Note:
The following curriculum is a consolidated version. It is legally non-binding and for informational purposes only.
The legally binding versions are found in the University of Innsbruck Bulletins (in German).

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Curriculum for the **Master's Programme in Physics** at the Faculty of Mathematics, Computer Science and Physics at the University of Innsbruck

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§ 1 Allocation of the study programme

Acc. to §54 par. 1 Universities Act 2002, the Master's Programme in Physics is allocated to the natural science studies.

§ 2 Qualification profile

The master's programme adds further knowledge and skills to the Bachelor's Programme in Physics that make highly qualified, independent and innovative work in research and development in physical and technical professions possible. Moreover, students are taught problem-solving strategies within the scope of their studies, which make them attractive to many other branches of industry and economy. This is achieved through advanced study of selected current areas in physics with an involvement in modern research.

In addition to university-related research, typical fields of work for graduates are the implementation and supervision of research and development projects in physico-technical economic areas and in the service sector. Physicists will find attractive employment, for example in the field of measurement and medical technology, in information and telecommunications companies, as well as in management consulting and in the financial sector. Graduates should be able to use their knowledge to solve problems in science, technology, medicine and business. Therefore, in the

first phase of the master's programme, the knowledge of both the fundamentals and the methods of physics is advanced, whereas in the second phase a research-oriented, independent profile formation embedded in the subject area of physics in Innsbruck takes place. An increased offer of research-based teaching, based on the university's main research areas, is intended to promote creative thinking and enables students to pursue a doctoral study programme.

§ 3 Scope and duration

The Master's Programme in Physics covers 120 ECTS-Credits corresponding to a duration of four semesters. One ECTS-Credit corresponds to a workload of 25 hours.

§ 4 Language of tuition

The Master's Programme in Physics is offered in English. In justified exceptional cases, exams and the Master's Thesis can be taken or written in German.

§ 5 Admission

(1) Completion of a relevant university bachelor's programme or a relevant bachelor's programme at a university of applied science, or completion of other equivalent studies at an accredited Austrian or non-Austrian post-secondary educational institution is required for admission to the Master's Programme in Physics.

(2) A completed Bachelor's Programme in Physics at the University of Innsbruck is in any case a relevant study programme. The rectorate decides based on the regulations specified in the Universities Act 2002 on the admission of graduates having completed other study programmes at approved Austrian or non-Austrian post-secondary education institutions or on the equivalence of the achievements.

(3) In the event that equivalence has been established in principle but with certain qualifications missing for full equivalence, supplemental examinations may be required. These examinations must be completed during the master's programme.

§ 6 Types of courses

(1) Courses without continuous performance assessment:

1. **Lectures** (VO) are courses held in lecture format. They introduce the research areas, methods and schools of thought for a given subject. No maximum number of participants.

(2) Courses with continuous performance assessment:

1. **Introductory seminars** (PS) introduce students interactively to scientific literature through the treatment of selected issues. They convey knowledge and methods of academic work. Maximum number of participants: 20
2. **Seminars** (SE) provide in-depth treatment of scientific topics through students' presentations and discussion thereof. Maximum number of participants: 15
3. **Practical training courses** (PR) provide practical experience with concrete scientific tasks, complementing occupational and/or academic training. Maximum number of participants: 8
4. **Project studies** (PJ): promote scientific collaboration of two or more fields through the treatment of multidisciplinary topics and the use of various methods and techniques. Maximum number of participants: 12
5. **Lectures with integrated practical parts** (VU) focus on the practical treatment of concrete scientific tasks that are discussed during the lecture parts of the course. Maximum number of participants: 25

§ 7 Compulsory and elective modules

(1) The following compulsory modules covering altogether 32.5 ECTS-Credits must be passed:

1.	Compulsory Module: Modern Physics	h	ECTS-Credits
	VO Modern Physics	3	5
	Total	**3**	**5**
	Learning Outcomes: Insight into recent developments of selected core areas of modern physics; ability to independently acquire knowledge about further basic concepts; basic understanding of the research-oriented way of thinking of modern physics;		
	Prerequisites: none		

2.	Compulsory Module: Critical Research Analysis	h	ECTS-Credits
a.	**PJ Research Study:**	6	12.5
b.	**SE Research Seminar:**	2	5
c.	**VU Research Analysis:**	3	5
	Total	**11**	**22.5**
	Learning Outcomes: Introduction to research-related project work including current literature; practical implementation of specific methods for current research projects; ability to carry out innovative projects under supervision; presentation and scientific communication of current research; advanced study of current topics in research		
	Prerequisites: 30 ECTS-Credits passed in the study programme		

