FACULTY OF SCIENCES
University of Amsterdam
VU University Amsterdam

TEACHING AND EXAMINATION REGULATIONS
PART B

Academic year 2016-2017

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

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

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. The programme has a workload of 120 EC.
3. A component of the programme consist of 3 EC or multiples of this number.
4. 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)
   - Physics of Life and Health
   - Science for Energy and Sustainability
   - Theoretical Physics
   - Science, Business & Innovation.
5. 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.
6. Within the programme Astronomy & Astrophysics the following tracks are offered:
   - Astronomy and Astrophysics
   - Gravitation, Astro- and Particle Physics GRAPPA/Astrophysics
7. 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.
8. 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 as correctly by the programme 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 completable 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 a 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 programme in Physics and Astronomy 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. Each graduate in the programme curriculum:
   - 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;
   - 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;
      - ultracold quantum gases, state-of-the-art lasers, 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, GRAPPA/astro and GRAPPA/particle) 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;
      - 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 Physics of Life & 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 2.1.2.12 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;
   d. has good receptive and written productive skills in the English language.
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. is informed about basic theoretical concepts as second quantization, path integrals;
   d. 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 (except for the SBI track, entry requirements SBI track in article 3.1a)

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;
2. Without prejudice to the provisions of paragraph 1, the Examination 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 Examination Board may grant admission to a student whose previous education does not meet aforementioned requirements for admission to the study programme, 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 Examination Board has decided additional education feasible, the Examinations Board may draw up a programme of maximum 30 EC 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. When the programme commences, the student must have fully completed the Bachelor's programme allowing admission to this programme.
5.

Article 3.1a Entry requirements track Science, Business and Innovation (SBI)

1. Students who have successfully completed the following degree may be admitted to the master Physics or the master Physics and Astronomy: a Bachelor's degree in SBI from VU University Amsterdam .
2. Without prejudice to the provisions of paragraph 1, the Examination 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 Examination Board may grant admission to a student whose previous education does not meet aforementioned requirements for admission to the study programme, 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 Examination Board has decided additional education feasible, the Examinations Board may draw up a programme of maximum 30 EC 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. When the programme commences, the student must have fully completed the Bachelor's programme allowing admission to this programme.

Article 3.2 – Premaster's programme (except for the SBI track, for a pre-master for the SBI track see article 3.2a)

Not applicable

Article 3.2a - Pre-master for the SBI track

Pre-master candidates have to apply via the Examinations Board.

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 1 May in the case of EU students (including Dutch students) and before 1 February in the case of non-EU students. Under exceptional circumstances, the Examinations Board may consider a request submitted after this closing date.

Article 3.5 – English Language Requirements
1. Admission to the programme requires sufficient command of the English language. A student may take one of the following tests to establish language competence:
   - IELTS: 6.5, at least 6.0 on sub-scores
   - TOEFL paper based test: 580
   - TOEFL internet based test: 92
   - Cambridge Advanced English: A,B
2. Those possessing a Bachelor's degree from a Dutch university satisfy the requirement of sufficient command of the English language.

Article 3.6 – Free curriculum
1. The student may compile a curriculum of his/her own choice, which has to be approved by the Examinations Board.
2. At least one half of the proposed curriculum has to consist of components of the regular programme, including the Research Project.

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 2. 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 course catalogue.

Table 1

Components	**Regular programme (EC)**	**Major (EC)**	**Minor (EC)**
Compulsory components appended of 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 maximal 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 1.
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 consist 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 as in Appendix 1.

Article 4.2 – Compulsory components

The regular programme includes compulsory components with a study load of at least 12 EC. The contents and format of the compulsory components of the various tracks are 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. The Course Catalogue 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 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 2, 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 course has to be relevant to the master chosen.
4. In exceptional cases students may choose Bachelor's-level free elective components as part of their programme. The Examinations Board will determine whether a free elective component at the Bachelor's level will be seen as part of the programme and the number of credits that will be allocated to the elective component.
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.
6. A free elective component will only be seen as part of the programme if the Examinations Board has given its prior approval.

