Physics and Astronomy

Faculty of Mathematics and Natural Sciences,
the University of Groningen

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This report was finalized on 11 June 2014.

Report on the master's programmes Physics, Applied Physics and Astronomy of the University of Groningen

This report takes the NVAO's Assessment framework for limited programme assessments as a starting point.

Administrative data regarding the programmes

Master's programme Physics

Name of the programme:	Physics
CROHO number:	60202
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	- Experimental Physics - Theoretical Physics - Instrumentation and Informatics - Science, Business and Policy
Location(s):	Groningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2014

Master's programme Applied Physics

Name of the programme:	Applied Physics
CROHO number:	60436
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	- Applied Physics - Instrumentation and Informatics
Location(s):	Groningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2014

Master's programme Astronomy

Name of the programme:	Astronomy
CROHO number:	60200
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	- Theoretical and Observational Astronomy - Instrumentation and Informatics - Science, Business and Policy
Location(s):	Groningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2014

The visit of the assessment committee Physics and Astronomy to the Faculty of Mathematics and Natural Sciences of the University of Groningen took place on 4 until 6 March 2014.

Administrative data regarding the institution

Name of the institution:	the University of Groningen
Status of the institution:	legal body providing higher education
Result institutional quality assurance assessment:	positive

Quantitative data regarding the programmes

The required quantitative data regarding the programmes are included in Appendix 5.

Composition of the assessment committee

The committee that assessed the master's programmes Physics, Applied Physics and Astronomy consisted of:

- Prof. dr. D. (Daan) Lenstra, professor emeritus of Electrical Engineering at Delft University of Technology and fellow at Eindhoven University of Technology (chair);
- Dr. H.P. (Henk) Blok, retired associate professor at the Faculty of Sciences of VU University Amsterdam;
- Prof. dr. ir. G. (Guido) van Oost; full professor Plasma Physics, Department of Applied Physics at Ghent University (BE);
- Prof. dr. W. (Wim) de Boer, professor of Physics at the University of Karlsruhe (DE);
- Prof. dr. E. (Elias) Brinks, professor of Astrophysics at the University of Hertfordshire (UK);
- Dr. ir. H.L. (Harald) Tepper, Chief strategy officer at the Netherlands Forensic Institute;
- J.J.T. (Jelmer) Wagenaar MSc., student member, PhD-student in Physics Leiden University.

The committee was supported by T.G. (Terry) Verseput, Msc., who acted as secretary.

Appendix 1 contains the curricula vitae of the members of the committee.

Working method of the assessment committee

The assessment of the master's programmes Physics, Applied Physics and Astronomy at the University of Groningen is part of a cluster assessment. In the context of this cluster visitation, in the time period between November 2013 and April 2014, twenty eight programmes at nine different institutions were assessed.

Appendix 2 contains the framework of reference.

The committee Physics and Astronomy is composed of in total sixteen members:

- Prof. dr. Daan Lenstra, professor emeritus of Electrical Engineering at Delft University of Technology and fellow at Eindhoven University of Technology (chair);
- Prof. dr. Wim de Boer, professor of Physics at the University of Karlsruhe (DE);
- Prof. dr. Elias Brinks, professor of Astrophysics at the University of Hertfordshire (UK);
- Prof. dr. Tom Theuns, reader in Astrophysics at Durham University (UK) and part time professor of Astrophysics at University of Antwerp (BE);
- Prof. dr. Gustaaf Borghs, professor emeritus of Physics at KU Leuven (BE) and senior fellow at the Interuniversity MicroElectronics Centre (IMEC);
- Dr. ir. Jaap Flokstra, retired associate professor Nanotechnology at University of Twente;
- Prof. dr. ir. Guido van Oost, full professor Plasma Physics at the Department of Applied Physics of Ghent University (BE);
- Dr. Henk Blok, retired associate professor at the Faculty of Sciences of VU University Amsterdam;
- Prof. dr. Martin Goedhart, professor Mathematics and Science Education at the University of Groningen;
- Christianne Vink MSc, didactic coach, educational advisor/trainer and partner of Academic Factory;
- Dr. Jan Hoogenraad, owner of Spoorgloren BV for change management and quantitative service in public transport;
- Dr. ir. Harald Tepper, chief strategy officer at the Netherlands Forensic Institute;
- Sander Breur MSc., PhD candidate at Nikhef, University of Amsterdam;
- Lisanne Coenen BSc., master student Applied Physics at Delft University of Technology;
- Carmen van Schoubroeck, bachelor student Mathematics and bachelor student Physics and Astronomy, Radboud University Nijmegen;
- Jelmer Wagenaar MSc., PhD candidate in Physics at Leiden University.

Preparation
The committee held a preliminary meeting on October 8, 2013. During this meeting the committee was instructed about the accreditation framework and the programme of the upcoming assessments. A vice chair for each visit was appointed and the Domain Specific Framework for Physics and Astronomy was set.

To prepare the contents of the site visits in Groningen the coordinator first checked the quality and completeness of the critical reflections prepared by the programmes. After establishing that the reports met the demands, they were forwarded to the participating committee members. The committee members read the reports and formulated questions on their contents.

Apart from the critical reflections, the committee members read a selection of ten theses for each programme. The theses were randomly chosen from a list of graduates of the last two completed academic years within a range of grades.

Site visit
A preliminary programme of the site visit was made by the coordinator and adapted after consultation of the coordinator of the University of Groningen. The time table for the visit in Groningen is included in Appendix 6.

Prior to the site visit, the committee asked the programmes to select representative interview partners. During the site visit, meetings were held with panels representing the faculty management, the programme management, alumni, the Programme Committee, the Board of Examiners and study advisors. Meetings were also held with representatives of the students and teaching staff.

During the site visit, the committee examined material it had requested; an overview of this material is given in Appendix 7. The committee gave students and lecturers the opportunity – outside the set interviews – to speak informally to the committee during a consultation hour. No requests were received for this option.

The committee used the final part of the visit for an internal meeting to discuss the findings. The visit was concluded with a public oral presentation of the preliminary impressions and general observations by the chair of the committee.

Report
Based on the committee's findings, the secretary prepared a draft report. This report was presented to the committee members involved in the site visit. After receiving approval, the draft report was sent to the Faculty with the request to check it for factual inaccuracies. The comments received from the Faculty were discussed with the committee chairman. Subsequently, the definitive report was approved and sent to the University of Groningen.

Decision rules
In accordance with the NVAO's Assessment framework for limited programme assessments (as of 22 November 2011), the committee used the following definitions for the assessment of both the standards and the programme as a whole.

Generic quality
The quality that can reasonably be expected in an international perspective from a higher education bachelor's or master's programme.

Unsatisfactory
The programme does not meet the current generic quality standards and shows serious shortcomings in several areas.

Satisfactory
The programme meets the current generic quality standards and shows an acceptable level across its entire spectrum.

Good
The programme systematically surpasses the current generic quality standards across its entire spectrum.

Excellent
The programme systematically well surpasses the current generic quality standards across its entire spectrum and is regarded as an (inter)national example.

Summary judgement

This report reflects the committee's findings and considerations of the master's programmes Physics, Applied Physics and Astronomy at the University of Groningen. The evaluations are based on information provided in the critical reflection, on interviews conducted during the site visit and on a selection of theses, course files and additional material supplied during the site visit. In its assessment, the committee observed positive aspects as well as ones that could be improved.

The committee reviewed the intended learning outcomes, the teaching-learning environment, the assessment and the achieved outcomes of the three programmes and found them all to be satisfactory. It decided that the master's programmes Physics, Applied Physics and Astronomy at the University of Groningen fulfil the requirements set by the NVAO for re-accreditation.