3.	Compulsory Module: Module: Preparation of the Master's Thesis	h	ECTS-Credits
	Agreement on the topic, scope and form of the Master's Thesis on the basis of a brief description of the content (synopsis) as well as an agreement on the work processes and the course of study. Planning a corresponding time frame for the completion of the Master Thesis.	-	2.5
	Total	**-**	**2.5**
	Learning Outcomes: After successfully completing the module, the students are able to write a short description of the content of the planned Master's Thesis (synopsis), outline a schedule and conclude a written Master's Thesis agreement.		
	Prerequisites: none		

4.	Compulsory Module: Defence of the Master's Thesis	h	ECTS-Credits
	Final oral defence of the Master's Thesis before an examination board		2.5
	Total		**2.5**
	Learning Outcomes: Reflection of the Master's Thesis in the general context of the master's programme. In this context, theoretical understanding, methodical fundamentals, presentation of results of the		

	Master's Thesis and presentation skills are the main focus.
	Prerequisites: successful completion of all other compulsory and elective modules as well as the Master's Thesis

(2) Elective modules covering a total of 60 ECTS-Credits are to be passed as follows.

1. A specialisation (30 ECTS-Credits) and further modules covering 30 ECTS-AP can be chosen. For the specialisation in
   a. quantum sciences, elective modules 1, 2 and 4 or 2, 3 and 4
   b. quantum engineering, elective modules 5, 6 and 7
   c. ion and applied physics, elective modules 1, 8 and 9
   d. many-body physics, elective modules 10, 11 and 12
   e. computational physics, elective modules 13, 14 and 15
   f. astrophysics and particle physics, elective modules 1, 16 and 17

   must be passed.
2. If no specialisation acc. to no. 1 is chosen, elective modules (par. 3 no. 1 to 23) covering altogether 60 ECTS-Credits must be selected and passed.
3. Instead of the elective module Interdisciplinary Skills (par. 3 no. 22) and the Individual Choice of Specialisation (par. 3 no. 23) a Minor for Master Programmes (30 ECTS-Credits) can be passed, providing the availability of places. Minors are fixed modules corresponding to a total of 30 ECTS-Credits. They are announced in the University of Innsbruck bulletin.

(3)

1.	**Elective Module: Advanced Laboratory Class**	**h**	**ECTS-Credits**
a.	**PR Advanced Laboratory Class A:**	2	5
b.	**PR Advanced Laboratory Class B:**	2	5
	Total	**4**	**10**
	Learning Outcomes: Mastering of experimental methods at an advanced level; ability to carry out experiments independently and to critically analyse, interpret and present experimental results;		
	Prerequisites: none		

2.	**Elective Module: Quantum Theory**	**h**	**ECTS-Credits**
a.	**VO Quantum Theory**	4	6
b.	**PS Quantum Theory**	2	4
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding in the field of quantum theory; ability to independently acquire further knowledge in the field;		
	Prerequisites: none		

3.	Elective Module: Advanced Methods of Quantum Theory	h	ECTS-Credits
a.	**VU Advanced Methods of Quantum Theory:**	3	5
b.	**VU Advanced Theoretical Physics:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding in the field of theoretical physics with its general importance for quantum physics; ability to independently acquire further knowledge in the field;		
	Prerequisites: none		

4.	Elective Module: Advanced Topics in Quantum Science	h	ECTS-Credits
a.	**VU Special Topics in Quantum Science A:**	3	5
b.	**VU Special Topics in Quantum Science B:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of topics beyond the acquired basic knowledge; ability to independently familiarise oneself with current topical areas of quantum science		
	Prerequisites: none		

5.	Elective Module: Classical Engineering	h	ECTS-Credits
a.	**VU Information and Communication Theory**	4	5
b.	**VU Electrical Engineering**	4	5
	Total	**8**	**10**
	Learning Outcomes: Advanced understanding in the field of electrical engineering and information processing; ability to independently acquire further knowledge in the field;		
	Prerequisites: none		