Article 4.5 – 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 4.6 – Participation practical training and tutorials

Not applicable

Article 4.7 – Exemption

1. At the written request of the student, the Examinations Board may exempt the student form 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 4.8 – 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 4.9 – 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.
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 4.10 – Participation in courses and rules for priority admission

1. Every student must enrol for every component. To participate in courses, the student must enrol within the period indicated in the Course Catalogue and according to procedures mentioned there. The student may be refused the opportunity to participate if he/she does not enrol or fails to enrol 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 4.11 – 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 Course Catalogue.

Article 4.12 – Research Project (including Master's Thesis and Colloquium)
1. It is mandatory that the student fills out an online research training contract, together with the supervisor, before the student starts the research training. The track coordinator and the supervisor evaluate this proposal, and upon approval the student can start the research training. The supervisor is permanent staff member of the VU and 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 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. Transitional and final provisions

Article 5.1 – Amendments
1. The dean shall establish amendments to the part B of these Regulations by independent decision – having heard the Board of Studies and with due regard for the authority of the relevant advisory bodies.
2. Amendments to these regulations take place following a recommendation by the Board of Studies relating to the regulations in their entirely, 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 5.2 – Cancelled programme components
Courses: Big Issues in Atomic Quantum Physics; Big Issues in Soft Matter; Summer-School AMEP, Own Project Academic Skills.

Article 5.3 - *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 5.4 – *Effective date*
These Regulations enter into force with effect from 1 September 2016.
Thus drawn up by the Dean of the Faculty of Science and by the Faculty board (VU) on 15 September 2016.

Appendix 1 Final attainment levels of the Major Teaching, and learning objectives minor TESLA and the minor Teaching

A. Final attainment levels of the major Teaching

This programme requires people to be fluent in the Dutch language.

Aan het eind van de opleiding moet de student beschikken over de kwaliteiten ofwel competenties op het gebied van geïntegreerde kennis, inzicht en vaardigheden behorend bij het beroep van leraar in het eerstegraads gebied van het voortgezet onderwijs. De competenties hebben betrekking op de taakgebieden waarvoor wordt opgeleid: onderwijzen, begeleiden, organiseren, ontwikkelen en onderzoeken, en professionaliseren. De competenties zijn de volgende.

• *Interpersoonlijk competent*
Je bent interpersoonlijk competent als je in het contact met leerlingen (en ook met anderen) kunt leiden, begeleiden, bemiddelen, stimuleren en confronteren. Daarmee bereik je een klimaat met open communicatie en een sfeer van samenwerking en wederzijds vertrouwen.

• *Pedagogisch competent*
Je bent pedagogisch competent als je benaderingen kunt ontwerpen, uitvoeren en evalueren om het welbevinden van leerlingen te bevorderen, om ontwikkelings- en gedragsproblemen te signaleren en om groepen en individuen te begeleiden. Daarmee bereik je een veilige leeromgeving waarin leerlingen zich kunnen ontwikkelen tot zelfstandige en verantwoordelijke personen.

• *Vakinhoudelijk en didactisch competent*
Je bent vakinhoudelijk en vakdidactisch competent als je je eigen vak gedegen beheerst, op basis daarvan aantrekkelijke, effectieve en efficiënte leeractiviteiten kunt ontwerpen, uitvoeren, begeleiden en evalueren. Daarmee bereik je een krachtige leeromgeving voor leerlingen.

• *Organisatorisch competent*
Je bent organisatorisch competent als je concrete en functionele procedures en afspraken kunt hanteren en als je de leeromgeving en het leren van leerlingen kunt organiseren en faciliteren en de planning kunt bewaken en bijstellen. Daarmee bereik je een overzichtelijke, ordelijke en taakgerichte leeromgeving.

• *Competent in het samenwerken met collega's*
Je bent competent in het samenwerken met collega's als je informatie deelt, actief bijdraagt aan overleg en samenwerkingsverbanden en deelneemt aan collegiale consultatie. Daarmee bevorder je een collegiale en harmonieuze werksfeer.

• *Competent in het samenwerken met de omgeving*
Je bent competent in het samenwerken met de omgeving als je doelmatige contacten onderhoudt met ouders (verzorgers), maar ook met andere mensen en instanties die te maken hebben met de zorg voor en de opleiding van leerlingen. Daarmee bereik je dat de ontwikkeling van leerlingen op een realistische en constructieve manier wordt ondersteund en dat eventuele problemen tijdig worden onderkend en opgelost.

