university of groningen / faculty of science and engineering / astronomy

Appendices to the Teaching and Examination Regulations

2022-2023

Bachelor's degree programme in Astronomy

Appendix I Learning outcomes of the Bachelor's degree programme (Article 3.1.1)

A. Generic learning outcomes – Knowledge

A1. Bachelor's graduates have general knowledge of the foundations and history of mathematics, natural sciences and technology, in particular those of astronomy.

A2. Bachelor's graduates have mastered the basic concepts of astronomy (see the Degree programme-specific learning outcomes, listed below, for further specification) to a certain extent and are familiar with the interrelationships of these concepts within astronomy as well as with other disciplines.

A3. Bachelor's graduates have in-depth knowledge of several contemporary topics within astronomy.

A4. Bachelor's graduates are familiar with the quantitative character of the fields of mathematics and natural sciences and have an understanding of the methods used in these fields, and particularly within astronomy, including computer-aided methods.

A5. Bachelor's graduates have sufficient knowledge and understanding of mathematics and natural sciences to successfully complete a follow-up Master's degree programme in astronomy.

A6. Bachelor's graduates are aware of the societal, ethical and social aspects involved in the fields of mathematics and natural sciences, and act accordingly.

B. Generic learning outcomes – Skills

B1 (Research) Bachelor's graduates are able to draw up a research question, design, plan and conduct research and report on it with an appropriate degree of supervision. Bachelor's graduates are able to evaluate the value and limitations of their research and assess its applicability outside their own field.

B2 (Designing) Bachelor's graduates are able to translate an astronomy problem, in particular a design problem, into a plan of approach and – taking into account the practical boundary conditions – find a solution.

B3 (Gathering information) Bachelor's graduates are able to gather relevant information using modern means of communication and to critically interpret this information.

B4 (Collaborating) Bachelor's graduates are able to collaborate in teams on technical-scientific problems.

B5 (Communicating) Bachelor's graduates are able to communicate in English, both orally and in writing in academic and professional contexts, with both colleagues and others. They are familiar with the relevant means of communication.

B6 (Reflecting) Bachelor's graduates are able to assess their own actions and those of others in a natural sciences context, bearing in mind the social/societal and ethical aspects.

B7 (Learning skills) Bachelor's graduates are able to apply learning skills that enable them to pursue a follow-up degree and acquire knowledge in new fields with a high level of autonomy.

B8 Additional subject-specific skills are listed below in Degree programme-specific learning

outcomes – Skills.

Degree programme-specific learning outcomes – Basic Knowledge

1. The bachelor's graduate in Astronomy
   1.1. has some knowledge of the historical development of the astronomical worldview;
   1.2. is familiar with the principles of positional astronomy;
   1.3. masters the basic astrophysics of planets, stars and galaxies, interstellar medium and cosmology;
   1.4. knows the basic principles concerning conducting astronomical observations in different wavelength regimes and processing the obtained observational data;
   1.5. has a thorough knowledge of theoretical astrophysics;
   1.6. has a thorough knowledge of general mathematics (calculus, linear algebra, complex analysis, error analysis, and statistics);
   1.7. has a thorough knowledge of general physics (classical mechanics, electromagnetism, quantum physics, thermodynamics, statistical physics, wave phenomena, oscillations and optics, matter: structure and interactions);
   1.8. (minor) has a deeper knowledge of subjects within their own discipline or a broad general knowledge of a different discipline.

Degree programme-specific learning outcomes – Skills

2. The bachelor's graduate in Astronomy
   2.1. is on an elementary level able to obtain, analyse, and presents observations in different wavelength regimes of objects like stars, galaxies, and star forming regions;
   2.2. is able to conduct basic astronomical observations with an optical telescope;
   2.3. is familiar with the use of computers and computing in astronomy research:
      - has experience in working with astronomical observations and/or astronomical simulations;
      - is able to write software in a common programming language.

Appendix II Majors and Minors of the degree programme (Article 3.6.4)

The programme consists of the major Astronomy (150 ects) and a minor (30 ects). The student can participate in either the minor Astronomy, the minor Instrumentation & Informatics or a Faculty, University, or an Exchange Minor.

