Faculty of Science, University of Amsterdam
Faculty of Science, Vrije Universiteit Amsterdam

TEACHING AND EXAMINATION REGULATIONS
PART B

Academic year 2018-2019

MASTER'S PROGRAMMES
Joint Degree Physics and Astronomy
Single Degree Physics
Single Degree Astronomy & Astrophysics

Contents

Chapter 1. General Provisions

Article 1.1 – Definitions

In addition to part A, the following definitions are used in part B

a.	Research project	Compulsory internship including master's thesis and colloquium
b.	Personal Education Plan	An individual study plan for the student's master programme
c.	Course	Education imparted in a series of lessons or meetings
d.	Admissions Board	Track-specific committee (track coordinator + VU/UvA staff member) that decides on admission

Article 1.2 – General information master's programme

1. The Master's programmes Physics and Astronomy (CROHO 65016), Physics (CROHO 60202) and Astronomy & Astrophysics (CROHO 60230) are offered on a full-time basis and the language of instruction is English.
2. In this document the reader should consider articles referring to the new track names (and to Astronomy & Astrophysics as track instead of a programme) to be applicable to the old tracks and programmes as well.
3. The programme has a workload of 120 EC.
4. A component of the programme generally consists of 3 EC or multiples of this number.
5. Within the programme Physics and Astronomy the following tracks are offered:
   - Astronomy and Astrophysics
   - Advanced Matter and Energy Physics
   - Gravitation, Astro- and Particle Physics (GRAPPA)
   - Biophysics and Biophotonics (formerly called Physics of Life and Health)
     Students enrolled under the track PLH can graduate until August 31, 2020. Upon graduation, the name of the PLH track will appear on their diploma supplement.
   - Science for Energy and Sustainability
   - Theoretical Physics
   - Science, Business & Innovation (SBI). The SBI track does not accept new incoming students. Since September 2017 the SBI track is an independent master programme and has its own TER.
6. Within the programme Physics the following tracks are offered:
   - Advanced Matter and Energy Physics
   - Gravitation, Astro- and Particle Physics GRAPPA/Particle and Astroparticle
   - Physics of Life and Health
   - Science for Energy and Sustainability
   - Theoretical Physics
   - Science, Business & Innovation.

   The Master's programme Physics does not accept new incoming students. Since September 2017 the SBI track is an independent master programme and has its own TER.
7. Within the programme Astronomy & Astrophysics the following tracks are offered:
   - Astronomy and Astrophysics
   - Gravitation, Astro- and Particle Physics GRAPPA/Astrophysics

   The Master's programme Astronomy & Astrophysics does not accept new incoming students
8. In each Master track the student may choose a major or a minor from the list below (see Article 4.1).

- Major Science Communication;
- Major Science in Society;
- Major Teaching;
- Minor Teaching;
- Minor Tesla.

9. The student determines the content of the Master's programme in consultation with the track coordinator of the Master's programme and according to the rules of Chapter 3. The study programme must be approved by the Examinations Board. For this purpose, a completed Personal Education Plan (PEP) form has to be submitted to the Examination Board. The student submits this PEP, signed by the track coordinator, to the Examinations Board. If the student wants to change the contents of the study programme, the student promptly consults with the track coordinator of the study programme. If this results in a new PEP the student submits this to the Examinations Board.

Article 1.3 – Enrolment

The programme starts at the beginning of the first semester (September). This enrolment date ensures a programme that can be expected to be completed within the official period.

Chapter 2. Aim of the programme and exit qualifications

Article 2.1 – Aim of the programme

The general objective of the Master's programme is to provide students with such knowledge, skills, abilities and insight in the field of Physics and/or Astronomy, including the necessary mathematical, experimental, computational and communicative skills, to enable them to work as a professional Physicist or Astronomer, or to become qualified to pursue advanced training as scientific researcher.

The programme also aims at furthering the understanding of the position and role of physics and astronomy in the sciences and in society, and to further a social sense of responsibility.

The aim of the Master's programmes in Physics and Astronomy, Physics, and Astronomy & Astrophysics is to:

a) educate students to become independent academic professionals, through conducting fundamental scientific research as well as working with current scientific knowledge, and applying this knowledge in new and continuously changing practical situations;
b) actively stimulate interdisciplinary collaboration in the development of science, based on knowledge in the field of physics/astronomy;
c) offer students the possibility to develop skills, knowledge and insight in a specialisation in the field of physics/astronomy, with emphasis on formulating relevant scientific questions and the approach to formulate answers to these questions;
d) provide student-oriented education that is of a high, internationally recognised quality;
e) offer students the opportunity to gain knowledge and insight in an international setting;
f) provide an inspiring academic learning environment, and to offer feasible study specialization programmes to a demanding and heterogeneously composed student population;
g) develop the ability in students to convey acquired knowledge to others.

Article 2.2 – Exit qualifications

1. The graduate of the Master's programmes Physics and Astronomy, Physics, Astronomy & Astrophysics:

a) has a thorough theoretical and practical knowledge of modern physics/astronomy, including the knowledge of other disciplines required for that purpose;
b) has a thorough knowledge of theoretical and/or experimental methods and research experience in at least one sub-area within the physics/astronomy discipline;
c) is able to become acquainted with other sub-areas of the physics/astronomy discipline within a reasonable period of time;
d) is able to formulate a research plan based on a realistic problem definition within the physics/astronomy discipline;
e) is able to analyse and formulate research results and to draw conclusions;
f) is able to write a scientific report or an internationally accessible scientific publication and to participate in discussions on (specialised) topics in the field of study;
g) is able to consult international professional literature in the relevant sub-areas and to apply the knowledge gained from that;
h) is able to apply one's knowledge of physics/astronomy in a broader (multidisciplinary) context;
i) is employable in those positions for which knowledge and research skills in the field of physics/astronomy are a prerequisite;
j) has sufficient knowledge of, and insight in the social role of physics/astronomy to make a sound choice regarding one's own profession, as well as in the exertion of this profession;
k) is able to cooperate with other people, to convey knowledge to other people, and to give a presentation both to discipline specialists and to a broader audience.

2. Students selecting an experimental or observational Master's programme must be able to independently conduct experiments, or devise observations and the corresponding controls, conducting and evaluating these within a given period of time.

   In addition, each graduate in the programme curriculum:
   - is able to compare and incorporate obtained research results and conclusions within the framework of the results of other scientists;
   - is able to form a vision on the development of scientific research in the field of physics/astronomy;
   - is able to quantitatively and qualitatively analyse physics/astronomy processes, to incorporate data in existing or new models and to present the results at various levels of abstraction.

3. In addition to paragraph 1 and 2, the student who has completed the track Advanced Matter and Energy Physics has obtained the following track-specific qualifications:
   a. a well-founded knowledge of the theoretical background behind experimental physics in the sub-disciplines: (hard and soft) condensed matter physics; atomic and laser physics;
   b. a well-founded knowledge of experimental approaches of relevance in modern research into at least one of the following research fields:
      - emergent materials, strongly correlated electron systems and unconventional superconductivity;
      - energy materials and processes for (solar) energy conversion;
      - complex liquids, granular and soft bio-matter;
      - high-precision laser spectroscopy, ultracold quantum gases, quantum information and simulation with ultracold atoms.
   c. proficiency in applying the theoretical knowledge learned to enable the interpretation of the results from experimental work - executed by the graduate at least in part as an independent investigator able to do guided research - in a research project in a field

within or close to those given in paragraph 2 above.