Master's programme Physics

Standard 1: Intended learning outcomes
The committee has studied the intended learning outcomes of the master's programme and compared the intended learning outcomes to the DSRK and to the programme's curriculum (standard 2). The committee advises the programme management to make sure that all the important skills and competences described in the DSRK are mentioned in the intended learning outcomes. The committee is enthusiastic about the interdisciplinary profile. It concludes that the master's programme has a solid focus on research and meets the criteria for level and domain of an academic master's degree programme in Physics.

The committee assesses Standard 1 as 'satisfactory'

Standard 2: Teaching-learning environment
For the period 2007 until 2013 the master's programme Physics distinguished four specializations: 1. Experimental Physics, 2. Theoretical Physics, 3. Instrumentation and Informatics and 4. Science, Business and Policy. With the start of the academic year 2013-2014, the master's programme Physics distinguishes three specializations: 1. Advanced Materials, 2. Quantum Universe and 3. Science, Business and Policy.

The committee acknowledges that the implementation of the new specializations of the master's Physics makes for a better link to the research expertise of the teaching staff. The committee is enthusiastic with the fact that the three master's programmes Physics, Applied Physics and Astronomy support and strengthen each other by sharing courses, while maintaining their individual identity. The common specializations between the master's programmes make the interdisciplinary character even more evident. The committee established that the quality of the education in the master's programme Physics is high. It is enthusiastic about the academic and scientific skills the students are taught. The committee also assessed the preparation of students for a professional career. It advises the programme management to devote special attention in the curriculum to skills that are useful in the labour market, such as communication and working together in an interdisciplinary team.

The committee advises the programme management to increase the student success rate by being stricter with deadlines of the thesis. It supports the efforts of the programme management to make the master's programme more international. The committee is satisfied with the programme's student/staff ratio. The committee noticed that the percentage of staff with a teaching qualification is rather low, but appreciates the current focus on the improvement of didactic skills. The committee values the grading of staff members by students during course evaluations as a feedback tool for staff members and values the open communication between lecturers and students. It appreciates the quality of the staff members of the master's programme.

The committee established that the Programme Committee has a good grip on the quality assurance of courses and is quick in identifying and addressing issues or bottlenecks within the programme. At this moment the programme's study association and the career service NEXT have taken responsibility for providing students with information about their options for specific work fields in the Netherlands and abroad. The committee appreciates NEXT and the study association, however, it is of the opinion that the master's programme itself is primarily responsible for providing its students with the information needed for their professional orientation. The committee appreciates that students become part of a research group and thus benefit from the high-quality facilities in the research institutes. The committee is of the opinion the Physics students have all the facilities they need.

The committee assesses Standard 2 as 'satisfactory'

Standard 3: Assessment and achieved learning outcomes
The committee established that the documentation of the meetings of the Boards of Examiners shows that the quality assurance of the master's programme is sufficient. It is enthusiastic about the structural testing of thesis quality by the Boards of Examiners. The committee concludes that the quality of the theses of the Physics students is good and matches the academic level that may be expected of a master's thesis. The committee advises the Board of Examiners Physics and Applied Physics to ensure that every master's thesis is assessed and archived with a thesis evaluation form.

The committee assesses Standard 3 as 'satisfactory'

Master's programme Applied Physics

Standard 1: Intended learning outcomes
The committee has studied the intended learning outcomes of the master's programme and compared the intended learning outcomes to the DSRK and to the programme's curriculum (standard 2). The committee advises the programme management to make sure that all the important skills and competences described in the DSRK are mentioned in the intended learning outcomes. The committee is enthusiastic about the interdisciplinary profile. It concludes that the programme has a solid focus on research and meets the criteria for level and domain of an academic master's degree programme in Applied Physics.

The committee assesses Standard 1 as 'satisfactory'

Standard 2: Teaching-learning environment
Until 2013 the master's programme Applied Physics distinguished two specializations: 1. Applied Physics and 2. Instrumentation and Informatics. With the start of the academic year 2013-2014, the master's programme Applied Physics no longer consists of these specializations but focuses on Advanced Materials instead. The committee acknowledges that the implementation of the new specialization of the master's programme Applied Physics makes for a better link to the research expertise of the teaching staff. The committee is enthusiastic with the fact that the three master's programmes Physics, Applied Physics and

Astronomy support and strengthen each other by sharing courses, while maintaining their individual identity. The common specializations between the master's programmes make the interdisciplinary character even more evident.

The committee established that the quality of the education in the master's programme Applied Phyics is high. It is enthusiastic about the academic and scientific skills the students are taught. The committee also assessed the preparation of students for a professional career. It advises the programme management to devote special attention in the curriculum to skills that are useful in the labour market, such as communication and working together in an interdisciplinary team.

The committee advises the programme management to increase the student success rate by being stricter with deadlines of the thesis. The committee supports the efforts of the programme management to make the master's programmes more international. The committee is satisfied with the programme's student/staff ratio. The committee noticed that the percentage of staff with a teaching qualification is rather low, but appreciates the current focus on the improvement of didactic skills. The committee values the grading of staff members by students during course evaluations as a feedback tool for staff members and values the open communication between lecturers and students. It appreciates the quality of the staff members of the master's programme.

The committee established that the Programme Committee has a good grip on the quality assurance of courses and is quick in identifying and addressing issues or bottlenecks within the programme. At this moment the programme's study association and the career service NEXT have taken responsibility for providing students with information about their options for specific work fields in the Netherlands and abroad. The committee appreciates NEXT and the study association, however, it is of the opinion that the master's programme itself is primarily responsible for providing its students with the information needed for their professional orientation. The committee appreciates that students become part of a research group and thus benefit from the high-quality facilities in the research institutes. The committee is of the opinion the Applied Physics students have all the facilities they need.

The committee assesses Standard 2 as 'satisfactory'

Standard 3: Assessment and achieved learning outcomes
The committee established that the documentation of the meetings of the Board of Examiners shows that the quality assurance of the master's programme is sufficient. It is enthusiastic about the structural testing of thesis quality by the Board of Examiners. The committee concludes that the quality of the theses of the Applied Physics students is good and matches the academic level that may be expected of a master's thesis. The committee advises the Board of Examiners Physics and Applied Physics to ensure that every master's thesis is assessed and archived with a thesis evaluation form.

The committee assesses Standard 3 as 'satisfactory'

Master's programme Astronomy

Standard 1: Intended learning outcomes
The committee has studied the intended learning outcomes of the master's programme Astronomy and compared the intended learning outcomes to the DSRK and to the programme's curriculum (standard 2). The committee advises the programme management to

make sure that all the important skills and competences described in the DSRK are mentioned in the intended learning outcomes. The committee established that the master's programme has a solid focus on research. It confirms that the programme meets the criteria for level and domain of an academic master's degree programme and is enthusiastic about its interdisciplinary profile.

The committee assesses Standard 1 as 'satisfactory'

Standard 2: Teaching-learning environment
Until 2013, the master's programme Astronomy distinguished three specializations: 1. Theoretical and Observational Astronomy, 2. Instrumentation and Informatics and 3. Science, Business and Policy. With the start of the academic year 2013-2014, Quantum Universe core courses were added to the curriculum of the specializations Theoretical and Observational Astronomy and Instrumentation and Informatics of the master's programme Astronomy. The committee is of the opinion that the Quantum Universe core courses are an improvement to the profile of the master's programme as it is now linked more explicitly to the research expertise of the teaching staff.

The committee is enthusiastic with the fact that the three master's programmes Physics, Applied Physics and Astronomy support and strengthen each other by sharing courses, while maintaining their individual identity. The common specializations between the master's programmes make the interdisciplinary character even more evident. The committee established that the quality of the education in the master's programme Astronomy is high. It is enthusiastic about the academic and scientific skills the students are taught. The committee also assessed the preparation of students for a professional career. It appreciates that Astronomy students are taught appropriate skills for the labour market and that the programme management is aware of the opportunities for students both in- and outside academia.