Appendix III Course units in the propaedeutic phase

- **List of course units; Article 4.1.1**
- **Compulsory order of examinations; Article 9.3**

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

Course unit (course code)	**ECTS**	**Practical**	**Entry requirements**
Calculus 1 (*TBA*)	5	X	
Calculus 2 (*TBA*)	5		
Electricity and Magnetism (WBPH033-10)	10	X	
Introduction to Programming and Computational Methods (WBAS013-05)	5	X	
Linear Algebra (WBPH054-05)	5		
Mathematical Physics (WBPH049-05)	5		
Mechanics and Relativity (WBPH001-10)	10		
Observational Astronomy (WBAS015-05)	5	X	
Physics Laboratory 1 (WBPH013-05)	5	X	
Choice: - Introduction to Astronomy (WBAS007-05) - Introduction to Energy & Environment (WBPH019-05) - Physics of Modern Technology - (WBPH027-05) - Medical Physics & Biophysics (WBPH022-05) - Introduction to Nanophysics (WBPH055-05) - Physics of the Quantum Universe (WBPH028-05)	5		

Appendix IV Course units in the post-propaedeutic phase

- **List of course units; Article 7.1.1**
- **Compulsory order of examinations; Article 9.3**

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

Course unit (course code)	ECTS	Practical	Entry requirements
Astroparticle Physics (WBPH036-05)	5		
Astrophysical Hydrodynamics (WBAS011-05)	5		
Complex Analysis (*TBA*)	5		
Interstellar Medium (WBAS012-05)	5		
Numerical Methods (WBAS014-05)	5	X	
Physics of Galaxies (WBAS016-05)	5		
Physics of Stars (WBAS017-05)	5		
Physics, Astronomy & Society: Ethical and Professional Aspects (WBPH053-05)	5		
Quantum Physics 1 (WBPH014-05)	5		
Quantum Physics 2 (WBPH052-05)	5		
Statistics for Astronomy (WBAS004-05)	5	X	
Structure of Matter 1 (WBPH034-10)	5		
Thermal Physics (WBPH002-10)	10		
Waves and Optics (WBPH032-05)	5	X	
Minor	30	Depending on the minor	Depending on the minor
Astronomy Bachelor Research Project (WBAS901-15)	15	X	Passed 150 ECTS of the Bachelor's degree programme

Minor Astronomy

The Minor comprises of 30 ECTS and is a coherent and deepening package of course units.

Course unit (course code)	ECTS	Practical	Entry requirements
Cosmology (WBAS001-05)	5		
Planetary Systems (WBAS002-05)	5		
Choice: - Atoms and Molecules (WBPH003-05) - Nuclear Physics (WBPH011-05) - Space Mission Technology (WBAS003-05)	5		
Choice: - Advanced Mechanics (WBPH017-05) - Radio Astronomy (WBAS008-05) - Statistical Signal Processing (WBAS009-05) - Introduction to Science Communication (WBEC001-05) - Oriëntatie op Onderwijs in de Bètawetenschappen (WBEC002-05)	15	X	

Minor Instrumentation and Informatics

The Minor comprises of 30 ECTS and is a coherent and deepening package of course units.

Course unit (course code)	ECTS	Practical	Entry requirements
Cosmology (WBAS001-05)	5		
Space Mission Technology (WBAS003-05)	5		
Statistical Signal Processing (WBAS009-05)	5		
Control Engineering (for BME) (WMBE024-05)	5	X	
Principles of Measurement Systems (WBPH029-05)	5		
Choice: - Radio Astronomy (WBAS008-05) - Introduction to Science Communication (WBEC001-05) - Oriëntatie op Onderwijs in de Bètawetenschappen (WBEC002-05)	5	X	

Appendix V Admission to the post-propaedeutic phase (Article 6.1.1)

Only students who have been issued a positive study advice from the degree programme in Astronomy will be admitted to the post-propaedeutic phase.

Appendix VI Contact hours propaedeutic and post-propaedeutic phase (Article 3.5.3)

Bachelor's year 1	
Structure contact hours	**Contact hours per year**
Lectures	346
Tutorial	288
Practicals	140
Tutoring	8
Examinations	45
Other structured hours	50

Bachelor's year 2	
Structure contact hours	**Contact hours per year**
Lectures	334
Tutorial	288
Practicals	71
Tutoring	8
Examinations	45
Other structured hours	18

Bachelor's year 3	
Structure contact hours	**Contact hours per year**
Lectures	334
Tutorial	288
Practicals	71
Tutoring	8
Examinations	45
Other structured hours	18

Appendix VII Additional Requirements Open degree Programmes (Art. 7.3)

Students wishing to pursue an open degree programme may file a request with the Board of Examiners of Astronomy. The Board of Examiners will evaluate whether the proposed curriculum meets the learning outcomes of the degree programme.

Appendix VIII Transitional arrangement (article 12.1)

There are no transitional arrangements this year.