C
3. **Σ 30 C**		M.Phy.405 Research Lab Course in Astro- und Geophysics (Compulsory) 18 C	M.Phy.1601 Development and Realization of Scientific Projects in Astro- /Geophysics (Compulsory) 9 C	M.Phy.1605 Networking in Astro-/Geophysics (Compulsory) 3 C		
4. **Σ 30 C**		Master thesis 30 C				
Σ 120 C	**12 C**	**56 C (+ 30 C)**			**10 C**	**12**

2. Research focus “Biophysics and physics of complex systems”

Sem. **Σ C**	**Lab courses (12 C)**	**Research focus “Biophysics and physics of complex systems” (56 C)**			**Area of professionalisa-tion (10 C)**	**Key competencies (12 C)**
	Module	Module	Module	Module	Module	Module
1. **Σ 30 C**	M.Phy.1401 Advanced Lab Course I (Optional required) 6 C	B.Phy.1571 Introduction to Biophysics (Optional required) 6 C	B.Phy.XXXX bzw. M.Phy.XXXX (Optional) 8 C		M.Phy.413 General Seminar (Compulsory) 4 C	Key competencies (Optional required) 6 C
2. **Σ 30 C**	M.Phy.1402 Advanced Lab Course II (Optional required) 6 C	M.Phy.410 Research Seminar Biophysics/ Physics of Complex Systems (Compulsory) 4 C	B.Phy.XXXX bzw. M.Phy.XXXX (Optional) 8 C		Mathematics/ natural sciences (Optional required) 6 C	Key competencies (Optional required) 6 C
3. **Σ 30 C**		M.Phy.406 Research Lab Course in Biophysics and Physics of Complex Systems (Compulsory) 18 C	M.Phy.1602 Development and Realization of Scientific Projects in Biophysics/ Physics of Complex Systems (Compulsory) 9 C	M.Phy.1606 Networking in Biophysics/ Physics of Complex Systems (Compulsory) 3 C		
4. **Σ 30 C**		Master thesis 30 C				
Σ 120 C	**12 C**	**56 C (+ 30 C)**			**10 C**	**12 C**

3. Research focus “Solid-state and material physics”

Sem. Σ C	Lab courses (12 C)	Research focus “Solid-state and material physics” (56 C)			Area of professionalisa-tion (10 C)	Key competencies (12 C)
	Module	Module	Module	Module	Module	Module
1. **Σ 30 C**	M.Phy.1401 Advanced Lab Course I (Optional required) 6 C	B.Phy.1522 Solid State Physics II (Optional required) 6 C	B.Phy.XXXX bzw. M.Phy.XXXX (Optional) 8 C		M.Phy.413 General Seminar (Compulsory) 4 C	Key competencies (Optional required) 6 C
2. **Σ 30 C**	M.Phy.1402 Advanced Lab Course II (Optional required) 6 C	M.Phy.411 Research Seminar Solid State/ Materials Physics (Compulsory) 4 C	B.Phy.XXXX bzw. M.Phy.XXXX (Optional) 8 C		Mathematics/ natural sciences (Optional required) 6 C	Key competencies (Optional required) 6 C
3. **Σ 30 C**		M.Phy.407 Research Lab Course in Solid State/Materials Physics (Compulsory) 18 C	M.Phy.1603 Development and Realization of Scientific Projects in Solid State/Materials Physics (Compulsory) 9 C	M.Phy.1607 Networking in Solid State/Materials Physics (Compulsory) 3 C		
4. **Σ 30 C**		Master thesis 30 C				
Σ 120 C	**12 C**	**56 C (+ 30 C)**			**10 C**	**12 C**

4. Research focus “Nuclear and particle physics”

Sem. **Σ C**	**Lab courses (12 C)**	**Research focus “Nuclear and particle physics” (56 C)**			**Area of professionalisa-tion (10 C)**	**Key competencies (12 C)**
	Module	Module	Module	Module	Module	Module
1. **Σ 30 C**	M.Phy.1401 Advanced Lab Course I (Optional required) 6 C	M.Phy.5807 Particle Physics III (Optional required) 6 C	B.Phy.XXXX bzw. M.Phy.XXXX (Optional) 8 C		M.Phy.413 General Seminar (Compulsory) 4 C	Key competencies (Optional required) 6 C
2. **Σ 30 C**	M.Phy.1402 Advanced Lab Course II (Optional required) 6 C	M.Phy.412 Research Seminar Particle Physics (Compulsory) 4 C	B.Phy.XXXX bzw. M.Phy.XXXX (Optional) 8 C		Mathematics/ natural sciences (Optional required) 6 C	Key competencies (Optional required) 6 C
3. **Σ 30 C**		M.Phy.408 Research Lab Course in Particle Physics (Compulsory) 18 C	M.Phy.1604 Development and Realization of Scientific Projects in Particle Physics (Compulsory) 9 C	M.Phy.1608 Networking in Particle Physics (Compulsory) 3 C		
4. **Σ 30 C**		Master thesis 30 C				
Σ 120 C	**12 C**	**56 C (+ 30 C)**			**10 C**	**12 C**

5. Research focus “Theoretical physics”

Sem. **Σ C**	**Lab courses (12 C)**	**Research focus “Theoretical physics” (56 C)**			**Area of professionalisa-tion (10 C)**	**Key comptetences (12 C)**
	Module	Module	Module	Module	Module	Module
1. **Σ 30 C**	M.Phy.1404 Methods of Computational Physics (Optional required) 6 C	M.Phy.5401 Advanced Statistical Physics (Compulsory) 6 C	B.Phy.5402 Advanced Quantum Mechanics (Compulsory) 6 C		M.Phy.413 General Seminar (Compulsory) 4 C	Key competencies (Optional required) 6 C
2. **Σ 30 C**	M.Phy.1405 Advanced Computational Physics (Optional required) 6 C	M.Phy.415 Research Seminar Theoretical Physics (Compulsory) 4 C	M.Phy.5403 Seminar Classical-Quantum Connections in Theoretical Physics (Optional required) 4 C	M.Phy.5406 Current Topics in Theoretical Physics (Optional required) 4 C	Mathematics/ natural sciences (Optional required) 6 C	Key competencies (Optional required) 6 C
3. **Σ 30 C**		M.Phy.414 Research Lab Course in Theoretical Physics (Compulsory) 18 C	M.Phy.1610 Development and Realization of Scientific Projects in Theoretical Physics (Compulsory) 9 C	M.Phy.1609 Networking in Theoretical Physics (Compulsory) 3 C		
4. **Σ 30 C**		Master thesis 30 C				
Σ 120 C	**12 C**	**56 C (+ 30 C)**			**10 C**	**12 C**