• *Competent in reflectie en onderzoek ten dienste van ontwikkeling*
Je bent competent in reflectie als je je handelen planmatig kunt bijstellen op grond van ervaringen in beroepssituaties. Daarmee bereik je professioneel leren en ontwikkeling van jezelf. Je bent competent in onderzoek als je de beroepspraktijk in het algemeen en je eigen beroepspraktijk in het bijzonder kunt analyseren met distantie en met onderzoeksmatige

deskundigheid. Daarmee bereik je ontwikkeling van je school, van de didactiek van je vak en/of van jezelf.

B. Learning Objectives Tesla

Main Objective

To offer ambitious science students with a demonstrated excellent Academic and non-Academic track record the opportunity to engage in a final challenge before finishing their research master programme.

On completing the Tesla Programme the graduate has acquired the qualities to bridge Science, Society and Business within complex research and project challenges related to the own scientific background. The graduate is fit to start a career in demanding environments which require abilities to utilize the disciplinary science background (as described in OER B) in work environments within or outside of science.

These qualities will be developed while 1) working on an interdisciplinary project related to the scientific background of the graduate and 2) undergoing intensive training on a range of skills.

General Objectives

The graduate has:

1. The analyzing, problem-solving and synthesizing abilities in order to be able to function at the required academic level
2. The abilities to utilize his or her specific scientific background (as specified in the OER B of the Master Programme in which the student is enrolled) in settings on the interface of science, business and society
3. A series of practical professional, academic and personal skills which result in the ability to
    a. independently set up, manage and execute an interdisciplinary projects at the interface of science, business and society. Thereby utilizing scientific knowledge in contributing to a real demand of a knowledge intensive organization
    b. get acquainted with a field of study in a short period of time by self-study, to form one's own opinion and to communicate critically and effectively with different audiences on the topic
    c. deal with complex challenges and gather and structure information on different levels to enable professional action in different fields and especially the ability to utilize his/her own scientific background in a non-Academic environment
    d. Communicate effectively with different stakeholders (e.g. business professionals, policymakers) while using appropriate means (e.g. business plans, policy advice).
    e. operate effectively in interdisciplinary teams.
4. An attitude that enables the student to critically reflect on his/her own actions

In doing so the graduate should have acquired the following qualities in the fields of 'Professional Knowledge & Insight' and 'Professional Skills':

Professional Knowledge and Insight

Students should develop professional knowledge and insight regarding bringing "science to value in practice", especially in relation to their scientific background. More specifically, students should:

a. Obtain understanding of different business practices, discourses and settings with regard to bringing scientific knowledge to value.
b. Develop knowledge on scientific developments in relevant disciplines related to dealing with the societal challenges of 21th century.

c. Obtain understanding of different non-profit practices and settings with regard to bringing scientific knowledge to value
d. Obtain understanding of different governmental practices and settings with regard to bringing scientific knowledge to value.
e. Increase knowledge and insight of possible career paths and possible roles in bringing scientific knowledge to value.

Professional Skills

Students should develop professional business skills to operate effectively in organizations and groups. More specifically, students should:

f. Develop professional cooperation skills.
    i. Develop presentation skills: the abilities necessary to communicate complex information and deliver professional presentations in different environments.
    ii. Develop feedback skills
    iii. Develop meeting skills: the abilities necessary to host and guide meetings in which complex information, different opinions and positions need to be structured to effectively facilitate collection work.
    iv. Develop teamwork and leadership skills.
    v. Develop interview techniques: abilities necessary to successfully obtain information by means of an interview in different settings.
    vi. Develop reasoning and related skills to structure information: develop the abilities to test arguments and bring propositions towards implementation by convincing others.
    vii. Develop communication and influencing skills.

g. Develop project management skills.
    i. Be able to effectively manage projects on the interface of Science and Practice, including becoming familiar with:
        1. Taking Initiative
        2. Managing the workflow
            a. Preparing a project planning
            b. Use of KPIs in Planning
            c. Prioritizing & adjustment (time management, etc.)
        3. Practical Tools
            a. Effective use of communication technology
            b. Budget management
        4. Team Management
            a. Engaging your interdisciplinary team
            b. Divide and take Responsibility
            c. Solving problems
    ii. Get acquainted with consultancy analytics and tools to structure complex challenges & information.
        1. Utilizing consultancy models to structure complex challenges and transform them into workable solutions.
        2. Develop visual thinking skills: the qualities to use visual tools to structure meetings, complex information and group processes.

