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Appendices to the Teaching and Examination Regulations

2018-2019

Master's degree programme in Physics



Appendix I Teaching outcomes of the degree programme (art. 1.3)

The master graduate in Physics:

1. *Knowledge and understanding*

- 1.1. understands the advanced concepts of physics, including the necessary mathematics and computer science, at a level which permits admission a PhD programme;
- 1.2. is familiar with the advanced quantitative character of physics and with the relevant research methods;
- 1.3. [Advanced Materials track] has a thorough understanding of materials science, more specifically of structure, functional properties and characterization of advanced materials;
- 1.4. [Quantum Universe track] has a thorough understanding of main fields of theoretical physics, more specifically in the fields of general relativity, statistical mechanics, quantum mechanics, particle physics and radiation processes;
- 1.5. [Science, Business and Policy track] has operational knowledge of, and insight into, the functioning of companies and administrations, as well as the relevant legislation;

2. *Application of knowledge and understanding*

- 2.1. is capable of carrying out research, aimed at the understanding of physical phenomena and their description in scientific terms;
- 2.2. is capable of analyzing a (new) complex physical problem, and to develop a structured and well-planned research approach;
- 2.3. is capable of applying his/her specific knowledge and skills in his/her own and related subject areas;
- 2.4. is capable of collaborating in a (multi-disciplinary) team;

3. *Judgement*

- 3.1. is capable of obtaining relevant information using modern information channels, and to interpret this information critically;
- 3.2. is capable of judging his/her and others' actions within a scientific context, taking societal and ethical aspects into account;
- 3.3. is able to draw conclusions on the basis of limited or incomplete information, and is able to realize and formulate the limitations of such conclusions;

4. *Communication skills*

- 4.1. is capable of communicating clearly, verbally and in writing, on his/her subject and relevant applications, at a level which is understandable to experts and non-experts, and using modern communication tools;

5. *Learning skills*

- 5.1. is capable of addressing issues inside as well as outside his/her main subject area, therefore and thereby gaining new knowledge and skills.



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Appendix II Tracks of the degree programme (art. 2.2)

The Master's degree programme in Physics offers the following tracks:

- Advanced Materials
- Quantum Universe
- Science, Business and Policy



Appendix III Content of the degree programme (art. 2.3)

The assessment method(s) of the courses below can be found in the assessment plan of the degree programme and on Ocasys.

Track Advanced Materials

Course unit	ECTS	Practical	Entry Requirements
<i>Choice</i> * Characterisation of Materials Cross-disciplinary Materials Science Functional Properties Structure at Macro, Meso and Nano Scale Supramolecular Chemistry	20		
Advanced Quantum Mechanics	5		
Computational Physics	5	X	
Mathematical Methods of Physics	5		
Statistical Mechanics	5		
Optional Courses in Advanced Materials	20	See app. IV	See appendix IV
Master's Research Project (Advanced Materials)	60	X	Passed 45 ECTS of the masters's degree programme

* Four out of five courses should be chosen

Track Quantum Universe

Course unit	ECTS	Practical	Entry Requirements
Advanced Quantum Mechanics	5		
Computational Physics	5	X	
Electrodynamics of Radiation Processes	5		
General Relativity	5		
Mathematical Methods of Physics	5		
Particle Physics Phenomenology	5		
Statistical Mechanics	5		
Student Seminar Quantum Universe	5		
Optional Courses in Quantum Universe	20	See app. IV	See appendix IV
Master's Research Project (Quantum Universe)	60	X	Passed 45 ECTS of the masters's degree programme



Track Science, Business and Policy

Course unit	ECTS	Practical	Entry Requirements
Advanced Quantum Mechanics	5		
Computational Physics	5	X	
Mathematical Methods of Physics	5		
Statistical Mechanics	5		
Two courses offered in the track Advanced Materials, the track Quantum Universe, or in the degree programme Applied Physics.	10	See app. III or IV of the corresponding programme	See app. III or IV of the corresponding programme
Introduction Science and Business	10		
Introduction Science and Policy	10		
Internship Science, Business and Policy	40	X	
Master's Research Project (Science, Business and Policy)	30	X	



Appendix IV Electives (art. 2.4)

The assessment method(s) of the courses below can be found in the assessment plan of the degree programme and on Ocasys.

Optional Courses in Advanced Materials

Course unit	ECTS	Practical	Entry Requirements
Atomic and Molecular Interactions	5		
Many Particle Systems	5		
Mechanical Properties	5		
Mesoscopic Physics	5		
Micromechanics	5		
Modern Laser Microscopy	5	X	
Non Linear Optics	5		
Physics of Lasers	5	X	
Polymer Physics	5		
Statistical Methods in Physics	5		
Statistical Signal Processing	5		
Surfaces and Interfaces	5		
Theoretical Condensed Matter Physics	5		
Ultrafast Time-Resolved Spectroscopy	5	X	
The student is allowed to choose courses in Applied Physics or Quantum Universe, on individual approval of the Board of Examiners (max. 10 ECTS)		See app. III or IV of the corresponding programme	See app. III or IV of the corresponding programme

Optional Courses in Quantum Universe

Course unit	ECTS	Practical	Entry Requirements
Big Experiments	5		
Elementary Particles	5		
Formation and Evolution of Galaxies	5		
Fundamental Constants	5		
Gravitational Waves	5		
Introduction to Plasma Physics	5		
Hamiltonian Mechanics	5		
Laser Cooling and Trapping	5		
Lie groups in Physics	5		
Nuclear Astrophysics	5		
Quantum Field Theory	5		
Statistical Methods in Physics	5		
The student is allowed to choose courses in Applied Physics, Astronomy or Advanced Materials, on individual approval by the Board of Examiners (max. 10 ECTS)		See app. III or IV of the corresponding programme	See app. III or IV of the corresponding programme
Biennial courses, offered in 2018-2019			
Cosmic Structure Formation	5		
Star and Planet Formation	5		
Stars, Nucleosynthesis, and Chemical Evolution	5		



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<i>Biennial courses, offered in 2019-2020</i>			
Dynamics of Galaxies	5		
Geometry and Topology	5		
High-energy astrophysics	5		



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Appendix V Entry requirements and compulsory order of examinations (art. 3.4)

For students admitted to the programme there are no entry requirements for the individual modules.



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Appendix VI Admission to the degree programme and different tracks (art. 5.1.1 + art. 5.2)

Candidates possessing one of the following Bachelor's degrees from the University of Groningen are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Physics on that basis:

- BSc Physics
- BSc Applied Physics



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Appendix VII Transitional provisions (art. 7.1)

There are no transitional provisions for Physics students.



Appendix VIII Admission

Application deadlines for admission (art. 5.6.1)

Deadline of Application	Non-EU students	EU students
Physics	May 1st 2019	May 1st 2019

Decision deadlines (art. 4.6.3)

Deadline of Decision	Non-EU students	EU students
Physics	November 1st 2019	November 1st 2019