6.	Elective Module: Quantum Physics	h	ECTS-Credits
a.	**VO Quantum Theory I**	2	3
b.	**PS Quantum Theory I**	1	2
c.	**VU Topics in Quantum Science A:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding in the field of quantum physics; ability to independently acquire further knowledge in the field;		
	Prerequisites: none		

7.	Elective Module: Experimental Methods in Quantum Engineering	h	ECTS-Credits
a.	**PR Advanced Lab Class A:**	2	5
b.	**VU Special Topics in Quantum Science A:**	3	5
	Total	**5**	**10**
	Learning Outcomes: Mastering of experimental methods; ability to analyse quantum physics experiments, to carry them out independently and to critically analyse, interpret and present experimental results.		
	Prerequisites: none		

8.	Elective Module: Ion Physics	h	ECTS-Credits
a.	**VO Ion Physics**	4	6
b.	**PS Ion Physics**	2	4
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding in the field of ion physics; ability to independently acquire further knowledge in the field;		
	Prerequisites: none		

9.	Elective Module: Advanced Topics in Ion and Applied Physics	h	ECTS-Credits
a.	**VU Special Topics in Ion Physics A:**	3	5
b.	**VU Special Topics in Ion Physics B:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of topics beyond the acquired basic knowledge; ability to independently acquire knowledge in current topics in ion physics and applied physics;		
	Prerequisites: none		

10.	Elective Module: Theoretical Foundations of Many-Body Physics	h	ECTS-Credits
a.	**VU Many-Body Physics I:**	3	5
b.	**VU Many-Body Physics II:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced theoretical understanding in the field of many-body physics; ability to independently acquire further knowledge in the field;		
	Prerequisites: none		

11.	Elective Module: Advanced Methods in Many-Body Theory	h	ECTS-Credits
a.	**VU Advanced Methods in Many-Body Physics A:**	3	5
b.	**VU Advanced Methods in Many-Body Physics B:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of the methods of many-body physics; ability to independently acquire advanced knowledge in the field of many-body physics;		
	Prerequisites: none		

12.	Elective Module: Applications of the Many-Body Theory and Complex Systems	h	ECTS-Credits
a.	**VU Special Topics in Many-Body Theory and Complex System Physics A:**	3	5
b.	**VU Special Topics in Many-Body Theory and Complex System Physics B:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of selected topics beyond the acquired basic knowledge; ability to independently acquire knowledge in current topics in many-body physics and complex systems physics;		
	Prerequisites: none		

13.	Elective Module: Advanced Numerical Mathematics	h	ECTS-Credits
a.	**VU Advanced Numerical Mathematics A:**	3	5
b.	**VU Advanced Numerical Mathematics B:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of basic mathematical methods in computational physics; ability to independently acquire further knowledge in the field;		
	Prerequisites: none		

14.	Elective Module: Methods in Computational Physics	h	ECTS-Credits
a.	**PR Methods in Computational Physics A:**	2	5
b.	**VU Methods in Computational Physics B:**	3	5
	Total	**5**	**10**
	Learning Outcomes: Advanced understanding of the methods in computational physics; ability to independently acquire advanced knowledge in the field of computational physics;		
	Prerequisites: none		

15.	Elective Module: Applications in Computational Physics	h	ECTS-Credits
a.	**VU Applications in Computational Physics A:**	3	5
b.	**VU Applications in Computational Physics B:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of topics beyond the acquired basic knowledge; Ability to make connections from the mathematical description of physical problems to the relevant numerical methods;		
	Prerequisites: none		

16.	Elective Module: Astrophysics and Particle Physics	h	ECTS-Credits
a.	**VU Astrophysics and Particle Physics A:**	3	5
b.	**VU Astrophysics and Particle Physics B:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of theories, observations and methods in astrophysics and particle physics; ability to independently acquire further knowledge in the field of astrophysics and particle physics;		
	Prerequisites: none		

17.	Elective Module: Advanced Astrophysics and Particle Physics	h	ECTS-Credits
a.	**VU Special Topics in Astrophysics and Particle Physics A:**	3	5
b.	**VU Special Topics in Astrophysics and Particle Physics B:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of topics beyond the acquired basic knowledge; ability to independently acquire knowledge of current topics in astrophysics and particle physics;		
	Prerequisites: none		