C. Minor teaching na een bachelor met een educatieve minor

De student volgt het tweede semester van de master leraar Voorbereidend Hoger Onderwijs (VHO) die de Interfacultaire Lerarenopleidingen (ILO) aanbiedt. De eindtermen komen overeen met die van de major teaching, zie hierboven.

D. Minor teaching na een bachelor zonder educatieve minor

De student volgt het eerste semester van de master leraar VHO die de ILO aanbiedt.
De opleiding leidt niet tot een bevoegdheid.
De eindtermen komen grotendeels overeen met die van de educatieve minor die de ILO aanbiedt.

De student is op basis van voldoende theoretisch inzicht, een professionele houding en voldoende vaardigheid in staat om:

1. een goede samenwerking met en tussen leerlingen tot stand te brengen;
2. voor groepen en voor individuele leerlingen een veilige leeromgeving te creëren;
3. voor groepen en voor individuele leerlingen een krachtige leeromgeving in te richten waarin leerlingen zich op een goede manier leerinhouden van het vakgebied eigen maken;
4. in groepen en in andere contacten met leerlingen een overzichtelijk, ordelijk en taakgericht leer- en werkklimaat tot stand te brengen;
5. relevante informatie uit te wisselen met collega's in de school en uitkomsten daarvan te benutten;
6. relevante informatie uit te wisselen met verzorgers van leerlingen buiten school en daarin te zorgen voor afstemming;
7. eigen opvattingen over het leraarschap en de eigen bekwaamheden als leraar, te expliciteren, kritisch te onderzoeken en verder te ontwikkelen op basis van theoretische inzichten en empirische gegevens.

Appendix 2. Description of the content and study load of the components

This list comprises the curriculum components of the Physics & Astronomy Master's programme tracks in the academic year 2016-2017. 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		
Emergent Energy Materials	5354BIIE6Y		6	1		
Hydrodynamics	5354HYDR6Y	X_428536	6	4		
Quantum Optics	5354QUOP6Y	X_420118	6	2	L, T	W, O
Showcase 1	53541SHO0Y		0	1		
Showcase 2	53548SHO0Y		0	2		
Core 1: (12 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, 6	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
Physics of Art Conservation	5354PHAC6Y		6	5		
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		
The Science and Technology of Nanolithography	5354NALI6Y		6	6		
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**		
Academic Skills: (6 EC required)						
See Academic Skills list below						
Year: 2						
Compulsory: (60 EC required)						
Research Project Physics and Astronomy 1	**53541RP00Y**		**60**	**1-6**		
Research Project Physics and Astronomy 2	**53542RP00Y**		**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	
Basic Linux and Coding for AA	5214BLCF3Y		3	1	L, CP	W
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
Computational Astrophysics	52148COA6Y		6	3,6	L, T	PROJ, O, R
Cosmology	5214COSM6Y		6	5-6	L, T	W
Fluid Dynamics*	5214FLDY6Y		6	5	L, T	W, O, PROJ
General Relativity	5354GERE6Y		6	4	L, T	W, O
HEA: Accretion onto Compact Objects	5214HAOC6Y		6	2	L, T	W, O
HEA: Radiative Processes and Relativistic Flows*	5214HRPR6Y		6	5	L, T	W, P, PROJ
Interferometry	5214INTE6Y					
Interstellar and Circumstellar Matter	5214INCM6Y		6	4-5	L, T	W
Inter-University Lectures	4214INUL6Y					
Observation Project	5214OBPR6		6	3,6	L	PROJ
Open Problems in Modern Astrophysics	5214OPMA6Y					
Particle Physics I	53541PAP6Y		6	1	L, T	W
Radio Astronomy	5214RAAS6Y		6	5	L, T	W, P, R, O
Space Instrumentation for High-Energy Astrophysics*	5214SIFH6Y		6	5		
Star and Planet Formation*	5214STPF6Y		6	4	L, T	W, O, PROJ
* course not available in 2016/2017						
Academic Skills: (6 EC required)						
See Academic Skills list below						
Suggested elective courses: (27 EC)						
Year 2						
Compulsory: (60 EC required)						
Research Project Physics and Astronomy 1	53541RP00Y		60	1-6		
Research Project Physics and Astronomy 2	53542RP00Y		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: (12 EC)						
Cosmology	5214COSM6Y		6	2	L,T	W,P
Particle Physics I	53541PAP6Y		6	1	L, T	W
Core 1: (6 EC required)						
Advanced Statistics	5354ADST3Y		3	3		
Astroparticle Physics	5354ASPH6Y		6	4	L, T	W
Basic Linux and Coding for AA	5214BLCF3Y		1			
Beyond the Standard Model	5354BESM3Y	X_420192	6	5	L	R
CERN Research Project	5354CERP6Y		6	6	PROJ	R, O
Computational Methods	53548COM6Y	X_420014	6	4	L, T	O
Computational Methods, extension	53548COM6Y	X_420014	3	4	L, T	O
Flavour Physics and CP Violation	53548CPV3Y	X_428539	3	4		W, P, O
GRAPPA Student Seminar	5354GRSS6Y		6	6		
Gravitational Waves	5354GRWA3Y		3	5		
Particle Detection	5354PADE6Y		6	2	L, T	O
Preparation Research Project at CERN	5354PRPC6Y		6	3		
Programming C++	5354PROG3Y		3	3		
Statistical Data Analysis	5354STDA6Y		6	1	T	W, O
Strong Interactions I	535481ST3Y		3	4	L, PW	W
Strong Interactions II	535482ST3Y		3	5		
Structure and Evolution of Stars	5214STES6Y		6	4	L, T	W, R, O
Core 2: (6 EC required)						
Mathematical Methods in Theoretical Physics I	53541MMT6Y	X_420025	6	1		
Open Problems in Modern Astrophysics	5214OPMA6Y		6	1	L, T	P, R, O
Quantum Field Theory	5354QUFT6Y		6	2	L, T	W, O
Quantum Field Theory, extension	5354QFTE3Y	X_422554	3	3		
String Theory	5354STTH6Y	X_400242	6	5	L, T	W