4. In addition to paragraph 1 and 2, the student who has completed the track Gravitation, Astro- and Particle Physics (GRAPPA) has obtained the following track-specific qualifications:
   a. a well-founded theoretical knowledge in particle physics and/or astroparticle physics and/or cosmology;
   b. a well-founded knowledge of experimental or theoretical approaches in at least one of the following research fields:
      - Standard Model and Beyond the Standard Model Physics;
      - Cosmology;
      - Dark Matter;
      - Gravitational Waves and tests of Gravity;
      - Cosmic Messengers;
      - (Astro-)Particle Physics Detector R&D.
5. In addition to paragraph 1 and 2, the student who has completed the track Biophysics and Biophotonics (formerly called Physics of Life and Health) has obtained the following track-specific qualifications:
   a. a well-founded knowledge of the physics background behind processes on a cellular or organ level
   b. a well-founded knowledge of experimental or simulation approaches into at least one of the following research fields:
      - Novel imaging modalities;
      - Novel therapeutic applications;
      - Cellular biophysics;
      - Organ biophysics;
   c. proficiency in applying the theoretical knowledge learned to enable the interpretation of the results from experimental work - executed by the graduate at least in part as an independent, principal investigator - in a research project in a field within or close to those given in 2.2.5b above.
6. In addition to paragraph 1 and 2, the student who has completed the track Science for Energy and Sustainability has obtained the following track-specific qualifications:
   a. a thorough knowledge of the scientific, technological and societal challenges for our future associated with energy and sustainability problems;
   b. proficiency in analysing and evaluating the current energy and sustainability problems;
   c. proficiency in applying the acquired theoretical and practical insights in day-to-day practice at an institution, company or organization, strongly focused on providing scientific solutions to current and future energy and sustainability problems;
7. In addition to paragraph 1 and 2, the student who has completed the track Theoretical Physics has obtained the following track-specific qualifications:
   a. a well-founded and working knowledge of Quantum Field Theory for particle physics as well as many body physics;
   b. a thorough knowledge of the fundamental aspects in modern statistical physics and condensed matter theory;
   c. the student is informed about basic theoretical concepts as second quantization, path integrals;
   d. the student is capable of finding the appropriate theoretical framework for a wide range of physics problems.
8. In addition to paragraph 1 and 2, the student who has completed the track Astronomy and Astrophysics has obtained the following track-specific qualifications:
   a well-founded knowledge of experimental or theoretical approaches in at least one of the following research fields:

- X-ray binaries and compact objects
- Gamma ray bursts and radio transients
- Advanced instrumentation
- Planet and star formation.

9. In addition to paragraph 1, the student who has completed the track Science, Business & Innovation has obtained the following track-specific qualifications:
   a. a thorough knowledge of the specific natural scientific and social scientific aspects of business innovation trajectories in the area of human life and health care (track Life & Health) or in sustainable energy technology (track Energy & Sustainability);
   b. a proficiency in analyzing and solving problems with respect to business innovation trajectories in drug development and health diagnostic instruments (track Life & Health) or in sustainable energy technology (track Energy & Sustainability);
   c. a proficiency in applying the acquired theoretical and practical insights in day-to-day practice at an institution, company or organization, strongly focused on providing natural science- and social science-based solutions that enable business innovation trajectories in drug development and health diagnostic instruments (track Life & Health) or in sustainable energy technology (track Energy & Sustainability).

Chapter 3. Admission to the programme

Article 3.1 – Entry requirements (TER)

1. Students who have successfully completed the following degrees may be admitted:
   - a Bachelor's degree in Physics and Astronomy, in Physics, in Technical Physics, or in Astronomy, awarded by a Dutch University;
   - a Bachelor's Degree in *Beta-gamma met een Natuurkunde Major* (Liberal Arts and Sciences with a Physics Major), awarded by the University of Amsterdam;
   - a Bachelor's Degree awarded by the Amsterdam University College with a *Science Major, track Physics,* including the courses Electrodynamics, Quantum Physics and Mathematical Methods in Physics;
2. Without prejudice to the provisions of paragraph 1, the Admissions Board may grant admission to the study programme when concluding that the previous education of the candidate is equivalent to the Bachelor's degree referred to in paragraph 1.
3. Without prejudice to the provisions of paragraphs 1 and 2 the Admissions Board may grant admission to a student whose previous education does not meet aforementioned requirements for admission to the study programme of a chosen track, when concluding that the candidate is able to meet the admission requirements within a reasonable period of time. At the request of a candidate, and if the Admissions Board has decided additional education feasible, the Admissions Board may draw up a programme as an admission requirement, a so called 'preparatory programme'. After completion of this preparatory programme a letter of admission will be issued, exclusively for the stated Master's programme and track.
4. Without prejudice to the provisions of paragraphs 1, 2 and 3, when the Admissions Board decides that the additional required education on Bachelor's-level for a candidate is for not more than 12 EC, direct admission to the master programme can be granted. In this case the additional course(s) to be taken by the student will be part of the *free* elective components.

Article 3.2 – Premaster's programme

Not applicable

Article 3.3 – Restrictions on the number of students admitted to the Master's programme

No restrictions

Article 3.4 – Intake dates

A request for admission to the Master's programme starting in September must be received before July 1 in the case of EU/EEA/Swiss students and before February 1 in the case of non-EU/EEA/Swiss students. Under exceptional circumstances, the Admissions Board may consider a request submitted after this closing date.

Article 3.5 – English Language Requirements

1. The proficiency requirement in English as the language of instruction can be met by the successful completion of one of the following examinations:
   - IELTS: 6,5, at least 6 on each sub-score (listening/reading/writing/speaking);
   - TOEFL paper-based: 580;
   - TOEFL Internet-based test: 92, at least 20 on each sub-score (listening/reading/writing/speaking);

   The foregoing examination must have been taken within two years before the student's enrolment.
   - Cambridge Advanced English: A or B;
   - CPE: minimal score of C

   Please note that the TOEFL-code for the Faculty of Science of the University of Amsterdam is 8628.
2. An exemption from the English examination referred to in the first paragraph shall be granted to students who:
   - have received a diploma in secondary or tertiary education in one of the following English-speaking countries: Australia, Canada (English), New Zealand, Ireland, the United Kingdom or the United States of America;
   - hold an English-language 'international baccalaureate' diploma;
   - possess a Bachelor's degree from a Dutch university satisfying the requirement of sufficient command of the English language;
   - passed the final examination for the subject of English as part of one of the following diplomas: VWO, Belgian ASO (Flemish).

Chapter 4. Content and organisation of the programme

Article 4.1 – Organisation of the programme

Depending of the specialization programme the study programme is composed of components according to Table 1.
A complete list of courses provided by the Master's programme can be found in Appendix 1. Every component will be tested. Within the Master's programme different types of testing and different types of teaching methods are used. These are described per component in the Appendix 1 and in the course catalogue.

Table 1

Components	**Regular programme (EC)**	**Programme with a major (EC)**	**Programme with a minor (EC)**
Compulsory components for the track	At least 12 EC**	Total: 24 EC	12 EC
Elective components discipline	Max 24 EC**		18 EC
Track specific compulsory project	6 EC		6 EC
Research Project (incl. thesis and colloquium)	60* EC	36 EC	54 EC
Free elective components	12 EC		
Academic skills in the Master	6 EC		
Major or minor programme		60 EC	30 EC
Total EC	120 EC	120 EC	120 EC

** The research project is 60 EC. A different organization of the research project requires permission of the Examination Board. The research project can be split in maximally 2 projects, 1 project is at least 36 EC. Each project is a multiple of 6 EC.*
*** Both components (compulsory and elective) together must be 36 EC, including at least 12 EC compulsory components.*

1. The student can choose between the regular programme and a programme containing a major or a minor. These are:
   a. Major Teaching;
   b. Minor Tesla;
   c. Minor Teaching;
   d. Major Science Communication (VU);
   e. Major Science in Society (VU).
2. Regarding majors:
   A major consists of 60 EC. It has to be combined with disciplinary components as listed in table 1, with the general compulsory components in order to meet the general requirements of the programme. Students have to go through a separate intake procedure for admission to a major. Students first have to finish the obligatory research part of the programme before starting a major.
3. Regarding the major Teaching:
   Students who have completed an Educative Minor of 30 EC during their Bachelor's programme may submit a non-standard study programme for approval to the Examinations Board of the *Interfacultaire Lerarenopleidingen*, after discussing this non-standard study programme with the coordinator of the major Teaching and the track

coordinator of the Master's programme. The exit qualifications of the major can be found in Appendix 2.

4. Regarding the minor Tesla:
   The minor Tesla consists of 30 EC. It must be combined with a regular programme, comprising at least 90 EC. The minor consists of a course component and a project-based component. This project-based component has to be supervised by a Faculty of Science examiner and is subject to prior approval of appropriateness to MSc Physics & Astronomy by the Physics & Astronomy programme director, as well as the Examinations Board. An examiner from the research programme has to be appointed as a second assessor. The learning objectives of this minor can be found in Appendix 2.

Article 4.2 – Compulsory components

The regular programme includes compulsory components with a total study load of at least 12 EC. The contents and format of the compulsory components of the various tracks are listed in Appendix 1 and further described in the Course Catalogue, stating the necessary entry requirements for successful participation in the component.

Article 4.3 – Practical components

1. In addition to, or instead of, classes in the form of lectures, the elements of the master's examination programme often include a practical component as defined in article 1.2 of part A. Appendix 1 contains information on the types of classes in each part of the programme. Attendance during practical components is mandatory.
2. When performing practical components, students must adhere to the faculty's safety regulations.
3. The programme consists of research-related components with a study load of at least 60 EC (36 in the major, 54 in the minor). The research-related components always include the compulsory components: a research assignment of at least 54 EC (30 in the major, 48 in the minor) and a final report and a scientific presentation with a study load of 6 EC.