The future objective of the Faculty of Mathematics and Natural Sciences and of the University of Groningen is that 90% of the students should graduate within 3 years. From the last six cohorts of the master's programme Astronomy, five had a 100% success rate within three years. The committee supports the efforts of the programme management to make the master's programme more international. The committee is satisfied with the programme's student/staff ratio. The committee noticed that the percentage of staff with a teaching qualification is rather low, but appreciates the current focus on the improvement of didactic skills. The committee values the grading of staff members by students during course evaluations as a feedback tool for staff members and values the open communication between lecturers and students. It appreciates the quality of the staff members of the master's programme.

The committee established that the Programme Committee has a good grip on the quality assurance of courses and is quick in identifying and addressing issues or bottlenecks within the programme. The committee has seen the workplaces and observatory during a guided tour. It was very impressed with the facilities of the master's programme Astronomy.

The committee assesses Standard 2 as 'good'

Standard 3: Assessment and achieved learning outcomes
The committee established that the documentation of the meetings of the Board of Examiners shows that the quality assurance of the master's programme is sufficient. It is

enthusiastic about the structural testing of thesis quality by the Board of Examiners. The committee concludes that the quality of the theses of the Astronomy students is good and matches the academic level that may be expected of a master's thesis. The committee advises the Board of Examiners Astronomy to ensure that every master's thesis is assessed and archived with a thesis evaluation form.

The committee assesses Standard 3 as 'satisfactory'

The committee assesses the standards from the Assessment framework for limited programme assessments in the following way:

Master's programme Physics:

Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

Master's programme Applied Physics:

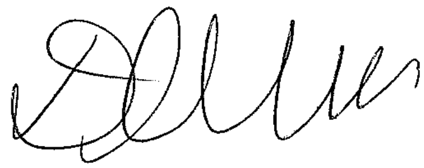
Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

Master's programme Astronomy :

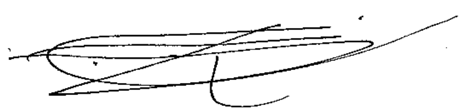
Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

The chair and the secretary of the committee hereby declare that all members of the committee have studied this report and that they agree with the judgements laid down in the report. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 11 June 2014.



Prof. dr. D. (Daan) Lenstra, Chair



T.G. (Terry) Verseput MSc., Secretary

Description of the standards from the Assessment framework for limited programme assessments

Standard 1: Intended learning outcomes

The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

Explanation:
As for level and orientation (bachelor's or master's; professional or academic), the intended learning outcomes fit into the Dutch qualifications framework. In addition, they tie in with the international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme.

Findings

The committee studied and assessed the intended learning outcomes of the master's programmes Physics, Applied Physics and Astronomy of the University of Groningen (RUG) with regard to content, level and orientation. The committee studied the domain-specific framework of reference (DSRK) (1.1.), the profile of the programmes (1.2.) and the level and orientation (1.3.).

1.1. Domain Specific Framework of Reference
The national council of program directors of the Physics and Astronomy programmes has established a domain-specific framework of reference (DSRK) for the assessment of the bachelor's and master's programmes in those disciplines. The program directors revised the framework that has been written for the assessment of Physics and Astronomy in 2007. That framework in turn was inspired by the intended learning outcomes as formulated in the European Tuning-project document *'Reference points for the design and delivery of degree programmes in physics'*, which has set an international standard. This document also uses the Dublin descriptors as guideline for differentiation between bachelor and master level. The current DSRK is furthermore based on the more recent documents *'A European Physics Bachelor Study'* en *'A European Physics Master Study'* (2009) by the European Physics Society. The DSRK for master's programmes can be found in Appendix 2. The committee agrees with the requirements the DSRK sets for the intended learning outcomes of the master's programmes Physics, Applied Physics and Astronomy.

The intended learning outcomes of the master's programmes Physics, Applied Physics and Astronomy of the RUG have been described in the critical reflection (Appendix 3). Also, the critical reflection contains an overview of how the curriculum enables students to meet the programme's intended learning outcomes. The committee has studied the intended learning outcomes of the master's programmes and compared them to the DSRK and to the curriculum of the three master's programmes (standard 2). It established that some of the important skills and competences described in the DSRK are taught in the curriculum but are not mentioned in the intended learning outcomes. In all three master's programmes Frontier research (a5), Absolute standards (a8) and Managing skills (c16) are not incorporated in the intended learning outcomes. Modelling skills (a1) are not mentioned in the intended learning outcomes of the master's programmes Physics and Astronomy. The committee advises the programme management to incorporate the missing skills and competences in the intended learning outcomes for all students (independently of the chosen specialisation). It concludes that in all three master's programmes the remaining requirements of the DSRK are reflected in the intended learning outcomes and that all DSRK requirements are reflected in the curriculum (standard 2).

1.2. Profile

Master's programme Physics
For the period 2007 until 2013 the master's programme Physics distinguished four specializations:

- Experimental Physics;
- Theoretical Physics;
- Instrumentation and Informatics;
- Science, Business and Policy.

With the start of the academic year 2013-2014, the master's programme Physics distinguishes three specializations: Advanced Materials (P-variant), Quantum Universe (P-variant), Science, Business and Policy (M-variant). The P-variants have a distinct research oriented character and may be followed by a PhD-programme. The M-variant prepares students for a professional career in management and policy. The specialization Advanced Materials is shared with the master's programme Applied Physics and the specialization Quantum Universe is shared with the master's programme Astronomy.

According to the critical reflection, physics as a discipline deals with a fundamental understanding of nature, based on quantitative observation of natural phenomena. It involves quantitative experimental observation, data processing and analysis, mathematical and numerical modelling and the development of a theoretical framework.

Master's programme Applied Physics
Until 2013 the master's programme Applied Physics distinguished two specializations:

- Applied Physics;
- Instrumentation and Informatics.

With the start of the academic year 2013-2014, the master's programme Applied Physics no longer consists of these specializations but focuses on Advanced Materials instead. This specialization is offered by the master's programme Physics and the master's programme Chemistry as well. According to the critical reflection, they all share the mandatory core, emphasizing the interdisciplinary character of the field of advanced materials.

The critical reflection states that the discipline Applied Physics deals with a fundamental understanding of natural phenomena and with the behavior of human-made systems. Students use quantitative experimental observation, data processing and analysis, mathematical and numerical modeling and the development of a theoretical framework. The objective of an applied physicist is the design and development of applications of physical phenomena; in Groningen it especially entails material properties. Furthermore, the master's programme is not only research oriented, but provides a basis for the design and development of industrial application and physics-based devices as well.

Master's programme Astronomy
Until 2013, the master's programme Astronomy distinguished three specializations:

- Theoretical and Observational Astronomy (P-variant);
- Instrumentation and Informatics (P-variant);
- Science, Business and Policy (M-variant, Dutch-taught only).

With the start of the academic year 2013-2014, Quantum Universe core courses were added to the curriculum of the master's programme Astronomy. The core courses are developed by the Kapteyn Astronomical Institute, the Centre for Theoretical Physics (CTN), and the Nuclear Accelerator Institute (KVI). The master's programme Astronomy as well as the master's programme Physics share a core of Quantum Universe courses. According to the critical reflection, the objective of the Quantum Universe courses is to stimulate the interdisciplinary character of the profile, to increase the quality of education and to increase the number of students. The Quantum Universe courses are offered in the specialization Theoretical and Observational Astronomy and the specialization Instrumentation Informatics.

The critical reflection describes Astronomy as a discipline that deals with the fundamental understanding of the universe. The students are taught quantitative observations, data processing and -analysis, mathematical, physical and numerical modelling of the phenomena observed, and are trained in putting those together to expand their understanding of the universe at small and large scales.