Guided Choice: (6 EC required)						
Mathematica for Physicists	5354MAFP3Y	X_428533	3	3	L, T	PROJ
Particles and Fields	5354PAFI6Y	X_420112	6	4-5	L, T	W, O
Particles and Fields, extension	5354PAFE2Y		2	6		
Statistical Methods for the Physical Sciences	5354SMFT6Y		6	2	L, T	R, O
Student Seminar Theoretical Physics	5354SSPH6Y		6	6		W
Profile Particle: (12 EC required)						
Nikhef Project	5354NIPR6Y		6	4-6	PROJ	W
Particle Physics II	53542PAP6Y		6	4	L, T	W
Profile Astro: (12 EC required)						
General Relativity	5354GERE6Y		6	4	L, T	W, O
HEA: Accretion onto Compact Objects	5214HAOC6Y		6	5	L, T	W, O
Academic Skills: (6 EC required)						
See Academic Skills list below						
Suggested elective courses: (21 EC required)						
Year 2						
Compulsory: (60 EC required)						
Research Project Physics and Astronomy 1	53541RP00Y		60	1-6		
Research Project Physics and Astronomy 2	53542RP00Y		60	1-6		

Schedule Physics & Astronomy track 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		
Advanced Medical Image Processing	53548AMI6Y		6	2		
Advanced Medical Technology	53548ADM6Y	X_437026	6	5	L, PW	
Biomedical Modelling and Simulation	53548MSM6Y	X_430112	6	1	L, T	W,P, O
Dynamics of Biomolecules and Cells	53548DYB6Y	X_422583	6	4	L	W,R, O
Hydrodynamics	5354HYDR6Y	X_428536	6	4		
Mathematica for Physicists	5354MAFP3Y	X_428533	3	3	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
Physics of organs 2: Sensory Organs and Bioelectricity	53542PHO6Y	X_428528	6	2	L, T	W
Statistical Physics of Soft & Living Matter	5354SPPL6Y		6	4		
Stochastic simulation	5284STSI6Y	X_418075	6	2	L, PW	As, W
Compulsory Choice: (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	PW	P
Literature Review Biomedical Physics	5354LBP6Y		6			
Academic Skills PolH: (6 EC required)						
Entrepreneurship for Physicists			6	3		
Ethics in biomedical research			3	3		
Innovation in Medical Technology to Improve	5354IIMT6Y		6			