Article 4.4 – Elective components

1. Students choose components in the field of the discipline with a study load of at least 24 EC in consultation with and accordance of the track coordinator of the Master's programme and according to the rules stated in Appendix 1 and in the Course Catalogue of the study programme.
2. Elective components are considered to be those components in the field of the discipline stated in Appendix 1, and included in the Course Catalogue of the discipline, or of components offered by another Dutch or foreign university, being according to the Examination Board of a comparable level.
3. Course components successfully completed elsewhere or that are not included in attachment 1 during the programme may supplement the student's examination programme, subject to prior permission from the Examinations Board.
   a. The courses have to be followed at an accredited university or institute
   b. The courses have to be relevant to the master chosen.
4. In exceptional cases, and only after the agreement of the track coordinator, students may choose Bachelor's-level free elective components as part of their programme.
5. In terms of content, elective components must not show too much similarity to other components of the student's curriculum. The acceptable degree of similarity will be decided by the Examinations Board.

Article 4.5 – Free curriculum

The student may compile a curriculum of his/her own choice, which has to be approved by the Examinations Board. At least one half of the proposed curriculum has to consist of components of the regular programme (see Table 1), including the Research Project.

Article 4.6 – Sequence and admission requirements

1. Participation in a course may be restricted to students that have completed certain other programme components. Information about sequence and admission requirements can be found in the course catalogue.
2. In cases where the result of a component has not been determined within the time periods mentioned in Article 4.4 of part A, this component may not be required as prior knowledge for the subsequent component.

Article 4.7 – Participation practical training and tutorials

Not applicable

Article 4.8 – Exemption

1. At the written request of the student, the Examinations Board may exempt the student from taking one or more examination components, if the student:
   a. Has passed a component of an academic or higher professional education programme that is equivalent in both content and level;
   b. Has demonstrated through his/her work and/or professional experience that he/she has sufficient knowledge and skills with regard to the relevant component.
2. This exemption does not apply to the Master's thesis.
3. Exemptions from examinations (or parts thereof), if granted, will be valid for the same period of examinations.
4. A maximum of 60 EC can be accumulated through granted exemptions.

Article 4.9 – Degree

A student who passes the final examination of a programme is awarded a Master of Science degree. The degree awarded is stated on the diploma.

Article 4.10 – Double Master's Degree Mathematics and Physics and Astronomy/ track Theoretical Physics

1. The candidate must be admitted to both Master programmes.

2. The total study load of the programme of the candidate should amount to at least 180 EC, comprising

   - 48 EC Compulsory components
   - 72 EC Master Project Mathematics and Theoretical Physics
   - 12 EC Constrained choice physics courses
   - 36 EC Constrained choice mathematics courses
   - 12 EC Free elective courses

3. The candidate has conducted an integrated research project Master Project Mathematics and Theoretical Physics (72 EC), replacing Master Project Mathematics (36EC) and Research Project Physics and Astronomy (60EC). This must be supervised by staff members from the

two study programmes; both staff members must assess the work as a pass, according to the standards for a research project in their respective master degrees.

4. The integrated research project of article 4.10, point 3 can be replaced by two separate projects: Master Project Mathematics (36 EC), and Research Project Physics and Astronomy (60EC). In this case the total load of the programme must be at least 192 EC.

5. The compulsory components are

- Differential Geometry (8EC, replaces Mathematical Methods from MSc Physics & Astronomy)
- Lie Groups and Lie Algebras (8EC, replaces Group Theory from MSc Physics & Astronomy)
- Quantum Field Theory (6EC)
- Statistical Physics & Condensed Matter Theory 1 (6EC)
- A joint course in Mathematics and Theoretical Physics (8EC). In 2018/19 the course will be Topology in Physics, 8EC
- Master seminar Algebra, Geometry & Mathematical Physics (6EC).
- Student seminar Theoretical Physics (6EC).

6. The constrained choice physics courses consist of 12 EC of physics courses from the MSc Physics & Astronomy, including at least 6 EC from the track Theoretical Physics. The courses Mathematical Methods and Group Theory cannot be taken as part of these 12 EC. The Teaching and Examination Regulations of the MSc Physics & Astronomy contains the list of courses of the MSc Physics & Astronomy, and the sub list of courses from the track Theoretical Physics.

7. The constrained choice courses from MSc Mathematics consists of 36 EC of mathematics courses from the MSc Mathematics, including at least 4 courses from the specializations Algebra & Geometry and Mathematical Physics. At least one of the courses Algebraic Topology, Algebraic Geometry 1 and Riemann Surfaces have to be taken. The Teaching and Examination Regulations of the MSc Mathematics contains the list of courses of the MSc Mathematics, and the sub list of courses from the specializations Algebra & Geometry and Mathematical Physics.

Article 4.11 – Double Master's programme (two-year programmes)

In order to be awarded two Master's degrees or to have stated on the Master's diploma that two Master's programmes have been completed within the discipline, the following requirements must be met:

1. The total programme of the candidate should amount to at least 180 ECTS credits. The student follows the Physics and Astronomy **Programme with a minor (cf. Table 1) (with 90 EC** Physics and Astronomy components) and obtains 30 EC exemptions (instead of the minor) with courses from the other Master's programme.
2. The candidate's work for the programme (lectures, research work, etc.) must be of such a standard that all the compulsory requirements of each of the two programmes have been met.
3. The candidate must have conducted separate research work for both Master's degrees. This may consist of two separate research projects (incl. thesis and colloquium) with supervisors from the respective study programmes. In the case of an integrated research project, this must be supervised by two staff members appointed from the two study programmes. Both staff members must assess the work as a pass. The total number of credits given for an integrated research project (incl. thesis and colloquium) is 3/4 of the sum of the credits given for two independent research projects.
4. The Examinations Boards of both study programmes must approve the student's double Master's programme before the student commences on the double Master's programme.

Article 4.12 – Participation in courses and rules for priority admission

1. Every student must enroll for every component. To participate in courses, the student must enroll within the period indicated in Appendix 1 and in the Course Catalogue and according to procedures mentioned there. The student may be refused the opportunity to participate if he/she does not enroll or fails to enroll in time.
2. Admission to courses with limited capacity takes place based on previously established and published admission criteria and rules for priority admission, on the understanding that students enrolled in the programme are given priority over others when enrolling for courses in the compulsory part of their programme.
3. Persons who are not enrolled at the University have no right to participate in teaching and examination activities.

Article 4.13 – Determining results of examination Academic Skills

1. The Academic skills in the Master consist of components with a study load of 6 EC.
2. The student may complete the Academic skills in the Master by participating in the relevant components as described in the Appendix 1 and in the Course Catalogue.
   The student cannot do both the English Academic Course and the course Scientific Writing in English (3EC). From 2018-2019 the English Academic Course will no longer be offered.

Article 4.14 – Research Project (including Master's Thesis and Colloquium)

1. It is mandatory that the student fills out a proposal in datanose (https://datanose.nl/), together with the supervisor. The track coordinator and the supervisor evaluate this proposal, and upon approval the student can start the research training. The supervisor is a permanent staff member of the VU or UvA Faculty of Science, appointed as an examiner by the Examinations Board.
2. At the end of the Research Project, the supervisor checks on the basis of the assessment form, if the student has sufficiently achieved the set exit qualifications.
3. For the assessment of the Research Project the advice and judgement, in particular on structure and quality of reporting and presentation, a second examiner is included in the assessment. A second examiner is a staff member of the VU and/or UvA Faculty of Science that is not directly involved with the research project
4. If the mark for the Research Project is 8 or higher, the supervisor and the second examiner provide the Examinations Board with a written statement explaining their assessment results in more detail and their agreement with a potential Cum Laude.

Chapter 5. Academic student counselling

Article 5.1 Academic student counselling

The academic student counselling for this programme consists of:

- a dedicated study advisor for all students of the programme.

Chapter 6. Teaching evaluation

Article 6.1 Teaching evaluation

Teaching evaluation shall take place as follows:

- Course evaluations with an UvA-Q questionnaire of all compulsory courses, and of courses requested by the Programme Committee (PC);
- Course evaluations with a VU questionnaire for those courses organized at the VU;

- Curriculum evaluation of the degree programme and the tracks within the programme;
- Oral discussion in the Semester Response System (SRS) meetings.

All evaluation reports are discussed within the PC. The PC advises the programme director on the quality of the degree programme.