According to the critical reflection, the master's programmes Physics, Applied Physics and Astronomy all aim to train students in such a way that they acquire the knowledge, skills, competences and insight that allow the recipient of the degree to establish a professional career in their chosen field (physics, applied physics or astronomy) and address in general the important contemporary, practical, environmental and technological issues as well. The committee established, based on the critical reflection and conversations during the site visit, that the three master's programmes have a solid focus on research. It is of the opinion that the new specializations, which were introduced in the academic year 2013-2014, are an improvement to the profile of the different master's programmes as they are now linked more explicitly to the research expertise of the teaching staff. The new specializations of the master's programme Physics emphasize the multidisciplinary character of the profile, whereas the new specializations of the master's programmes Applied Physics and Astronomy strengthen their international profile. The committee is enthusiastic about the fact that all three programmes have an interdisciplinary profile and at the same time reflect their research field sufficiently well.

1.3. Level and orientation

The programmes intend to reach an academic master level. The committee confirms that the DSRK is based on the Dublin descriptors. The master's programmes refer to both research and other academic skills. The committee concludes that the intended outcomes of the three master's programmes are indeed fitting and meet the criteria for level and domain of an academic master's degree programme.

Considerations

The committee has studied the Domain Specific Framework of Reference as established by the national council of programme directors. It agrees with the requirements the DSRK sets for the intended learning outcomes of master's programmes Physics, Applied Physics and Astronomy. The committee concludes that the master's programmes intended learning outcomes meet the criteria for level and domain of an academic master's degree programme. The committee encourages the programmes to make sure all DSRK requirements that are reflected in the curriculum are incorporated in the intended learning outcomes.

Conclusion

Master's programme Physics: the committee assesses Standard 1 as **satisfactory**.
Master's programme Applied Physics: the committee assesses Standard 1 as **satisfactory**.
Master's programme Astronomy : the committee assesses Standard 1 as **satisfactory**.

Standard 2: Teaching-learning environment

The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

Explanation:
The contents and structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The quality of the staff and of the programme-specific services and facilities is essential to that end. Curriculum, staff, services and facilities constitute a coherent teaching-learning environment for the students.

Findings

In this standard the curriculum (2.1), translation of intended learning outcomes in the curriculum (2.2) and study load and feasibility (2.3) is examined. In addition, the staff (2.4) and student support (2.5) are discussed.

2.1. Curriculum

Master's programme Physics
The master's programme Physics is a two-year fulltime programme of 120 EC. An overview of the curricula of the specializations until 2013, as well as an overview of the curricula of the specializations since 2013 is included in Appendix 4. In the period 2007-2013, the programme accommodated four specializations: 1. Experimental Physics, 2. Theoretical Physics, 3. Instrumentation and Informatics, and 4. Science, Business and Policy. The specializations were taught in English, with the exception of Science, Business and Policy which is taught in Dutch.

The curriculum of Experimental Physics consisted of 60 EC of course work in the first year and a research project of 60 EC during the second year. It was optional for students to start their research project earlier and take some courses in the second year. For the research project the students took part in a research group that focused on fundamental experimental research. The specialization Theoretical Physics had a similar structure to Experimental Physics. Students in Theoretical Physics performed their research project in one of the research groups of the Center for Theoretical Physics or in the theory group at the Nuclear Accelerator Institute (KVI). The curricula of both specializations left ample room for electives.

Instrumentation and Informatics was a common specialization in the master's programmes Physics, Applied Physics and Astronomy and was intended for students with an explicit interest in advanced instrumentation and informatics. The curriculum consisted of courses (50 EC), a technology project (10 EC), an internship in industry (20 EC) and a research project (40 EC). The research project could be performed in any physics research group but preferably a group with a component in the field of instrumentation and informatics. This specialization has been terminated since the start of the academic year 2012-2013, because of the low number of applicants and the retirement of relevant staff.

The specialization Science, Business and Policy still is a common specialization in each of the major disciplines of the Faculty of Mathematics and Natural Sciences. Within the master's programme Physics, the curriculum of this specialization is split into two: 60 EC is devoted to business and policy (a 20 EC module and an external internship of 40 EC), while the other 60 EC consists of physics courses (30 EC) and a (physics) research project (30 EC).

With the start of the academic year 2013-2014, a new curriculum was implemented with the specializations Advanced Materials, Quantum Universe and Science, Business and Policy. All specializations share a common core (20 EC) of four courses: Computational Physics, Statistical Mechanics, Mathematical Methods of Physics and Advanced Quantum Mechanics. Furthermore, the specializations Advanced Materials and Quantum Universe each consist of core courses within their own field (20 EC), elective courses related to their field (20 EC), and a research project of 60 EC. The specialization Science, Business and policy stays the same, only the Physics coursework is now filled with 20 EC core courses and 10 EC for electives.

Master's programme Applied Physics
The master's programme Applied Physics is a two-year fulltime programme of 120 EC, taught in English. An overview of the curricula of the specializations until 2013, as well as an overview of the curriculum since 2013 is included in Appendix 4. In the period 2007-2013, the programme accommodated two specializations: 1. Applied Physics and 2. Instrumentation and Informatics.

The curriculum of the specialization Applied Physics consisted of 45 EC of course work, an external internship of 30 EC and a research project of 45 EC. The external internship was performed at an industrial company or at an industrial research lab with a focus on applied physics. Students performed their research project at one of the research groups that focus on applied physics research. In individual cases the internship could be performed at a university abroad.

Instrumentation and Informatics was a common specialization in the master's programmes Physics, Applied Physics and Astronomy and was intended for students with an explicit interest in advanced instrumentation and informatics. For Applied Physics students, the curriculum consisted of 45 EC of courses in the field of Instrumentation and Informatics and 15 EC of Applied Physics courses. Students would do a research project for 40 EC, performed in a research group in the field of physics. The external internship of 20 EC was to have a strong focus on instrumentation and informatics. This specialization has been terminated since the start of the academic year 2012-2013, because of a low number of applicants and the retirement of relevant staff.

With the start of the academic year 2013-2014, a new curriculum for the master's programme Applied Physics was implemented, which is focused on Advanced Materials as only specialization. The curriculum consists of an mandatory core (20 EC) of three Advanced Applied Physics courses and four Advanced Materials courses, a course in Business and Management (5 EC), three optional courses in science and engineering (15 EC), an internship in the industry (20 EC) and a research project of 45 EC. Advanced Materials is a specialization of the master's programmes Physics and Chemistry too; the three programmes share the mandatory core in Advanced Materials (20 EC).

Master's programme Astronomy
The master's programme Astronomy is a two-year fulltime programme of 120 EC. An overview of the curricula of the specializations until 2013, as well as an overview of the curricula of the specializations since 2013 is included in Appendix 4. In the period 2007-2013, the programme accommodated three specializations: 1. Theoretical and Observational Astronomy, 2. Instrumentation and Informatics and 3. Science, Business and Policy. The specializations were taught in English, with the exception of Science, Business and Policy, which is taught in Dutch.

The curriculum of the specialization Theoretical and Observational Astronomy offers 60 EC of course work in the first year, which consists of Astrophysics courses (30 EC), optional courses in science (20 EC) and free optional courses (10 EC). Students conduct a research project of 60 EC during the second year. The research project is performed at the Kapteyn Astronomical Institute, SRON, ASTRON, or in individual cases at a university abroad.

Instrumentation and Informatics, which is more technically oriented, was a common specialization in the master's programmes Physics, Applied Physics and Astronomy. For Astronomy students, the curriculum consists of 30 EC of courses in the field of Instrumentation and Informatics and 20 EC of Astrophysics courses. The students would do a research project for 40 EC, performed at the Kapteyn Astronomical Institute, SRON or ASTRON, with at least a RUG co-supervisor. The industrial internship of 20 EC was performed in a research laboratory or at an industrial company, with a strong focus on information technology. The project Information Technology of 10 EC took place in a research group related to the Kapteyn Astronomical Institute, SRON, ASTRON, or the KVI.