Health Care System			
Academic Skills: (6 EC required) **See also Academic Skills list below**			
Suggested elective courses: (33 EC required)			
Year 2			
Compulsory: (60 EC required)			
Research Project Physics and Astronomy 1	**53541RP00Y**	**60**	**1-6**
Research Project Physics and Astronomy 2	**53542RP00Y**	**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	
Catalysis for Sustainable Energy	5254CFSE6Y		6	4		
Coordination and Organometallic Chemistry	5254COO6Y		6	2		
Emergent Energy Materials	5354BIIE6Y		6	1		
Energy and Climate Change: Science, Policy and Economics	5264ECCS6Y		6	2		
Environmental Chemistry		X_437004	6	1		
Green Chemistry	52548GRC6Y	X_430557	6	1		
Heterogeneous Catalysis	5254HECA6Y		6	3		
Homogeneous Catalysis	5254HOCA6Y		6	5		
Management of Sustainable Innovation		X_432739	6	2		
Open Innovation in Science and Sustainability		New	6	2		
Organic Photovoltaics		X_422590	6	5		
Photosynthesis and Energy		X_422553	6	5		
Photovoltaics	5354PHVO6Y		6	4		
Academic Skills: (6 EC required)						
See Academic Skills list below						
Suggested elective courses: (39 EC required)						
Year 2						
Compulsory: (60 EC required)						
Research Project Physics and Astronomy 1	53541RP00Y		60	1-6		

Research Project Physics and Astronomy 2	53542RP00Y		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
Student Seminar Theoretical Physics	5354SSPH6Y		6	6		O
Core 1: (0 EC required)						
Advanced Cosmology	5354ADCO3Y		3	6		
Advanced Numerical Methods in Many Body Physics	5354ANMI6Y		6	4		
Advanced Quantum Field Theory			6	4		
Advanced Topics in Theoretical Physics 1	5354ATIT6Y		6	1-2 & 4-5	L, T	
General Relativity	5354GERE6Y	X_420128	6	4	L, T	W, O
General Relativity, extension			3	6		
Mathematical Methods in Theoretical Physics I	53541MMTY	X_420025	6	1		
Mathematical Methods in Theoretical Physics II	53542MMTY		6	2		
Particles and Fields	5354PAFI6Y	X_420112	6	4-5	L, T	W, O
Particles and Fields, extension	5354PAFE2Y		2	6		
Quantum Field Theory, extension	5354QFTE3Y	X_422554	3	3		
Statistical Physics and Condensed Matter Theory II	53542SPC6Y	X_420100	6	5	L, T	P, R
Statistical Physics and Condensed Matter Theory, extension	5354SPCM3Y	X_420083	3	3		
Statistical Physics of Soft & Living Matter			6	4		
String Theory	5354STTH6Y	X_400242	6	5	L, T	W
String Theory, extension	5354STTE3Y		3	6		
Core 2: (0 EC required)						
Beyond the Standard Model	5354BESM3Y	X_420192	3	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		W/P
Introduction to BV Quantization *	5324ITBQ3Y		3	6		
Particle Physics I	53541PAP6Y		6	1	L, T	W
* course not available in 2016/2017						
Academic Skills: (6 EC required)						
See Academic Skills list below						
Suggested elective courses: (57 EC)						
Year 2						
Compulsory: (60 EC required)						
Research Project Physics and Astronomy 1	53541RP00Y		60	1-6		
Research Project Physics and Astronomy 2	53542RP00Y		60	1-6		