Chapter 7. Transitional and final provisions

Article 7.1 – Amendments

1. The dean shall establish amendments to the part B of these Regulations by independent decision – having heard the Programme Committee (PC) and with due regard for the authority of the relevant advisory bodies.
2. Amendments to these regulations take place following a recommendation by the PC relating to the regulations in their entirety, and with the endorsement of a joint meeting of those sections which do not relate to the subject of Article 7.13 paragraphs 2a to g, and paragraph 3 of the Act and the admission requirements for Master's programmes.
3. Amendments to the part B of these Regulations do not apply to the current academic year unless they can be reasonably assumed not to damage the student's interest.

Article 7.2 – Cancelled programme components

Courses:
Advanced Medical Technology
Physics of organs 2: Sensory Organs and Bioelectricity
Innovation in Medical Technology to Improve Health Care System
Ethics in Biomedical Research
English Academic Course
Particles and Fields

Article 7.3 - Publication

1. The dean shall ensure a fitting publication of part A and B of these Regulations and the rules and guideline referred to in the Act.
2. These regulations can be accessed at the website of the Faculty.

Article 7.4 – Effective date

These Regulations enter into force with effect from 1 September 2018.
Thus drawn up by the Dean of the Faculty of Science on 28 August 2018. .

Appendix 1. Description of the content and study load of the components

This list comprises the curriculum components of the Physics and Astronomy Master's programme tracks in the academic year 2018-2019. The contents of the components are described in the Course Catalogue.

Schedule Physics & Astronomy Master track Advanced Matter and Energy Physics

Format: L: lectures; T: tutorials; CP: computer practicum; Lit: literature study; As: assignment; Exp: experimental work; PW: practical work; PROJ: Project
Assessment: W: written exam; O: oral exam; P: presentation; R: report, PROJ: Project

Course	course code UvA	course code VU	EC	period	format	assessment
Year 1						
Compulsory: (24 EC)						
AMEP Lab Project	5354AMLP6Y		6	1-6	Exp	P, R
Emergent Energy Materials	5354EMEM6Y		6	1	L, T	W
Hydrodynamics	5354HYDR6Y	X_428536	6	4	L, T	W,PROJ,As
Quantum Optics	5354QUOP6Y	X_420118	6	2	L, T	W, O
Showcase 1	53541SHO0Y		0	1	L	none
Showcase 2	53548SHO0Y		0	2	L	none
Core 1: (18 EC required)						
Bose Einstein Condensates	5354BOEC6Y		6	2	L, T	W, O
Fermi Quantum Gases	5354FEQG6Y	X_428514	6	5	L, T	W, O
Mathematica for Physicists	5354MAFP3Y	X_428533	3	3	L, T	PROJ
Nanophotonics	5354NANO6Y		6	5	L, PW	P, O
Photosynthesis and Energy	53548PHO6Y	X_422553	6	5	L, T	P, R
Photovoltaics	5354PHVO6Y	X_428516	6	4	L, T	O
Soft and Porous Matter	5354PHAC6Y		6	5	L, T	P,W,As
Soft Condensed Matter and Biological Physics	53548SCM6Y	X_420167	6	2	L	W, P, O
Superconductivity	5354SUPE6Y	X_428522	6	2	L	W, O
Surface and Interface Science	5354SUIS6Y		6	5	L	As, P
The Science and Technology of Nanolithography	5354NALI6Y		6	6	L, T	W
Ultrafast Laser Physics	53548ULL6Y	X_422556	6	4	L, T	W
Core 2: (6 EC required)						
Statistical Physics and Condensed Matter Theory I	53541SPC6Y	X_420083	6	1	L, T	W

Statistical Physics of Soft & Living Matter	5354SPSL6Y	6	4	L, T	P, W
Track specific compulsory project:					
AMEP lab project	5354AMLP6Y	6	1-6	PROJ	P, R
Academic Skills: (6 EC required)					
See Academic Skills list below					
Year: 2					
Compulsory: (60 EC required)					
Research Project Physics and Astronomy 1	5354RPP60Y	60	1-6		
Research Project Physics and Astronomy 2	53542RP60Y	60	1-6		

Schedule Physics & Astronomy Master track Astronomy & Astrophysics

Format: L: lectures; T: tutorials; CP: computer practicum; Lit: literature study; As: assignment; Exp: experimental work; PW: practical work; PROJ: Project
Assessment: W: written exam; O: oral exam; P: presentation; R: report

Course Year 1	course code UvA	course code VU	EC	period	format	assessment
Compulsory: (24 EC)						
Astrophysics Colloquium	5214ASCO0Y		0	1-6	L	none
Open Problems in Modern Astrophysics	5354OPIM3Y		3	1	L, T	W, R, O
Statistical Methods for the Physical Sciences	5354SMFT6Y		6	2	L, T	R, O
Stellar Atmospheres	5214STAT6Y		6	1-2	L, T	W
Structure and Evolution of Stars	5214STES6Y		6	4	L, T	W, R, O
Constrained choice: (24 EC required)						
Astroparticle Physics	5354ASPH6Y		6	4	L, T	W
Astrovaria	5214ASTR6Y		6	1-6	PROJ	R, O
Basic Linux and Coding for AA	5214BLCF3Y		3	1	L, CP	W
Cosmology	5214COSM6Y		6	2	L, T	W
General Relativity	5354GERE6Y		6	1	L, T	W, O
HEA: Accretion onto Compact Objects	5214HAOC6Y		6	4-5	L, T	W, P, PROJ
Interstellar and Circumstellar Matter	5214INCM6Y		6	4-5	L, T	W
Observation Project	5214OBPR6		6	1,6	L	PROJ
Particle Physics I	53541PAP6Y		6	1	L, T	W
Radio Astronomy	5214RAAS6Y		6	5	L,T	W, R, P

Space Instrumentation for High-Energy Astrophysics	5214SIFH6Y	6	5	L, T, CP	W
Track specific compulsory project	One course out of these courses	6	1-6	PROJ	P, R
Open Problems Basis Linux and Coding Observation Project					
Academic Skills: (6 EC required)					
See Academic Skills list below					
Year 2					
Compulsory: (60 EC required)					
Research Project Physics and Astronomy 1	5354RPP60Y	Max 60	1-6		
Research Project Physics and Astronomy 2	53542RP60Y	Max 60	1-6		

Schedule Physics & Astronomy Master track GRAPPA

Format: L: lectures; T: tutorials; CP: computer practicum; Lit: literature study; As: assignment; Exp: experimental work; PW: practical work; PROJ: Project
Assessment: W: written exam; O: oral exam; P: presentation; R: report

Course	course code UvA	course code VU	EC	period	format	assessment
Year 1						
Compulsory: (6 EC)						
Cosmology	5214COSM6Y		6	2	L,T	W
Choice of GRAPPA profile:						
Profile Particle: (12 EC required)						
Particle Physics I	53541PAP6Y		6	1	L, T	W
Particle Physics II	53542PAP6Y		6	4	L, T	W
Profile Astro: (12 EC required)						
Astroparticle Physics	5354ASPH6Y		6	4	L, T	W
General Relativity	5354GERE6Y		6	4	L, T	W, O
Electives: (18 EC required)						
Advanced Cosmology	5354ADCO3Y		3	6	L, T	W, O

Advanced Quantum Field Theory	5354AQFT6Y		6	4	L, T	W
Advanced Statistics	5354ADST3Y		3	3	L, T	W, O
Astroparticle Physics	5354ASPH6Y		6	4	L, T	W
Astrovaria	5214ASTR6Y		6	1-6	PROJ	R, O
Basic Linux and Coding for AA	5214BLCF3Y		3	1	L, CP	W
Beyond the Standard Model	5354BESM3Y	X_420192	6	5	L	R
CERN Research Project	5354CERP6Y		6	1	PROJ	R, O
Computational Astrophysics	52148COA6Y		6	3,6	CP	R
Computational Methods	53548COM6Y	X_420014	6	4	L, T	O
Computational Methods, extension	53548COM6Y	X_420014	3		L, T	O
Flavour Physics and CP Violation	53548CPV3Y	X_428539	3	4		W, P, O
GRAPPA Student Seminar	5354GRSS6Y		6	6		P, R
Gravitational Waves	5354GRWA3Y		3	5		W
HEA: Accretion onto Compact Objects	5214HAOC6Y		6	4-5	L, T	W, P, PROJ
Nikhef Project	5354NIPR6Y		6	4-6	PROJ	W
Open Problems in Modern Astrophysics	5214OPMA6Y		3	1	L, T	P, R, O
Particle Detection A	5354PADA3Y		3	4	L, T	W, P
Particle Detection B	5354PADB3Y		3	5	L, T	W, P
Quantum Field Theory	5354QUFT6Y		6	2	L, T	W, O
Quantum Field Theory, extension	5354QFTE3Y	X_422554	3	3	L, T	W, O
Statistical Data Analysis	5354STDA6Y		6	1	T	W, O
Statistical Methods for the Physical Sciences	5354SMFT6Y		6	2	L, T	R, O
String Theory	5354STTH6Y	X_400242	6	5	L, T	W
Structure and Evolution of Stars	5214STES6Y		6	4	L, T	W, R, O
Track specific compulsory project : GRAPPA Student Seminar Nikhef Project CERN Research Project Astrovaria	One course out of these courses		6	1-6	PROJ	P, R
Academic Skills: (6 EC required)						
See Academic Skills list below						
Year 2						
Compulsory: (60 EC required)						
Research Project Physics and Astronomy 1	5354RPP60Y		Max 60	1-6		
Research Project Physics and Astronomy 2	53542RP60Y		Max 60	1-6		

Schedule Physics & Astronomy track Biophysics and Biophotonics (formerly called Physics of Life and Health). In the single degree the track name is still Physics of Life and Health.