The specialization Science, Business and Policy still is a common specialization in each of the major disciplines of the Faculty of Mathematics and Natural Sciences. Within the master's programme Astronomy, the curriculum of this specialization is split into two: 60 EC is devoted to business and policy (a 20 EC module and an external internship of 40 EC), while the other 60 EC consists of astronomy courses (30 EC) and an astronomy research project performed at the Kapteyn Astronomical Institute (30 EC).

With the start of the academic year 2013-2014, Quantum Universe core courses were added to the curriculum of the master's programme Astronomy. The first year of the specialization Theoretical and Observational Astronomy now consists of Quantum Universe core courses (20 EC), Astrophysics core courses (20 EC) and optional courses (20 EC). The Astrophysics courses of the specialization Instrumentation and Informatics are replaced by Quantum Universe core courses. The instrumentation and Informatics courses are either Astronomy related or related to Instrumentation and Informatics in the field of Physics, Mathematics, and Computing sciences.

The committee studied the specializations of the master's programmes Physics, Applied Physics and Astronomy. It values the solid research oriented profile of the three master's programmes. The committee has studied the curricula before 2013 and the curricula of the master's programmes since 2013. It acknowledges that the implementation of the new specializations makes for an even better link to the research expertise of the teaching staff. Also, the curricula have a stronger focus as a result of the decrease in electives. The committee is enthusiastic with the fact that the three master's programmes support and strengthen each other by sharing courses, while maintaining their individual identity. The common specializations between the master's programmes make the interdisciplinary character even more evident.

During the site visit, the committee studied the requested materials provided by the three master's programmes. It concludes that the materials provided during the courses are of a sufficient level. The master students informed the committee that they appreciate the new curricula and the opportunities to specialize in a subject of their interest.

2.2. Translation of intended learning outcomes in the curriculum

In the critical reflection, the three master's programmes included a table that describes how and where the intended learning outcomes are realized in the curricula. The committee has studied this table and compared it with the course information and the DSRK. As stated before, the committee established that all the important skills and competences described in the DSRK are taught in the curricula. All learning outcomes are adequately translated into the curricula as well, with the note that the intended learning outcomes need to be completed.

The committee established that the quality of the education in the three master's programmes is high. It is enthusiastic about the academic and scientific skills the students are taught in the curricula, such as giving oral presentations and writing academic essays. This applies especially to the master's programme Astronomy, where students are taught multiple types of academic skills and are offered Capita Selecta courses. During the site visit, the master's students Astronomy expressed their appreciation for the Capita Selecta courses, where they stay informed about current developments and recent research papers in their field. The committee noted that the greater part of the specializations within the master's programmes Physics and Astronomy specifically prepare students for a PhD-programme. It concludes that students of the three master's programmes are well prepared for a scientific career.

The committee also assessed the preparation of students for a professional career. It asked students and alumni whether they felt well-prepared for a professional career. Physics Alumni stated that there could be more focus on new advanced technologies and professionalism in the curriculum. The committee noted that it appeared that in the curriculum of the master's programme Applied Physics, design skills were not the point of focus. However, during the site visit, the students explained they were able to acquire these skills during their internship. The committee was glad to see that with the new curriculum, Applied Physics students are also offered practice with advanced materials in the curriculum. The committee advises the programme management to devote special attention in the curricula of the master's programmes Physics and Applied Physics to skills that are useful in the labour market, such as communication and working together in an interdisciplinary team. The committee appreciates the compulsory internship, which is a rare feature in similar programmes in The Netherlands.

During the site visit, the committee established that Astronomy students are taught programming in Python, which is a popular tool in scientific environments. Also, Astronomy students carry out observations with the telescope in small groups of four students at maximum. The master's programme Astronomy has an active alumni network and a good overview of where master's students end up in industry. The committee appreciates that Astronomy students are taught appropriate skills for the labour market and that the programme management is aware of the opportunities for students both in- and outside academia.

2.3. Study load and feasibility

All master's programmes have a curriculum of two years. Since the academic year 2013-2014, the year is divided into semesters, which are subdivided into quartiles of eight weeks of lectures followed by two weeks of examinations. Students are enrolled in three courses during each period and each course has a study load of 5 EC. During the site visit it became evident that the staff members and the master's students are not all appreciative of the new system, where the academic year is reduced to 40 weeks instead of 42 weeks. The students noted that they do not have sufficient time to process the information provided during a course. The committee supports the decision to divide some of the courses into two periods to give students more time. In 2013, the university introduced the 'harde knip', which forbids bachelor students to enrol in master courses.

The current objective of the Faculty of Mathematics and Natural Sciences is that 80% of the students should graduate within 3 years. The Board of the Faculty wants to increase its targeted success rate to 90%. Another target of the Faculty of Mathematics and Natural Science is a student intake of more than 20 students per academic year. The critical reflection states that since 2006 the student intake of the master's programme Physics fluctuates between 14 and 20 students per academic year. On average, 75% of the Physics students graduated within 3 years. The average student intake of the master's programme Applied Physics fluctuates between 8 and 21 students per academic year. On average, approximately 90% of the Applied Physics students graduated within 3 years. In order to reach the goal of increasing the diploma yield after three years to 90%, two temporary study advisors have been appointed to work on improving the throughput of the degree programmes within the Faculty of Mathematics and Natural Sciences.

For the master's programme Astronomy, the average student intake since 2006 varied from 2 to 9 students per academic year. The critical reflection noted that since 2011 the intake in the bachelor's programme Astronomy has doubled. Thus, an increase in applications for the master is predicted. Management has indicated that even if the current intake would not increase as expected, the Faculty is determined to continue the programme. From the last six cohorts, five had a 100% success rate within three years. The master's programme Astronomy fulfils the faculty's objectives, even if the targeted success rate would be increased to 90%.

The committee established for all master's programmes that the student output after three years is sufficient. However, a greater part of the students takes longer than the required two years to finish their study. During the site visit the master's students declared that they were happy with the curricula and found them feasible. They explained that most students take longer to finish their research project and hand in their thesis, because the research project is rather time consuming. Also, some students hope to obtain a higher grade by putting more efforts into their research project and their thesis. The committee wants to alert the programme management that every student should be able to finish his/her thesis without delay. It advises the programme management to increase the student success rate by being stricter with deadlines. The committee recommends thesis supervisors to make a mutual agreement with the students about time path and expectations prior to the start of the project.

The faculty of Mathematics and Natural Sciences has set as a target for 2016 that 20% of the student intake should consist of foreign enrolment. During the site visit, the committee learned that the programme management is working on attracting more foreign students. Students from abroad stated that they are satisfied with the master's programmes. They feel these programmes could be more well-known and acknowledged world-wide. The programme management hired an expert in internationalisation and an expert in marketing to improve the international profile of the programmes. In combination with the introduction of bachelor's programmes taught in English, the programme management is expecting an increase in foreign applications in the master's programmes. The committee supports the efforts of the programme management to make the master's programmes more international.

During the site visit, the committee established that the student intake in the specialization Science, Business and Policy from the master's programme Astronomy and Physics is low. Within both programmes, the average intake consists of one student every two years. But as the specialization is offered in more master's programmes, there is a total of 40 students. The committee recommends making this specialisation more well-known to bachelor students of Physics and Astronomy.

2.4. Staff

The average number of students enrolled in the Physics master's programme is 32, while the permanent scientific staff's teaching effort is calculated as 2.0 FTE. Thus, the student/staff ratio is 32/2 = 16.0. The student/staff ratio of the master's programme Applied Physics is 25/1.6 = 15.6 and the student/staff ratio of the master's programme Astronomy is 10/0.56 = 17.9. The committee is satisfied with the student/staff ratio of all three programmes.

