



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

1. Knowledge, skills, and insight

- 1.1 The MSc masters the fundamental astronomical and astrophysical concepts as well as the necessary tools from physics, mathematics and computer science, at a level which permits admission to PhD studies
- 1.2 The MSc is familiar with the quantitative character of astronomy and astrophysics, and with the relevant research methods
- 1.3 * The MSc who has completed the Astronomy track has operational knowledge in an observational or theoretical astronomical or astrophysical subarea
 - * The MSc who has completed the Instrumentation and Informatics track has operational knowledge in the area of instrumentation and information technology in astronomy, physics, and/or space research
 - * The MSc who has completed the 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 skills

- 2.1 The MSc is capable to carry out research, aimed at understanding of astronomical phenomena, both observational and theoretical
- 2.2 The MSc is capable to analyse a (new) complex astrophysical problem, and develop a structured and well-planned research approach
- 2.3 The MSc is capable to apply his/her specific knowledge and skills in his/her own and related subject areas
- 2.4 The MSc is capable to collaborate in a (multi-disciplinary) team

3. Judgement

- 3.1 The MSc is capable to obtain relevant information using modern information channels, and to interpret this information critically
- 3.2 The MSc is capable to judge his/her and others' actions within a scientific context, taking societal and ethical aspects into account
- 3.3 The MSc 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

The MSc is capable to communicate 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

The MSc is capable to also address issues outside his/her main subject area, therefore and thereby gaining new knowledge and skills



Appendix B Specializations of the degree programme (art. 2.2)

The degree programme has the following specializations:

- Theoretical and Observational Astronomy (Quantum Universe)
- Instrumentation and Informatics
- Science, Business and Policy

Appendix C Content of degree programme (art. 2.3)

Specialization Theoretical and Observational Astronomy (Quantum Universe)

| Module | ECTS | assessment | practical |
|--|------|--|------------|
| General Relativity | 5 | Assignments, written exam | |
| Student seminar Quantum Universe | 5 | Presentations | |
| Particle Physics Phenomenology | 5 | Written exam | |
| Electrodynamics of Radiation Processes | 5 | Written exam | |
| Astrophysics Core Courses | 20 | see appendix D | see app. D |
| Optional Courses in Theoretical and Observational Astronomy (Quantum Universe) | 20 | see appendix D | see app. D |
| Master Research / Thesis | 60 | Assessment of performance, report, presentation, attendance Astronomy Colloquium | x |

Specialization Instrumentation and Informatics

| Module | ECTS | assessment | practical |
|---|------|--|------------|
| General Relativity | 5 | Assignments, written exam | |
| Student seminar Quantum Universe | 5 | Presentations | |
| Particle Physics Phenomenology | 5 | Written exam | |
| Electrodynamics of Radiation Processes | 5 | Written exam | |
| Optional courses in Instrumentation and Informatics | 30 | see appendix D | see app. D |
| Project Information Technology | 10 | Assessment of performance, report, presentation | x |
| Internship in Industry | 20 | Assessment of performance, report, presentation | x |
| Master Research / Thesis | 40 | Assessment of performance, report, presentation, attendance Astronomy Colloquium | x |

Specialization Science, Business and Policy

| module | ECTS | assessment | practical |
|--|------|---------------------------------------|------------|
| Astrophysics Core Courses | 20 | see appendix D | see app. D |
| Optional Courses in Theoretical and Observational Astronomy (Quantum Universe) | 10 | see appendix D | see app. D |
| Course Science, Business and Policy | 20 | Assignments, written exam, attendance | |
| Internship Science, Business and | 40 | Assessment of performance, reports | x |



Policy

| | | | |
|--------------------------|----|--|---|
| Master Research / Thesis | 30 | Assessment of performance, report, presentation , attendance Astronomy Colloquium | x |
|--------------------------|----|--|---|

Appendix D Optional modules (art. 2.4)