Format: L: lectures; T: tutorials; CP: computer practicum; Lit: literature study; As: assignment; Exp: experimental work; PW: practical work; PROJ: Project

Assessment: W: written exam; O: oral exam; P: presentation; R: report

Course	course code UvA	course code VU	EC	period	format	assessment
Year 1						
Compulsory: (12 EC)						
Light-tissue Interaction	5354LITI6Y		6	1	L, T	W, P, O
Soft Condensed Matter and Biological Physics	53548SCM6Y	X_420167	6	2	L	W, P, O
Constrained Choice: (24 EC required)						
Advanced 3D & 4D Medical Imaging	5354A34M6Y		6	5	L, T	W,P
Advanced Medical Image Processing	53548AMI6Y		6	2	L, T, CP	R
Tracer Kinetic Modeling	53548TRK6Y		6	5	L, PW	
Biomedical Modelling and Simulation	53548MSM6Y	X_430112	6	1	L, T, CP	W, P, R
Dynamics of Biomolecules and Cells	53548DYB6Y	X_422583	6	4	L	W, R, P
Hydrodynamics	5354HYDR6Y	X_428536	6	4	L, T	W,PROJ,As
Mathematica for Physicists	5354MAFP3Y	X_428533	3	3,6	L, T	PROJ
Nanophotonics	5354NANO6Y	X_428537	6	5	L, PW	O
Parameter Estimation Applied to Medical and Biological Sciences	53548PEM6Y	X_432631	6	4	L	W
Physics of organs 1: Cardio-Pulmonary Physics	53541PHO6Y	X_428527	6	1	L, T	W
Photosynthesis and Energy	53548PHO6Y	X_422553	6	5	L, CP	W
Statistical Physics of Soft & Living Matter	5354SPSL6Y		6	4	L, T	P, W
Stochastic simulation	5284STSI6Y	X_418075	6	2	L, PW	As, W
Track specific compulsory project: **(6 EC required)**						
Advanced MRI	5354ADMR3Y		3	6	PW	P
Advanced spectroscopy	52548ADS6Y	X_432767	6	6	L, T, PW	W, P, O
From Genome to Physiome	5354GETP3Y		3	6	PW	P
Laboratory challenge	53548LAC3Y		3	6	Exp	P,R
Literature Review Biophysics and Biophotonics	5354LBP6Y		6	6	Lit	R
Academic Skills (6 EC required)						
Entrepreneurship for Physicists	53548ENF6Y		6	3	L, T, As	W
See also Academic Skills list below						
Year 2						
Compulsory: (60 EC required)						
Research Project Physics and Astronomy 1	5354RPP60Y		Max 60	1-6		

Research Project Physics and Astronomy 2	53542RP00Y		Max 60	1-6		

Schedule Physics & Astronomy track Science for Energy and Sustainability

Format: L: lectures; T: tutorials; CP: computer practicum; Lit: literature study; As: assignment; Exp: experimental work; PW: practical work; PROJ: Project
Assessment: W: written exam; O: oral exam; P: presentation; R: report

Course	course code UvA	course code VU	EC	period	format	assessment
Year: 1						
Compulsory: (12 EC)						
Current Sustainable Energy Technologies	52548CSE6Y	X_4225826	6	3	L, T	R
Project Sustainable Future	52548PRS6Y	X_432784	6	6	L,T, PROJ	W,R, O
Constrained Choice: (24 EC required)						
BioSolar Cells	52548BIC6Y	X_428531	6	1	L, T, Lit	R, P
Catalysis for Sustainable Energy	5254CFSE6Y		6	4	L, Lit, As	W,R
Coordination and Organometallic Chemistry	5254COO6Y		6	2	L	W
Emergent Energy Materials	5354BIIE6Y		6	1	L, T	W
Energy and Climate Change: Science, Policy and Economics	5264ECCS6Y		6	2	L, T	W, P
Environmental Chemistry	5254ENCH6Y	X_437004	6	1	L, T	W
Green Chemistry	52548GRC6Y	X_430557	6	1	L, T, As	W, P
Heterogeneous Catalysis	5254HECA6Y		6	3	L, T, P	W
Homogeneous Catalysis	5254HOCA6Y		6	5	L	W
Management of Sustainable Innovation	52548MAS6Y	X_432739	6	2	L	T, O
Open Innovation in Science and Sustainability	53548OII6Y		6	2	L	As, W
Organic Photovoltaics	53548ORP6Y	X_422590	6	5	L, Lit	R
Photosynthesis and Energy	53548PHO6Y	X_422553	6	5	L, CP	W
Photovoltaics	5354PHVO6Y		6	4	L, T	O
Track specific compulsory project						
SfES project	5354SFPR6Y		6	1-6	PROJ	P, R
Academic Skills: (6 EC required)						
See Academic Skills list below						
Year 2						
Compulsory: (60 EC required)						
Research Project Physics and Astronomy 1	5354RPP60Y		Max 60	1-6		
Research Project Physics and Astronomy 2	53542RP00Y		Max 60	1-6		

Schedule Physics & Astronomy Master track: Theoretical Physics

Format: L: lectures; T: tutorials; CP: computer practicum; Lit: literature study; As: assignment; Exp: experimental work; PW: practical work; PROJ: Project
Assessment: W: written exam; O: oral exam; P: presentation; R: report

Course	course code UvA	course code VU	EC	period	format	assessment
Year 1						
Compulsory: (18 EC required)						
Quantum Field Theory	5354QUFT6Y	X_420081	6	2	L, T	W, O
Statistical Physics and Condensed Matter Theory I	53541SPC6Y	X_420083	6	1	L, T	W, R
Student Seminar Theoretical Physics	5354SSPH6Y		6	4-5	L, PROJ	P, R
Core 1: (0 EC required)						
Advanced Computational Condensed Matter	5354ACCM3Y		3	6	L, T, CP	W, O
Advanced Cosmology	5354ADCO3Y		3	6	L, T	W, O
Advanced Numerical Methods in Many Body Physics	5354ANMI6Y		6	5	L, T, CP	W
Advanced Quantum Field Theory	5354AQFT6Y		6	4	L, T	W
Advanced Statistics	5354ADST3Y		3	3	L, T	W, O
Advanced Topics in Theoretical Physics 1	5354ATIT6Y		6	1-2	L, T	W, O, R
Advanced Topics in Theoretical Physics 2	53542ATT6Y		6	4-5	L, T	W, O, R
Cosmology	5214COSM6Y		6	2	L, T	W
General Relativity	5354GERE6Y	X_420128	6	1	L, T	W, O
Mathematical Methods in Theoretical Physics	5354MMIT6Y		6	2	L, T, CP	W, As
Field Theory in Particle Physics	5354FTIP6Y		6	4-5	L, T	W, O
Field Theory in Particle Physics, extension	5354FTIP3Y		3	6	L, T	W, O
Quantum Field Theory, extension	5354QFTE3Y	X_422554	3	3	L, T	W, O
Statistical Physics and Condensed Matter Theory II	53542SPC6Y	X_420100	6	4-5	L, T	P, R
Statistical Physics and Condensed Matter Theory, extension	5354SPCM3Y	X_420083	3	3	L, PROJ	P, R
Statistical Physics of Soft & Living Matter	5354SPSL6Y		6	4	L, T	P, W
String Theory	5354STTH6Y	X_400242	6	5	L, T	W
String Theory, extension	5354STTE3Y		3	6	L, T	W, O
Topology in Physics	5354TOIP6Y		6	4-5	L, T	W
Core 2: (0 EC required)						
Beyond the Standard Model	5354BESM6Y	X_420192	6	5	L	R