According to the critical reflection, all teaching staff has a PhD degree. The committee learned that at the moment of the site visit 15% of the Physics-, 30% of the Applied Physics- and 54% of the Astronomy staff members obtained their BKO (Basis Kwalificatie Onderwijs, BKO). The programme management explained that most staff members are currently enrolled in the BKO-trajectory and formulated the ambition to also develop a senior teaching qualification track (Senior Kwalificatie Onderwijs, SKO). Newly appointed staff is obliged to enrol for a teaching qualification track. The committee noticed that the percentage of staff with a teaching qualification is rather low, but appreciates the current focus on the improvement of didactic skills. During the site visit, staff members mentioned that they wanted to enrol for a BKO-trajectory, but that no places were available. The committee encourages the programme management to ensure that all staff members are able to obtain their BKO as soon as possible.

Staff members of the three master's programmes are evaluated and graded (varying from A+ to C) by the Programme Committee. The staff members receive a summary of this evaluation including improvement points in a letter on behalf of the adjunct director. The committee values the grading of staff members by students during course evaluations as a feedback tool for staff members.

During the site visit, the students and alumni of the three master's programmes informed the committee that the staff members are easy to approach and always willing to help students, for instance in finding an industrial company or research lab to perform their internship. The master's students (Applied) Physics are very enthusiastic about the small-scale education and the guidance of staff members. During the site visit, they stated that the staff's quality in lecturing should be properly appreciated by faculty management. The Astronomy students experience the small-scale education as motivating. They benefit from the low threshold for approaching their supervisors, a positive peer pressure amongst students, and a strong community spirit. During the courses, there is always room for questions and students feel part of the research community. The committee values the open communication between lecturers and students, and appreciates the quality of the staff members of all three master's programmes.

2.5. Student support

According to the critical reflection, the Educational Support Center (ESC) is shared by all three master's programmes. It provides services in managing the programme: the study advisor, the student administration, the Programme Committee, and the Board of Examiners. The Board of Examiners of the three master's programmes is discussed in Standard 3.

The master's programmes Physics, Applied Physics and Astronomy share one study advisor, who advises students on issues with regard to study behaviour. Within their master's programme, students are mentored by a member of the scientific staff as well, who can advise them about the content of the programme. Master's students Astronomy noted that their mentor helps them with choosing courses and they even get guidance after they finished their master's programme in choosing a PhD, in the Netherlands or even abroad. The committee values the guidance offered to, especially the Astronomy, master's students.

The two Programme Committees provide solicited and unsolicited advice to the directors of the Undergraduate and Graduate School of Science and the adjunct-directors of the bachelor's and master's programmes. The Programme Committee Physics and Applied Physics consists of six staff members and six student members, and holds meetings at least four times a year. The adjunct director of the programmes is present at meetings as well; on occasion, a study advisor is invited to the meeting. The study association of Physics and Applied Physics communicates general complaints to the student members of the Programme Committee. The Programme Committee explained to the assessment committee that it advises about the quality of courses by processing student evaluations and discussing them with the adjunct-director of the programmes. In case of a negative evaluation, the adjunct director informs the staff member responsible for the course. The Programme Committee comments on the Teaching and Exam Regulations (OER), the outcome of the student evaluations, and on potential scheduling problems in the curricula.

According to the critical reflection, the Programme Committee for the bachelor- and master's programme Astronomy consists of three staff members and three student members and holds at least four meetings a year. It provides the same function and uses the same methods as the Programme Committee (Applied) Physics. Thanks to the small scale of the programme, master students Astronomy can inform the student members of the Programme Committee personally about issues concerning the quality of the programme.

The committee established that both Programme Committees have a good grip on the quality assurance of courses. It noted that both Programme Committees are quick in identifying and addressing issues or bottlenecks within the programmes. The committee advises to have meetings without the adjunct-director from time to time, to make sure every member can speak freely. It advises both Programme Committees to document all meetings. During the site visit, students told the committee that although they appreciate the small-scale education, they think that some students would gain from a more formal way of communication. Consequently, the committee wants to emphasize to the programme management that students need to be aware of the existence of the Programme Committee and how they can contact their members.

The committee noted that a substantial part of the curricula (60 EC or more) of all specializations of the master's programmes Physics, Applied Physics and Astronomy is carried out externally. The committee is enthusiastic about the experience students are offered, but advices the programme management to make sure a supervisor within the university is appointed to assess whether the external work and guidance during a research project or an industrial internship is up to standard.

The RUG offers a career service, NEXT, for students to prepare and develop their careers. NEXT is working with faculties, study associations, alumni organizations, and other providers in the field of careers services. It organizes various activities to help students make study choices and prepare them for the job market. Additionally, at this moment the study association of each master's programme is responsible for providing students with information about their options for specific work fields in the Netherlands and abroad. They organize a career day at the beginning of the academic year, inviting external guest speakers from the business, and internal speakers from master's students of the faculty. During the site visit, the master's students emphasized the importance of the study associations to provide students with the necessary information about the labour market and the options for graduates. The committee appreciates NEXT and the study associations, and advises the programme management to keep supporting them. However, it is of the opinion that the master's programmes themselves are primarily responsible for providing their students with the information needed for their professional orientation.

An electronic learning environment, Nestor, is used for various courses of the master's programmes Physics and Applied Physics. Students and lecturers use Nestor to exchange information and course material in digital form, for grading of assignments, and for chat sessions. The students and alumni told the committee that Nestor is appreciated as a tool, but that the staff members should be instructed how to use it. The committee agrees that the implementation of Nestor could be improved. The master's programmes Physics and Applied Physics make use of several local libraries and the University Library. The majority of information is available online. The master's programme Astronomy also uses a small private library at the Kapteyn Astronomical Institute.

During the master research project, the Astronomy students have a workplace at the Kapteyn Astronomical Institute, located on the Zernike Complex in the Kapteynborg. According to the critical reflection, the Kapteyn Astronomical Institute has a lecture room for astronomy lectures and meetings of the scientific staff. Furthermore, it has a computer cluster with 21 computer systems available for students. These computers are equipped with general astronomical software and data reduction packages, and are used for practical sessions and self-study of students in Astronomy. Since 2008, the Zernike Complex offers the Blaauw Observatory with a 40 cm Ritchey-Chrétin telescope. The committee has seen the workplaces and observatory during a guided tour. It was very impressed with the facilities of the master's programme Astronomy.

During the master research project, the Physics and Applied Physics students are members of the research group where their project is carried out. Thus they benefit from the high-quality facilities in the research institutes. The committee is of the opinion the Physics and Applied Physics students have all the facilities they need.

Considerations

The committee studied the specializations of the master's programmes Physics, Applied Physics and Astronomy. It values the solid research-oriented profile of the three master's programmes. The committee has studied the curricula before 2013 and the curricula of the master's programmes since 2013. It acknowledges that the implementation of the new specializations makes for an even better connection with the respective research field. The committee is enthusiastic about the individual identity of the three master's programmes as well as with their interdisciplinary character. The committee appreciates that the master's programme Astronomy benefits from small-scale education as well as education on a larger scale by collaborating with other master's programmes.

The committee established that all the important skills and competences described in the DSRK are taught in the curricula of all three master's programmes. The committee noted that the quality of education in the three master's programmes is high. It values the academic and scientific skills the students are taught in the curricula. The committee especially appreciates the Capita Selecta courses offered in the master's programme Astronomy. The committee advises the programme management to devote special attention in the curricula of the master's programmes Physics and Applied Physics to skills that are useful in the labour market.

The study load and average study duration of all three master's programmes are acceptable. The committee has noted that the master's programme Astronomy fulfils the faculty's new target of a 90% success rate after three years. The committee established that most students take more than the prescribed time to finish their thesis. It advises the project supervisors to make agreements with the students about time path and mutual expectations prior to the start of the project.

The committee is positive about the expertise, engagement, and accessibility of the staff members. Although BKO training and other activities to improve the didactic skills of lecturers started relatively late, the programme is now making good efforts to catch up. The system of course evaluations functions adequately in signalling and resolving issues or bottlenecks within the programme.

Based on these considerations, the committee concludes that the master's programmes Physics and Applied Physics fulfil the requirements for the teaching and learning environment in a satisfactory way. The master's programme Astronomy more than fulfils the requirements for this standard; the committee assesses the teaching and learning environment for this programme as 'good'.

