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

The master graduate in Physics…

1. Knowledge and understanding
   - 1.1. understands the basic 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 quantitative character of physics and with the relevant research methods;
   - 1.3. [specialization Advanced Materials] has a thorough understanding of materials science, more specifically of structure, functional properties and characterisation of advanced materials;
   - 1.4. [specialization Quantum Universe] has a thorough understanding of main fields of theoretical physics, more specifically in the fields of general relativity, quantum mechanics, particle physics and electromagnetic processes;
   - 1.5. [specialization Science, Business and Policy specialization] 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;

# Appendix II Specializations of the degree programme (art. 2.2)

The degree programme has the following tracks:
- Advanced Materials
- Quantum Universe
- Science, Business and Policy

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

### Specialization Advanced Materials

| Course unit | ECTS | Practical | Entry Requirements |
|---|---|---|---|
| Computational Physics | 5 | X | |
| Cross-disciplinary Materials Science | 5 | | |
| Advanced Quantum Mechanics | 5 | | |
| Functional Properties | 5 | | |
| Structure at Macro, Meso and Nano Scale | 5 | | |
| Characterisation of Materials | 5 | | |
| Statistical Mechanics | 5 | | |
| Mathematical Methods of Physics | 5 | | |
| Elective specializing courses | 20 | See app. IV | See appendix IV |
| General Physics Colloquium | - | | |
| Scientific Integrity | - | | |
| Master's Research Project (Advanced Materials) | 60 | X | Passed 35 ECTS of the masters's degree programme |

The assessment method of the courses can be found in the assessment plan of the degree programme and on Ocasys

### Specialization Quantum Universe

| Module | ECTS | Practical | Prerequisites |
|---|---|---|---|
| Computational Physics | 5 | X | |
| General Relativity | 5 | | |
| Advanced Quantum Mechanics | 5 | | |
| Electrodynamics of Radiation Processes | 5 | | |
| Particle Physics Phenomenology | 5 | | |
| Statistical Mechanics | 5 | | |
| Mathematical Methods of Physics | 5 | | |
| Student Seminar Quantum Universe | 5 | | |
| Elective specializing courses | 20 | See app. IV | See appendix IV |
| General Physics Colloquium | - | | |
| Scientific Integrity | - | | |
| Master's Research Project (Quantum Universe) | 60 | X | Passed 35 ECTS of the masters's degree programme |

The assessment method of the courses can be found in the assessment plan of the degree programme and on Ocasys

**Specialization Science, Business and Policy**

| Course unit | ECTS | Practical | Entry Requirements |
|---|---|---|---|
| Computational Physics | 5 | X | |
| Advanced Quantum Mechanics | 5 | | |
| Statistical Mechanics | 5 | | |
| Mathematical Methods of Physics | 5 | | |
| Courses in:<br>- Advanced Materials<br>- Quantum Universe<br>- Applied Physics<br>- Optional courses in Physics | 10 | See app. III or IV of the corresponding programme | See app. III or IV of the corresponding programme |
| Introduction Science, Business and Policy | 20 | | |
| Internship Science, Business and Policy | 40 | X | |
| General Physics Colloquium | - | | |
| Scientific Integrity | - | | |
| Master's Research Project (Science, Business and Policy) | 30 | X | |

The assessment method of the courses can be found in the assessment plan of the degree programme and on Ocasys

# Appendix IV Electives (art. 2.4)

## Optional Courses in Advanced Materials

| Course unit | ECTS | Practical | Entry Requirements |
|---|---|---|---|
| Atomic and Molecular Interactions | 5 | | |
| Micromechanics | 5 | | |
| Surfaces and Interfaces | 5 | | |
| Statistical Signal Processing | 5 | | |
| Mechanical Properties | 5 | | |
| Non Linear Optics | 5 | | |
| Physics of Lasers | 5 | X | |
| Statistical Methods in Physics | 5 | | |
| Theoretical Condensed Matter Physics | 5 | | |
| Many Particle Systems | 5 | | |
| Mesoscopic Physics | 5 | | |
| Modern Laser Microscopy | 5 | X | |
| Polymer 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 |

The assessment method of the courses can be found in the assessment plan of the degree programme and on Ocasys

## Optional Courses in Quantum Universe

| Course unit | ECTS | Practical | Entry Requirements |
|---|---|---|---|
| High-energy astrophysics (15/16) | 5 | | |
| Introduction to Plasma Physics | 5 | | |
| Lie groups in Physics | 5 | | |
| Stellar Structure and Evolution (16/17) | 5 | | |
| Cosmic Structure Formation (16/17) | 5 | | |
| Fundamental Constants | 5 | | |
| Nuclear Astrophysics | 5 | | |
| Quantum Field Theory | 5 | | |
| Dynamics of Galaxies | 5 | | |
| Geometry and Topology (15/16) | 5 | | |
| Geometry & Differential Equations (16/17) | 5 | | |
| Star and planet formation (16/17) | 5 | X | |
| Statistical Methods in Physics | 5 | | |
| Big Experiments | 5 | | |
| Elementary Particles | 5 | | |
| Formation and Evolution of Galaxies | 5 | | |
| The student is allowed to choose courses in Applied Physics, Astronomy or Advanced Materials, 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 |

The assessment method of the courses can be found in the assessment plan of the degree programme and on Ocasys

## Appendix V Entry requirements and compulsory order of examinations (art. 3.2)

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

## Appendix VI Admission to the degree programme and different specializations (art. 4.1.1 + art. 4.2)

Holders 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 Natuurkunde
- BSc Technische Natuurkunde

# Appendix VII

## Application deadlines for admission (art. 4.6.1)

| Deadline of Application | Non-EU students | EU students |
|---|---|---|
| Nanoscience | February 1st 2015 | May 1 st 2015 |
| Behavioural and Cognitive Neurosciences | May 1st 2015 | May 1st 2015 |
| Biomolecular Sciences (topprogramme) | May 1st 2015 | May 1st 2015 |
| Evolutionary Biology (topprogramme/EM) | January 15th 2015 | January 15th 2015 |
| Remaining FMNS Masters | May 1st 2015 | May 1st 2015 |

## Decision deadlines (art. 4.6.3)

| Deadline of Decision | Non-EU students | EU students |
|---|---|---|
| Nanoscience | June 1st 2015 | June 1st 2015 |
| Behavioural and Cognitive Neurosciences | June 1st 2015 | June 1st 2015 |
| Biomolecular Sciences (topprogramme) | June 1st 2015 | June 1st 2015 |
| Evolutionary Biology (topprogramme/EM) | June 1st 2015 | June 1st 2015 |
| Remaining FMNS Masters | November 1st 2015 | November 1st 2015 |