Bose Einstein Condensates	5354BOEC6Y		6	2	L, T	W, O
Computational Methods	53548COM6Y	X_420014	6	4	L, T	W
Fermi Quantum Gases	5354FEQG6Y	X_428514	6	5	L, T	W, O
Flavour Physics and CP Violation	53548CPV3Y	X_428539	3	4	L, T	W/P
Introduction to BV Quantization	5324ITBQ3Y		3		L, T	W, O
Particle Physics I	53541PAP6Y		6	1	L, T	W
Track specific compulsory project						
Student Seminar Theoretical Physics	5354SSPH6Y		6	1-2	L, PROJ	P, R
Academic Skills: (6 EC required)						
See Academic Skills list below						
Year 2						
Compulsory: (60 EC required)						
Research Project Physics and Astronomy 1	5354RPP60Y		Max 60	1-6		
Research Project Physics and Astronomy 2	53542RP00Y		Max 60	1-6		

Schedule Science, Business & Innovation

The schedule can be found in the TER of the master SBI

ACADEMIC SKILLS COURSES: 6 EC required out of list below (except for the SBI track)

Course	course code UvA	course code VU	EC	period	format	assessment
Communication, Organization and Management		AM_470572	6	2	L, T, PW	W, R, O
Entrepreneurship for Physicists	53548ENF6Y	X_422600	6	3	L, T, As	W
Physics Education Project	5354PHEP3Y	X_420523	3-6	1-6		PROJ
Managing Science and Technology in Society		AM_470586	6	1	L,T, PW	R, O, PROJ
Academic skills; individual project	5354ASIP3Y		3	1-6		PROJ
Research Methods for Analyzing Complex Problems		AM_1182	6	1	L, T, PROJ	W, PROJ
Science and Communication		AM_470587	6	1	L, T	W, O, PROJ
Science in Dialogue		AM_1002	6	2	L, T, PROJ	PROJ, W, R
Science in Perspective	5524SCPE6Y	X_437030	6	4-5	L, T	W, R, O
Science Journalism		AM_471014	6	2	L, T	W, R, O
Scientific Writing in English		X_400592	3	2,6	W	O
Tutoring Students		X_432625	3	2	L, T	R, O
Wetenschapscommunicatie voor Bèta-onderzoekers		AB_470185	6	5	L, T	W, O, PROJ
Academic Skills; Critical Thinking *	5524ASCT3Y			6	L, T	W, R

* if less than 20 students, the course is canceled.

Schedule Physics Majors and Minors

Vakken majoren

Format: L: lectures; T: tutorials; CP: computer practicum; Lit: literature study; As: assignment; Exp: experimental work; PW: practical work; PROJ: Project
Assessment: W: written exam; O: oral exam; P: presentation; R: report

Major Science in Society

The Master's graduate with a specialization Science in Society combines an academic approach with the skills and competences that will allow him or her to perform scientific research at the interface of the biomedical sciences and society. The specialization aims to develop strategies that contribute to an understanding of complex societal problems and strategies to solve complex societal problems through interdisciplinary research. In addition, the programme analyses the social, economic and ethical aspects of new developments in the biomedical sciences, so as to assess their implications for society. Master's graduates have the necessary skills to collaborate and communicate with researchers from various scientific disciplines (including but not limited to those in the life sciences) and societal actors, and the ability to use these academic insights.
(Studiegids Biomedical Sciences VU 2017-2018, Specialisation Science in Society.)

Compulsory courses

Course	Course code	EC	period	format	assessment
Research Methods for Analyzing Complex Problems	AM_1182	6	1	L, T, As	W, R
Analysis of Governmental Policy	AM_470571	6	1	L, T	W, R, P
Communication, Organization and Management	AM_470572	6	2	L, T	W, R
Internship Science in Society	AM_1134	30	1-6	PW	P, R

Elective courses:

Course	Course code	EC	period	format	assessment
Policy, Politics and Participation	AM_470589	6	2	L, T, CP	P, R
Business Management in Health and Life Sciences	AM_470584	6	2	L	W, R
Science in Dialogue	AM_1002	6	2	L, T	W, R, O
Disability and Development	AM_470588	6	2	L, T	W, R
Health, Globalisation and Human Rights	AM_470818	6	2	L, T	W, PROJ
Management of innovative technologies in Community Based Health Care	AM_1181	6	2	L, T	W, P
Epidemiology	AM_1179	3	3	L, T, CP	W
Clinical development and clinical trials	AM_1180	3	3	L, T	W
International comparative Analysis of Health care systems	AM_470820	6	3	L, T, As	W, R
Science Museology		6	3		
Innovation Behavior and Economy	AM_1052	3	3	L, As	W, R
Ethics in Life Sciences	AM_470707	3	3	L, T	W, P

Major Science Communication

Communication about science takes place between academic peers and between scientists and the general public. This makes the Communication specialization a complex and dynamic field of research and practice, for example on patient participation in health research, the use and effects of media metaphors and hype, and public understanding of emergent technologies. The Master's graduate with this specialization has a theoretical understanding of the complex problems that arise during such communication processes and has developed the necessary skills to act professionally at this interface to enhance communication and the outcomes of communication between scientific actors and society. (Studiegids Biomedical Sciences VU 2017-2018, Specialisation Science Communication.)

Compulsory courses

Course	Course code	EC	period	format	assessment
Research Methods for Analyzing Complex Problems	AM_1182	6	1	L, T, CP, As	W, R
Science and Communication	AM_470587	6	1	L, T, As	P, R, W

Internship (one from this list)

Course	Course code	EC	period	format	assessment
Reflective Practice Internship Science Communication	AM_1163	30	1-6	PW	P, R
Research Internship Science Communication	AM_1162	30	1-6	PW	P, R

Elective courses

Course	Course code	EC	period	format	assessment
Communication, Organization and Management	AM_470572	6	2	L, T	W, R
Science in Dialogue	AM_1002	6	2	L, T	W, R, O
Science Journalism*	AM_471014	6	2	L, T, CP, As	R
Science Museology	AM_470590	6	3	L, T, PW, As	P, R

* Course is taught in Dutch.

Major Teaching

Courses are taught in Dutch.

Met de opleiding wordt beoogd studenten op te leiden tot Leraar Voorbereidend Hoger Onderwijs. De opleiding combineert het ambachtelijke met het academische: studenten ontwikkelen een stevige kennisbasis en een onderzoekende houding in het vak en beroep, en staan tegelijkertijd met twee benen in de praktijk waar ze het 'ambacht' leren. Studenten worden opgeleid tot teamwerkers die initiatief nemen en draagvlak zoeken, en die zichzelf én een rolmodel voor leerlingen durven te zijn. Zij zijn gericht op innovatie en dragen actief bij aan het creëren van nieuwe kennis en aan schoolvak- en onderwijsontwikkeling.
(OER Master Leraar Voorbereidend Hoger Onderwijs, 2018-2019, artikel B.1.2.)

Compulsory courses:

Course	Course code	EC	semester	format	assessment
Pedagogiek en algemene didactiek A	7104MA101Y	3	1	L, T, Lit, As	W, R
Pedagogiek en algemene didactiek B	7104MA102Y	3	1	L, T, Lit, As	W, R
Vakdidactiek 1 (bètavakken)	7104MA104Y	9	1	T, Lit, As	W, R
Onderwijspraktijk A	7104MA109Y	6	1	PW, As, T	R
Onderwijspraktijk B	7104MA111Y	9	1	PW, As, T	R
Vakdidactiek 2	7104MA108Y	3	2	L, T,As	O, R
Onderwijspraktijk C	7104MA114Y	15	2	PW, As, T	R
Educatief ontwerpen	n.n.b.	9	2	L, T, Lit, Exp	R

Elective courses (one from this list):

Course	Course code	EC	semester	format	assessment
Sociale veiligheid en pesten	7104MA119Y	3	2	T, Lit, As	R
Pedagogische ethiek	7012S330AY	3	2	L, As	R
Leerling-leerkrachtinteracties	7104MA121Y	3	2	L, As	R
Leerlingbegeleiding en passend onderwijs	7104MA122Y	3	2	T, Lit, As	R

Appendix 2 Final attainment levels of the major Science in Society, the major Science Communication, the major Teaching, and learning objectives minor TESLA and the minor Teaching

A. Final attainment levels of the major Science in Society

Dublin descriptor 1: Knowledge and understanding
The graduate has theoretical and practical knowledge of management, policy analysis and entrepreneurship. The graduate:
1. has insight into the various relevant disciplines in the social and behavioural sciences. More specifically the student acquires insight into:
   a. important concepts and theories in the field of policy science, management studies, and entrepreneurship;
   b. the relation of these gamma sciences to the beta sciences;
2. has insight into concepts and the latest theories, research methodologies, analytical models and important research questions related to interdisciplinary research for addressing societal problems;
3. has knowledge of, and insight into, relevant concepts and theories for effective communication and collaboration.