Astrophysics Core Courses

| module | ECTS | assessment | practical |
|---|------|------------------------------------|-----------|
| <i>Yearly courses</i> | | | |
| Statistical Signal Processing | 5 | Assignments, written exam | |
| Formation and Evolution of Galaxies | 5 | Written exam | |
| <i>Biennial courses, offered in 2015-2016</i> | | | |
| High-energy Astrophysics | 5 | Lecture, presentation, assignments | x |
| Dynamics of Galaxies | 5 | Assignments, written exam | |
| <i>Biennial courses, offered in 2014-2015</i> | | | |
| Stellar Structure and Evolution | 5 | Written exam | |
| Cosmic Structure Formation | 5 | Written exam | |
| Star and Planet Formation | 5 | Written exam | |

Optional Courses in Theoretical and Observational Astronomy (Quantum Universe)

| module | ECTS | Assessment | practical |
|---|------|---|-----------|
| <i>Yearly courses</i> | | | |
| Inter Academy Course | 5 | Assignments, written exam | |
| <i>Biennial courses, offered in 2015/16</i> | | | |
| Space Mission Technology | 5 | Written exam | |
| Basic Detection Techniques | 5 | Assignments, report about experiments | x |
| <i>Biennial courses, offered in 2014-2015</i> | | | |
| Interferometry | 5 | Written exam | |
| <i>Capita Selecta courses, offered in 2014/15</i> | | | |
| Chemical Evolution of Galaxies | 3 | Literature assignments, presentation | |
| La Palma Observation Trip | 3 | Collect and analyse data, presentation, report | x |
| Gravitational Lensing | 3 | Presentation, report | |
| HI in the Universe | 3 | Literature assignments, discussion, presentation | |
| Gas Flow in Galaxies | 3 | Literature assignments, report, oral presentation | |
| Exoplanets | 3 | Literature assignments, presentation | |

Capita Selecta courses, offered in 2015/16

Different capita selecta courses will be offered, as indicated in appendix D of the year 2015/16

Quantum Universe Courses

| | | | |
|-------------------------------------|---|----------------------|---|
| Mathematical Methods of Physics | 5 | Assignments | |
| Computational Physics | 5 | Computer assignments | x |
| Atomic and Molecular Interactions | 5 | Written exam | |
| Elementary Particle Physics | 5 | Oral exam | |
| Formation and Evolution of Galaxies | 5 | Written exam | |
| Fundamental Constants | 5 | Assignments | |



| | | |
|---------------------------------|---|---------------------------|
| Geometry and Topology | 5 | Assignments, written exam |
| Cosmic Structure Formation | 5 | Written exam |
| Lie Groups in Physics | 5 | Oral or written exam |
| Stellar Structure and Evolution | 5 | Written exam, |
| Introduction to Plasma Physics | 5 | Written exam |
| Quantum Field Theory | 5 | Oral exam |
| Star and Planet Formation | 5 | Written exam |
| Statistical Methods in Physics | 5 | Written exam |

Optional Courses in Instrumentation and Informatics

| module | ECTS | assessment | practical |
|---|------|--|-----------|
| Interferometry (biennial, offered in 2014/15) | 5 | Written exam | |
| Statistical Signal Processing | 5 | Assignments, written exam | |
| Basic Detection Techniques (biennial, offered in 2015/16) | 5 | Assignments, report about experiments | x |
| Space Mission Technology (biennial, offered in 2015/16) | 5 | Written exam | |
| Numerical Mathematics 2 | 5 | Written exam | x |
| Instrumentation related physics courses on approval of the board of examiners | | as indicated in appendix C or D of the corresponding MSc Programme | |

Appendix E 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 F 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 Astronomy on that basis:

- BSc Sterrenkunde



Appendix G Application deadlines for admission (art. 4.5.1)

| Deadline of Application | Non-EU students | EU students |
|-------------------------------------|------------------------|--------------------|
| Master's degree programme Astronomy | April 1st 2014 | May 1st 2014 |

Decision deadlines (art. 4.5.3)

| Deadline of Decision | Non-EU students | EU students |
|-------------------------------------|------------------------|--------------------|
| Master's degree programme Astronomy | June 1st 2014 | June 1st 2014 |