Schedule Science, Business & Innovation

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: (24 EC Required)						
Management of Sustainable Innovation	52548MAS6Y	X_432739	6	2		
Networked Organizations and Communication		S_NOC	6	2		
SBI Research Methodology		X_432846	6	1-6		
Transdisciplinarity and Transition		X_430604	6	2		
Compulsory Choice Science Project: (24 EC required)						
Business and Innovation Project		X_422591	24	1-6		
Materials for Energy and Environmental Sustainability			12	4,5		
Researching Science Research			12	4,5		
Science Project		X_422591	24	1-6		
Compulsory Choice Science Courses: (24 EC required)						
Biomedical Modelling and Simulation	53548BIM6Y	X_430112	6	1		
BioSolar Cells	52548BIC6Y	X_428531	6	1		
Chemical Biology	52548CHB6Y	X_432538	6	1		
Green Chemistry	52548GRC6Y	X_430557	6	1		
Innovation in Medical Technology to Improve the Health Care System	5354IIMT6Y	X_430602		6		
Organic Photovoltaics	53548ORP6Y	X_2259056	6	5		
Principles of Pharmaceutical Sciences / Pharmacochemistry		X_435675	6	1		
Project Sustainable Future	52548PRS6Y	X_432784	6	6		
Protein Science		AM_470145	6	1		
Suggested elective courses: (15 EC)						
Science and Society in a Historical Perspective		X_400424	6	4, 5		
Technology and Innovation Processes		E_BA_TIP	6	2		
Year 2						

Compulsory: (36 EC)

SBI Project & Master Thesis	X_432735	36	1-6		

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
English Academic Course*	5524ENAC3Y	X_437028	3	1-2		O, P
Communication, Organization and Management		AM_470572	6	2	L, T, PW	W, R, O
Entrepreneurship for Physicists		X_422600	6	3		
Ethics in Life Sciences		AM_470707	3	3	L, T	W, P, O
Ethics in Biomedical Research		X_422592	3	3	L, T	W, P
Physics Education Project		X_420523	3	1-6		
Innovation in Medical Technology to Improve the Health Care System		X_430602	6	6	L, T	P, R
Managing Science and Technology in Society		AM_470586	6	1	L,T, PW	R, O, PROJ
Academic skills; individual project			3	1-6		PROJ
Research Methods for Analyzing Complex Problems		AM_1182	6	1		
Science and Communication		AM_470587	6	1	L, T	W, O, PROJ
Science in Dialogue		AM_1002	6	2	h, w, prac	PROJ, W, R
Science in Perspective	5524SCPE6Y	X_437030	6	4-5	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

External free elective suggestions: 0 EC required out of courses below

Advanced Statistics	5354ADST3Y	3	3	L	W, O
Gravitational Waves	5354GRWA3Y	3	5	L, T	W, O
Particles and Fields	5354PAFI6Y	6	4-5	L, T	W, O
Programming C++	5354PROG3Y	3	3	CP	
Quantum Field Theory	5354QUFT6Y	6	2	L, T	W, O

Schedule Physics Majors and Minors

Major Science in Society

Compulsory courses

Educational component	Subject code	EC	Period	Type	Assessment
Analysis of Governmental Policy	AM_470571	6	1	L, T	W, R, P
Research Methods for Analyzing Complex Problems	AM_1182	6	1	L, T	-
Business Management in Health and Life Sciences	AM_470584	6	2	L	W, R
Communication, Organization and Management	AM_470572	6	2	L, T	W, R
Disability and Development	AM_470588	6	2	L, T	W, R
Entrepreneurship in Health and Life Sciences	AM_470575	6	2	L, T	W, O
Health, Globalisation and Human Rights	AM_470818	6	2	L, T	W, PROJ
Policy, Politics and Participation	AM_470589	6	2	L, T	P, R
Science in Dialogue	AM_1002	6	2	L, T	W, R, O
Clinical development and clinical trials	AM_470585	6	3	L, T	W
Internship Science in Society	AM_1134	30	1-6	-	-

Major Science communication

Educational component	Subject code	EC	Period	Type	Assessment
Internship Communication Specialisation	AM_471148	30	1-6	-	-

Major Teaching

Educational component	Subject code	EC	Period	Type	Assessment
Didactiek 1	O_MLDIDAC_1	6	1	L, T	-
Didactiek 2	O_MLDIDAC_2	6	2,3	L, T	-
Didactiek 3	O_MLDIDAC_3	9	4-6	L, T	-
Peergroup 1	O_MLPEERGR_1	0	1-3	T	-
Peergroup 2	O_MLPEERGR_2	0	3-5	T	-
Praktijk 1	O_MLPRAK_1	6	1	L	-
Praktijk 2	O_MLPRAK_2	9	2,3	-	-
Praktijk 3	O_MLPRAK_3	15	4-6	-	-
Praktijk onderzoek 1	O_MLPROZ_1	3	3	L, T	-
Praktijk onderzoek 2	O_MLPROZ_2	6	4-6	-	-