Dublin descriptor 2: Applying knowledge and understanding
The graduate is experienced in carrying out interdisciplinary research, in applying techniques specific to the subject area and in applying scientific knowledge to societal problems. The graduate:
1. has the ability to integrate knowledge from the beta and gamma sciences, as well as from science and practice;
2. can apply scientific knowledge to formulate solutions to societal problems and assess them for appropriateness and societal relevance;
3. adopts an appropriate attitude towards the correct and unbiased use and presentation of data.

Dublin descriptor 3: Making judgments
The graduate is able to independently and critically judge information. The graduate is able to:
1. independently acquire information in relevant scientific areas through a literature review and by conducting empirical research, as well as evaluate such information critically;
2. select and order information, distinguish essentials from trivialities, and recognize connections;
3. formulate personal learning objectives and critically evaluate own performance, both introspectively and in discussion with others.

Dublin descriptor 4: Communication
The graduate is able to transfer knowledge and skills related to his/her subject area to other people and to adequately reply to questions and problems posed within society. The graduate:
1. has acquired skills to report orally and in writing on research results in English;
2. has the ability to communicate research conclusions, and the knowledge and rationale underpinning them, to specialist audiences and non-specialist audiences clearly and unambiguously;
3. can collaborate with researchers from various scientific disciplines;
4. can make essential contributions to scientific discussions about plans, results and consequences of research.

Dublin descriptor 5: Learning skills

The graduate has developed learning skills that enable him/her to continue with self-education and development within the subject area. The graduate:

1. has acquired skills to develop a research plan, giving details of the problem statement, objectives, research questions, research approach, research methods, and planning;
2. is familiar with the general scientific journals, such as Nature and Science, and with journals in the specialisation, such as Research Policy, Health Policy, Science, Technology & Human Values, Social Science & Medicine, and International Journal on Technology Management;
3. has the learning skills to allow him/her to continue to study in a manner that may be largely self-directed or autonomous (life-long learning).

B. Final attainment levels of the major Science Communication

The MSc graduate possesses an academic attitude, skills and competences to operate at the interface of science and society aiming to contribute to a fruitful science-society dialogue. This means that Master's graduates have the following focus:

- Understanding the dynamic relationship between science and society;
- Translating information from the natural sciences to society and vice versa;
- Shaping the dialogue between science and society.

Knowledge

1. Knowledge of and insight into the relevant concepts and theories in the field of science communication, sociology, communication science, philosophy and science & technology studies in relation to the natural sciences;
2. Familiarity with scientific journals in the field of science communication and science & technology studies, as well as familiarity with a variety of popular-scientific media;
3. Insight into the nature and course of interpersonal and group communication processes relevant to the formal and informal dialogue between science and society;
4. Insight into relevant concepts and theories for effective communication and collaboration in relation to diverse science-society interactions;
5. Insight into the popularization of the natural sciences in various media;
6. Insight into the roles and responsibilities of museums in science communication.

Skills

1. Independently acquire, analyze and evaluate relevant information in a variety of scientific disciplines, by conducting literature study and empirical research;
2. Communicate and collaborate effectively with diverse professionals of scientific and nonscientific disciplines as well as lay citizens;
3. Design and facilitate interactive processes in relation to the science-society dialogue;
4. Translate information from various natural science disciplines into more generally accessible language and formats;
5. Produce popular-scientific media output concerning developments in the natural sciences, aimed at a variety of publics;
6. Contribute to the design of museum exhibitions from the perspective of scientific content management and science communication theory;
7. Make an intrinsic contribution to the societal discussion of developments in science and technology.

C. Final attainment levels of the major Teaching

1. De bekwaamheidseisen Leraar Voorbereidend Hoger Onderwijs zijn, naast de voor alle wo-masteropleidingen geldende Dublin-descriptoren en algemene wettelijke eisen, richtinggevend voor de doelstellingen en eindtermen van de lerarenopleidingen Voorbereidend Hoger Onderwijs. Deze bekwaamheidseisen zijn vastgelegd in de Wet op het voortgezet onderwijs (artikel 36 e.v.) en het Besluit bekwaamheidseisen onderwijspersoneel (zie 'Besluit bekwaamheidseisen onderwijspersoneel' (http://wetten.overheid.nl/BWBR0018692/2017-08-01) en 'Besluit van 16 maart 2017 tot wijziging van het Besluit bekwaamheidseisen onderwijspersoneel en het Besluit bekwaamheidseisen onderwijspersoneel BES in verband met de herijking van de bekwaamheidseisen voor leraren en docenten' (https://zoek.officielebekendmakingen.nl/stb-2017-148.html)).

   De eindtermen zijn geordend in twee categorieën:
   - Eindtermen die rechtstreeks te maken hebben met de kern van het beroep: het onderwijsleerproces en het leren van leerlingen, te weten de vakinhoudelijke, vakdidactische en pedagogische bekwaamheid (eindterm 1 t/m 3).
   - Eindtermen die betrekking hebben op meer algemene aspecten van professioneel handelen ten dienste van die kern van het beroep: te weten samenwerking met collega's en de omgeving van de school en met reflectie en persoonlijke en professionele ontwikkeling (eindterm 4 t/m 5).

   De opleiding draagt er zorg voor dat de afgestudeerde Leraar VHO in ieder geval:
   1. aantoonbaar beschikt over vakinhoudelijke kennis en vaardigheden die het wo-bachelorniveau overstijgen dan wel verdiepen. Dat wil zeggen dat de afgestudeerde Leraar VHO:
      a. de inhoud van vak beheerst / boven de leerstof staat;
      b. daardoor de leerstof, voor het schooltype waarin de leraar werkzaam is, zo kan samenstellen, kiezen of bewerken dat de leerlingen die kunnen leren;
      c. vanuit vakinhoudelijke expertise verbanden kan leggen met het dagelijks leven, met werk en met wetenschap en het onderwijs betekenisvol kan maken voor de leerlingen;
      d. daarmee kan bijdragen aan de algemene vorming van de leerlingen.
   2. aantoonbaar beschikt over vakdidactische kennis en vaardigheden. Dat wil zeggen dat de afgestudeerde Leraar VHO:
      a. de vakinhoud weet te vertalen in leerplannen of leertrajecten en dat doet op een professionele, ontwikkelingsgerichte werkwijze;
      b. de vakinhoud leerbaar maakt voor en afstemt op het niveau en kenmerken van de leerlingen, daarbij doelmatig gebruikmakend van (digitale) beschikbare leermiddelen;
      c. het onderwijs kan ontwikkelen en evalueren;
      d. het onderwijs doelmatig kan uitvoeren en het leren van leerlingen kan organiseren;
      e. de vak inhoud/didactiek afstemt met de collega's op school en laat aansluiten bij de visie en missie van de school.
   3. aantoonbaar beschikt over pedagogische kennis en vaardigheden. Dat wil zeggen dat de afgestudeerde Leraar VHO:
      a. de ontwikkeling van leerlingen volgt in hun leren en gedrag en daarop het handelen afstemt;
      b. bijdraagt aan de sociaal-emotionele en morele ontwikkeling van de leerlingen;
      c. bijdraagt aan de burgerschapsvorming en de ontwikkeling van de leerling tot een zelfstandige en verantwoordelijke volwassene;

    d. met een professionele, ontwikkelingsgerichte werkwijze en in samenwerking met collega's een veilig, ondersteunend en stimulerend leerklimaat voor leerlingen kan realiseren;
    e. in staat is om oordelen te formuleren, rekening houdend met de sociaal-maatschappelijke en ethische verantwoordelijkheden die horen bij het beroep.
4. aantoonbaar reflecteert ten behoeve van persoonlijke en professionele ontwikkeling. Dat wil zeggen dat de afgestudeerde Leraar VHO:
    a. in staat is kritisch te reflecteren op alle aspecten die met zijn/haar persoonlijkheid, motivatie, attitudes, verwachtingen en cognities te maken hebben (die onder meer tot uiting komen in het pedagogisch handelen) en feedback hieromtrent ter harte te nemen
    b. op onderzoeksmatige wijze de (eigen) onderwijspraktijk verbetert en blijft ontwikkelen;
    c. in staat is (vak)kennis en -kunde actueel te houden;
    d. in staat is een eigen positie te bepalen ten aanzien van de missie en visie van de school/instelling en bereid is een constructieve bijdrage te leveren aan de ontwikkeling van het vak/het onderwijs in de school.
5. aantoonbaar samenwerkt en communiceert met collega's en omgeving. Dat wil zeggen dat de afgestudeerde Leraar VHO:
    a. het pedagogisch handelen kan afstemmen met collega's en met anderen die voor de ontwikkeling van de leerling verantwoordelijk zijn;
    b. de ontwikkeling van het vak/curriculum in de school kan afstemmen met collega's en met anderen die voor de ontwikkeling van de leerling verantwoordelijk zijn.