Conclusion
Master's programme Physics: the committee assesses Standard 2 as **satisfactory**.
Master's programme Applied Physics: the committee assesses Standard 2 as **satisfactory**.
Master's programme Astronomy : the committee assesses Standard 2 as **good**.

Standard 3: Assessment and achieved learning outcomes

The programme has an adequate assessment system in place and demonstrates that the intended learning outcomes are achieved.

Explanation:
The level achieved is demonstrated by interim and final tests, final projects and the performance of graduates in actual practice or in post-graduate programmes. The tests and assessments are valid, reliable and transparent to the students.

Findings

In this standard, the findings on the assessment system and methods used are described (3.1), followed by the achieved learning outcomes (3.2). The assessment committee has read the programme's education and examinations regulations (OER), has spoken with members of the Board of Examiners, and has evaluated assignments, exams, and final projects of the different programmes.

3.1. Assessment system and methods

According to the critical reflection, the Board of the Faculty has developed a testing and assessment policy for all three master's programmes. The general objectives are that the method of testing is derived from the learning objectives, the testing is an integrated part of the programme, each test is as transparent and as reliable as possible, and students are informed about the testing in a timely fashion. Each master's programme develops a testing plan, which has to be approved by the Board of the Faculty. Additionally, each lecturer develops a 'course unit assessment overview' as a refinement of the testing plan, for which the Board of the Faculty developed a template.

Each year, the Board of Examiners of a master's programme establishes whether the testing plan of the programme, the course unit assessment overviews, and the testing system are adequate and informs the Board of the Faculty in case of omissions. Since 2010, the Board of Examiners is required by law to control the system of testing and assessment within the master's programmes. The critical reflection states that the Board of Examiners has started with the assessment of testing material after course-unit assessment overviews became available in January 2014.

According to the critical reflection, the Board of Examiners Physics and Applied Physics consists of four members, who assess the quality of exams, reports and theses in relation to the intended learning outcomes of the bachelor's- and master's programmes Physics and Applied Physics. During the site visit, the Board of Examiners Physics and Applied Physics explained its task is to award degrees after checking the students' achieved learning outcomes. The thesis grading is evaluated and in case of discrepancies, the Board of Examiners Physics and Applied Physics will contact the supervisors of the thesis. The Board of Examiners explained that it may have only recently started to systematically assess the testing quality and the quality of the master theses, but that in earlier years it had installed a series of checks and balances (like collegial checks of testing materials and thesis assessment forms).

The Board of Examiners Astronomy consists of four staff members, who assess the quality of exams, reports and theses in relation to the intended learning outcomes of the bachelor's and master's programmes Astronomy. During the site visit, the Board of Examiners Astronomy explained they have similar tasks and objectives as the Board of Examiners

Physics: assuring the quality and homogeneity of exams, reports and theses. Although the Board of Examiners Astronomy is late in formalizing its tasks, it has been testing the quality of exams for fifteen years. For example, over the past few years one of the members of the Board of Examiners has been third member of all thesis assessment committees. This year, the master's theses Astronomy were all independently assessed again by the Board of Examiners, resulting in very similar grading (a maximum deviation of half a point from the original grade).

The committee established that the documentation of the meetings of the Boards of Examiners shows that the quality assurance of the master's programmes is sufficient. It is enthusiastic about the structural testing of thesis quality by the Boards of Examiners. According to the committee, the Boards of Examiners Physics and Applied Physics and Astronomy have a good grip on their tasks and it has confidence that the Boards will further develop their new working methods.

3.2. Achieved learning outcomes

The students of the master's programmes Physics, Applied Physics and Astronomy write their master's thesis at the end of their research project. The thesis is assessed with help of the thesis assessment form, which is divided into four blocks: content and scientific quality, attitude and level of independence, written report and oral presentation. The final grade is determined by weighing the four grades in the ratio 4:2:1:1. A master's student graduates cum laude when the average grade is 8 or higher and when none of the grades is below 7.

For the master's programmes Physics and Applied Physics, only the supervisor grades the content and scientific quality, attitude and level of independence. The written report and oral presentation are also evaluated independently by a staff member who was not involved in the project. The assessment form is signed by both staff members, discussed with the student and submitted to the Education Support Desk. According to the Board of Examiners Physics, the independent staff member who grades the thesis also checks for plagiarism. The Board of Examiners only accepts a thesis after approval by this staff member. During the period of the assessment, the thesis grades for the master's programme Physics amount to 7.9 on average. The thesis grades for the master's programme Applied Physics amount to 8.1 on average

The master's theses of Astronomy students are judged independently by three staff members: the supervisor, a staff member, and the coordinator. The thesis assessment form is completed and signed by the two staff members and the coordinator, discussed with the student and submitted to the Education Support Center. The coordinator of the master's theses ensures a consistent assessment of all master's projects. During the period of the assessment, the thesis grades for the master's programme Astronomy amount to 8.2 on average.

Prior to the site visit the assessment committee has studied ten master's theses of each master's programme to check whether students have achieved the intended learning outcomes. In general, it agrees with the grading of the theses. In some cases the theses received a higher grade than the committee would have given. The committee concludes that the quality of the theses is good and matches the academic level that may be expected of a master's thesis. It would have liked to see a thesis assessment form for each thesis, but unfortunately that was not the case. Programme management explained that evaluation forms were used, but were not properly archived until September 2012. The committee advises the Board of Examiners Physics and Astronomy to ensure that every master's thesis is assessed and archived with a thesis evaluation form and that the staff members grade the students independently before coming to the final grade.

Considerations

The committee is enthusiastic about the objectives of quality assurance for tests and the master's theses of the Board of Faculty; those objectives adequately meet the requirements for generic quality. However, the committee noted that the Boards of Examiners Physics and Applied Physics and Astronomy are late with the implementation of their legal tasks to assess the quality of testing and assessments and encourages them to accelerate the implementation progress and to make sure all their activities are documented. The committee also advises the Boards of Examiners Physics and Applied Physics and Astronomy to ensure that thesis evaluation forms are always filled in and archived correctly.

The committee is of the opinion that the master's theses of the three master's programmes reflect the achieved intended learning outcomes by students. There was a close match between the assessments given by the committee and those originally recorded by the team of supervisors. The committee concludes that the quality of the theses is good and matches the academic level that may be expected of a master's thesis.

Conclusion

Master's programme Physics: the committee assesses Standard 3 as **satisfactory**.
Master's programme Applied Physics: the committee assesses Standard 3 as **satisfactory**.
Master's programme Astronomy : the committee assesses Standard 3 as **satisfactory**.

General conclusion

In the committee's judgement the master's degree programmes Physics, Applied Physics and Astronomy at University of Groningen fulfil the criteria for accreditation. It has noted many positive aspects and suggested several points for improvement. Weighing those points and the individual assessment of each standard, the committee concludes that the programmes 'meet the current generic quality standards and show an acceptable level across their entire spectrum' and consequently can be assessed as 'satisfactory'.

Conclusion
The committee assesses the *master's programme Physics* as **satisfactory**.
The committee assesses the *master's programme Applied Physics* as **satisfactory**.
The committee assesses the *master's programme Astronomy* as **satisfactory**.

Appendices

Appendix 1: Curricula vitae of the members of the assessment committee

Prof. dr. D. (Daan) Lenstra studied Physics at the University of Groningen and got his PhD at the Delft University of Technology on the subject 'Polarization effects in gas lasers'. Since 1979 his research is focused on the broad area of quantum electronics. He was professor at the VU University Amsterdam from 1991-2006. Between 2000 and 2006 he was also professor at Eindhoven University of Technology. From 2004-2006 he was scientific director of the COBRA Research Instituut was. From November 2006 until his retirement in 2010 he was dean of the Faculty Electrical Engineering, Mathematics and Computer Sciences at Delft University of Technology. Since 2012 he is honorary advisor for the Faculty Electrical Engineering of Eindhoven University of Technology.