18.	Elective Module: Special Advanced Lab Classes	h	ECTS-Credits
a.	**PR Special Advanced Lab Class A:**	2	5
b.	**PR Special Advanced Lab Class B:**	2	5
	Total	**4**	**10**
	Learning Outcomes: Mastering of experimental methods at an advanced level; ability to carry out experiments independently and to critically analyse, interpret and present experimental results;		
	Prerequisites: none		

19.	Elective Module: Specialisation A	h	ECTS-Credits
a.	**VU Special Topics 1:**	3	5
b.	**VU Special Topics 2:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of special applications; ability to independently acquire further knowledge in the field;		
	Prerequisites: none		

20.	Elective Module: Specialisation B	h	ECTS-Credits
a.	**VU Special Topics 3:**	3	5
b.	**VU Special Topics 4:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of special applications; ability to independently acquire further knowledge in the field;		
	Prerequisites: none		

21.	Elective Module: Theoretical Specialisation	h	ECTS-Credits
a.	**VU Special Theoretical Topics 1:**	3	5
b.	**VU Special Theoretical Topics 2:**	3	5
	Total	**6**	**10**
	Learning Outcomes: Advanced understanding of special theoretical methods; ability to independently acquire further knowledge in the field;		
	Prerequisites: none		

22.	Elective Module: Interdisciplinary Skills	h	ECTS-Credits
	Providing the availability of places, courses from the curricula of the master's and/or diploma programmes at the University of Innsbruck can be selected. It is recommended to select one course from the field of gender studies, women's and gender research.		10
	Total		**10**
	Learning Outcomes: Expansion of the study programme and acquisition of additional qualifications.		
	Prerequisites: The registration prerequisites of the respective curricula must be met.		

23. Individual Choice of Specialisation:

For individual choice of specialisation, modules corresponding to 20 ECTS-Credits from the curricula of the master's programmes at the Faculty of Mathematics, Computer Science and Physics at the University of Innsbruck can be freely chosen. The registration prerequisites specified by the respective curricula must be met.

§ 8 Master's Thesis

(1) A Master's Thesis corresponding to 27.5 ECTS-Credits must be written in the master's programme. The Master's Thesis is a scientific paper that serves to demonstrate the ability to work on a scientific topic independently and in a justifiable way in terms of content and methodology.

(2) If a specialisation acc. to §7 par. 2 no.1 is chosen, the Master's Thesis must be written in the topical area of the specialisation, otherwise in the field of physics.

(3) Students are entitled to suggest the topic for the Master's Thesis or can select one from a number of suggestions.

§ 9 Examination regulations

(1) Modules are assessed by module examinations. Module examinations are examinations that serve to show the knowledge and skills gained in a module. The module is completed by positive evaluation of all parts of a module examinations.

(2) Courses of modules are assessed by course examinations. Course examinations are

a. Examinations that assess the knowledge and skills covered by an individual course for which the performance is assessed by a single examination at the end of the course. The course lecturer must communicate the examination method (written or oral) before the start of the course.

b. Courses with continuous performance assessment, for which the performance assessment is based on regular written and/or oral contributions by the participants.

(3) Course lecturers must inform the students on the targets, contents and methods of their course in a suitable fashion before the start of each semester, as well as on the contents, the methods and the evaluations criteria and standards of the course examinations.

(4) The module "Preparation of the Master's Thesis" is evaluated by the supervisor based on a synopsis. Positive evaluation reads "successfully completion", negative evaluation reads "unsuccessfully completion".

(5) The compulsory module "Defence of the Master's Thesis" is evaluated by an oral examination before an examination board consisting of the three persons.

§ 10 Academic degree

Graduates of the Master's Programme in Physics are awarded the title of "Master of Science", shortened to "MSc".

§ 11 Coming into force

This curriculum comes into force on 1 October 2020.

§ 12 Transitional provisions

(1) This curriculum applies to all students commencing their Master's Programme in Physics as of the 2020/21 winter semester.

(2) Full-time students who have started their Master's Programme in Physics at the University of Innsbruck based on the 2007 curriculum, as published in the University of Innsbruck Bulletin on 23 April 2007, Issue 34, No. 198, are entitled to finish their study programme within a maximum of six semesters from this time onwards.

(3) If the Master's Programme in Physics acc. to the 2007 curriculum is not finished in time, students are subjected to the curriculum for the Master's Programme in Physics, published in the University of Innsbruck Bulletin on 30 April 2020, Issue 30, No. 349 (2020 curriculum). Students are also entitled to subject to the curriculum of 2020 on a voluntary basis.