2. Onverminderd het bepaalde in lid 1 heeft de afgestudeerde van afstudeerrichting Biologie een gedegen vakinhoudelijke kennis van en inzicht in het vakgebied en de vakdidactiek van Biologie en kan op basis daarvan aantrekkelijke, effectieve en efficiënte leeractiviteiten ontwerpen, uitvoeren, begeleiden en evalueren voor het schoolvak Biologie in de onderbouw en/of bovenbouw.
3. Onverminderd het bepaalde in lid 1 heeft de afgestudeerde van afstudeerrichting Natuurkunde een gedegen vakinhoudelijke kennis van en inzicht in het vakgebied en de vakdidactiek van Natuurkunde en kan op basis daarvan aantrekkelijke, effectieve en efficiënte leeractiviteiten ontwerpen, uitvoeren, begeleiden en evalueren voor het schoolvak Natuurkunde in de onderbouw en/of bovenbouw.
4. Onverminderd het bepaalde in lid 1 heeft de afgestudeerde van afstudeerrichting Scheikunde een gedegen vakinhoudelijke kennis van en inzicht in het vakgebied en de vakdidactiek van Scheikunde en kan op basis daarvan aantrekkelijke, effectieve en efficiënte leeractiviteiten ontwerpen, uitvoeren, begeleiden en evalueren voor het schoolvak Scheikunde in de onderbouw en/of bovenbouw.
5. Onverminderd het bepaalde in lid 1 heeft de afgestudeerde van afstudeerrichting Wiskunde een gedegen vakinhoudelijke kennis van en inzicht in het vakgebied en de vakdidactiek van Wiskunde en kan op basis daarvan aantrekkelijke, effectieve en efficiënte leeractiviteiten ontwerpen, uitvoeren, begeleiden en evalueren voor het schoolvak Wiskunde in de onderbouw en/of bovenbouw.
6. Onverminderd het bepaalde in lid 1 heeft de afgestudeerde van afstudeerrichting Aardrijkskunde een gedegen vakinhoudelijke kennis van en inzicht in het vakgebied en de vakdidactiek van Aardrijkskunde en kan op basis daarvan aantrekkelijke, effectieve en efficiënte leeractiviteiten ontwerpen, uitvoeren, begeleiden en evalueren voor het schoolvak Aardrijkskunde in de onderbouw en/of bovenbouw.

D. Learning objectives of the minor Tesla

By completing the Tesla Minor the graduate is fit to start a career in demanding environments which require abilities to utilize the disciplinary science background in research, corporate, civil society, governmental and advisory work environments.
All learning objectives fall into at least one of the following categories:

1. Information processing;
2. Teamwork;
3. Project Work;
4. Communication;
5. Self-reflection.

Further information about the minor Tesla can be found in the study guide:
http://www.teslaminor.nl .

E. Final attainment levels of the minor Educatie

De bekwaamheidseisen Leraar Voorbereidend Hoger Onderwijs zijn, naast de voor alle wo-bacheloropleidingen geldende Dublin-descriptoren en algemene wettelijke eisen, richtinggevend voor de doelstellingen en eindtermen van de minor Educatie en Educatieve module. Deze bekwaamheidseisen zijn vastgelegd in de Wet op het voortgezet onderwijs (artikel 36 e.v.) en het Besluit bekwaamheidseisen onderwijspersoneel (zie 'Besluit bekwaamheidseisen onderwijspersoneel' (http://wetten.overheid.nl/BWBR0018692/2017-08-01) en 'Besluit van 16 maart 2017 tot wijziging van het Besluit bekwaamheidseisen onderwijspersoneel en het Besluit bekwaamheidseisen onderwijspersoneel BES in verband met de herijking van de bekwaamheidseisen voor leraren en docenten' (https://zoek.officielebekendmakingen.nl/stb-2017-148.html)). De eindtermen zijn toegespitst op de onderwijssector waarvoor de minor Educatie of Educatieve module opleidt en waarop de bevoegdheid die er sinds 2009 aan verbonden is betrekking heeft: de theoretische leerweg in het vmbo en de eerste drie klassen van havo en vwo.

De eindtermen zijn geordend in twee categorieën:

- Eindtermen die rechtstreeks te maken hebben met de kern van het beroep: het onderwijsleerproces en het leren van leerlingen, te weten de vakinhoudelijke, vakdidactische en pedagogische bekwaamheid (eindterm 1 t/m 3).
- Eindtermen die betrekking hebben op meer algemene aspecten van professioneel handelen ten dienste van die kern van het beroep: te weten samenwerking met collega's en de omgeving van de school en met reflectie en persoonlijke en professionele ontwikkeling (eindterm 4 t/m 5).

De opleiding draagt er zorg voor dat de afgestudeerde Leraar VHO met een beperkte tweedegraads bevoegdheid in ieder geval:

1. aantoonbaar beschikt over vakinhoudelijke kennis en vaardigheden die verondersteld mogen worden op wo-bachelorniveau. Dat wil zeggen dat de afgestudeerde leraar met de beperkte tweedegraads bevoegdheid:
    a. de inhoud van het schoolvak in de onderbouw beheerst
    b. daardoor de leerstof, voor het schooltype waarin de leraar werkzaam is, zo kan samenstellen, kiezen of bewerken dat de leerlingen die kunnen leren;
    c. vanuit vakinhoudelijke expertise verbanden kan leggen met het dagelijks leven, en het onderwijs betekenisvol kan maken voor de leerlingen;
    d. daarmee kan bijdragen aan de algemene vorming van de leerlingen.

2. aantoonbaar beschikt over vakdidactische kennis en vaardigheden. Dat wil zeggen dat de afgestudeerde Leraar VHO met een beperkte tweedegraads bevoegdheid:
    a. de vakinhoud weet te vertalen in lessenreeksen en dat doet op een ontwikkelingsgerichte werkwijze;
    b. de vakinhoud leerbaar maakt voor de leerlingen, daarbij doelmatig gebruikmakend van (digitale) beschikbare leermiddelen;
    c. het onderwijs kan ontwikkelen en evalueren;
    d. het onderwijs doelmatig kan uitvoeren ;
    e. de vak inhoud/didactiek afstemt met collega's.
3. aantoonbaar beschikt over pedagogische kennis en vaardigheden. Dat wil zeggen dat de afgestudeerde Leraar VHO met een beperkte tweedegraads bevoegdheid:
    a. het handelen af kan stemmen op de leerlingen;
    b. zicht heeft op de sociaal-emotionele en morele ontwikkeling van de leerlingen;
    c. bijdraagt aan burgerschapsvorming
    d. in samenwerking met collega's een veilig, ondersteunend en stimulerend leerklimaat voor leerlingen kan realiseren;
4. aantoonbaar reflecteert ten behoeve van persoonlijke en professionele ontwikkeling. Dat wil zeggen dat de afgestudeerde Leraar VHO met een beperkte tweedegraads bevoegdheid:
    a. in staat is kritisch te reflecteren op alle aspecten die met zijn/haar persoonlijkheid, motivatie, attitudes, verwachtingen en cognities te maken hebben (die onder meer tot uiting komen in het pedagogisch handelen) en feedback hieromtrent ter harte te nemen
    b. de (eigen) onderwijspraktijk verbetert en blijft ontwikkelen;
    c. (vak)kennis en -kunde actueel kan houden;
5. aantoonbaar samenwerkt en communiceert met collega's en omgeving. Dat wil zeggen dat de afgestudeerde Leraar VHO met een beperkte tweedegraads bevoegdheid:
    a. het pedagogisch handelen kan bespreken met collega's en met anderen die voor de ontwikkeling van de leerling verantwoordelijk zijn;
    b. de ontwikkeling van het vak/curriculum in de school kan bespreken met collega's en met anderen die voor de ontwikkeling van de leerling verantwoordelijk zijn.