Dr. H.P. (Henk) Blok studied Experimental Physics at the VU University Amsterdam. He got his PhD in 1972 at the same university and stayed at this university as assistant professor and PI. He did experimental work with the VU cyclotron and the electronics accelerator of NIKHEF and other places (Boulder, Osaka, Darmstadt, Orsay, JLab, DESY). He teached and supervised undergraduate, graduate and PhD students. Between 1998 and 2004 he occupied the position of programme director Physics and educational director of the Faculty of Sciences at the VU University Amsterdam. He retired in 2005 from these functions but is still active in experimental work and teaching.

Prof. dr. ir. G. (Guido) van Oost has graduated from Ghent University as an electrotechnical engineer in 1972 and he did his PhD while being a researcher at the Laboratory of Plasma Physics at the Royal Military Academy (LPP-ERM/KMS) Brussels. There he worked as a research associate until he became their leading scientist and permanent representative at the Institute of Plasma Physics (IPP) of the Forschungszentrum Jülich (Germany) on the tokamak TEXTOR in the framework of the coordinated nuclear fusion programme of the European Commission. Since 1999 he has been a full professor of plasma physics at the Department of Applied Physics of Ghent University, responsible for research in the fields of nuclear fusion and plasma treatment of waste and biomass. He supervises 7-10 master theses in nuclear fusion every year. He is coordinator of the Erasmus Mundus "European Master in Nuclear Fusion and Science and Engineering Physics" and of the Erasmus Mundus "International Doctoral College in Fusion Science and Engineering".

Prof. dr. W. (Wim) de Boer of the Karlsruhe Institute of Technology is a leading expert in the fields of particle - and astroparticle physics. His main interest focuses on the search for the elusive dark matter, which makes up more than 80% of the matter in the universe, but its nature is unknown. Prof. De Boer participates in the search for dark matter using the CMS detector at the Large Hadron Collider (LHC) at the European Particle Physics Laboratory CERN in Geneva and the AMS-02 detector on the International Space Station. He also contributed to the phenomenology of Supersymmetry by showing that Supersymmetry can lead to a Grand Unified Theory with a perfect candidate for a dark matter particle. Prof. De Boer received his PhD at Delft University of Technology in 1974. Since 2009, he is member of the Advisory Committee IMAPP, Radboud University Nijmegen.

Prof. dr E. (Elias) Brinks earned his doctorate in 1983 at Leiden University with a study of the neutral hydrogen distribution in Messier 31, the Andromeda galaxy. Following a postdoctoral fellowship at the European Southern Observatory (ESO) in Garching and an employment as Senior Research Associate at the former Royal Greenwich Observatory in the UK, he spent nearly six years as Associate Scientist at the National Radio Astronomy Observatory's Very Large Array (NRAO-VLA) in Socorro, New Mexico (USA). He then moved to "Old" Mexico to help set up the Department of Astronomy at the University of Guanajuato and subsequently was appointed as staff scientist at the Instituto Nacional de Astronomía, Óptica y Electrónica (INAOE) in Puebla, where he contributed to efforts to build the Large Millimeter telescope. Since September 2004 he is back in Europe, as Full Professor at the University of Hertfordshire. Upon retuning to the UK he was elected Secretary of the European Astronomical Society (2006-2012). His research focuses on nearby normal and dwarf galaxies, galaxy interactions, and their formation and evolution.

Dr. ir. H.L. (Harald) Tepper studied Chemical Engineering at the University of Twente and obtained his PhD in computational physics at the same university in 2001. Between 2002 and 2007 he was a post-doc researcher at the University of Utah and VENI-researcher at the AMOLF Institute in Amsterdam. He has been a management consultant at McKinsey & Company since 2007 and has worked on large-scale change trajectories, audits, benchmarking of organisations and strategy-establishing of an academic business school. He is Chief Strategy Officer at the Netherlands Forensic Institute. During his undergraduate and graduate studies he also obtained his diploma in Music education in Clarinet at the conservatory. He was co-founder and chair (2006-2011) of The National Thinktank, an organisation which aims to add interdisciplinary experience to the curriculum for (PhD-)students.

J.J.T. (Jelmer) Wagenaar, Msc. obtained his bachelor's degree in Physics in 2011 at Leiden University. During his graduate studies, he completed courses at Leiden University and the Technical University Delft. He obtained his master's degree in 2013. During his studies he was teaching assistant for two courses, and co-developed the course materials for the course 'Signal processing and Noise'. For 5 years he was active as member of the educational committee of Physics and an active member of the Physics student society. At the moment he is a PhD student at Leiden University under the supervision of Prof. dr. ir. T.H. Oosterkamp. He teaches Physics and Chemistry to pupils preparing for their high school graduation exams.

Appendix 2: Domain-specific framework of reference

The descriptors for the master degree programmes can be described with three types of competences, as is done below. The sequence within each category is, with few exceptions, taken from what is called the 'Rating of Importance Order' in the Tuning document.

(a) Discipline-related cognitive competences.

	Specific competence	Description. On completion of the degree course, the student should
1	Modelling skills	be able to identify the essentials of a process/situation and to set up a working model of the same; be able to perform the required approximations; i.e. critically think about how to construct physical models.
2	Problem solving skills	be able to evaluate clearly the orders of magnitude in situations which are physically different, but show analogies, thus allowing the use of known solutions in new problems.
3	Knowledge and understanding of Physics	have a good understanding of the important physical theories (logical and mathematical structure, experimental support, physical phenomena described).
4	Familiarity with basic and applied research	acquire an understanding of the nature and ways of physics research and of how physics research is applicable to many fields other than physics, e.g. engineering; be able to design experimental and/or theoretical procedures for: (i) solving current problems in academic or industrial research; (ii) improving the existing results.
5	Frontier research	have a good knowledge of the state of the art in (at least) one of the presently active topics in physics research.
6	Human / professional skills	be able to develop a personal sense of responsibility; be able to gain professional flexibility through the wide spectrum of scientific techniques offered in the curriculum.
7	Physics culture	be familiar with the most important areas of physics and with the common approaches, which span many areas in physics.
8	Absolute standards	have become familiar with highly regarded research in the field thus developing an awareness of the highest standards.

(b) Discipline-related practical skills.

	Specific competence	Description. On completion of the degree course, the student should
9	Mathematical skills	be able to understand and master the use of the most commonly used mathematical and numerical methods.
10	Computer skills	be able to perform calculations independently, even when a small PC or a large computer is needed, including the development of software programmes.
11	Experimental skills	have become familiar with most important experimental methods and be able to perform experiments independently, as well as to describe, analyse and critically evaluate experimental data; and to be able to scientifically report the findings.

(c) Discipline-related generic competences.

	Specific competence	Description. On completion of the degree course, the student should
12	Literature search	be able to search for and use physical and other technical literature, as well as any other sources of information relevant to research work and technical project development; have good knowledge of technical English.
13	Learning ability	be able to enter new fields through independent study.
14	Ethical behaviour (relevant to physics)	be able to understand the socially related problems related to the profession, and to comprehend the ethical characteristics of research and of the professional activity in physics and its responsibility to society.
15	Specific communication skills	be able to listen carefully and to present difficult ideas and complex information in a clear and concise manner to professional as well as to lay audiences; be able to work in an interdisciplinary team.
16	Managing skills	be able to work with a high degree of autonomy, even accepting responsibility in (project) planning, and in the managing of structures.
17	Updating skills	enjoy the facility to remain informed of new developments and methods, and be able to provide professional advice on their possible impact or range of applications.
18	Foreign language skills	have improved command of foreign languages through participation in courses taught in foreign language.

Appendix 3: Intended learning outcomes

Master's programme Physics

Until 2013
The master graduate in Physics

1. Knowledge and understanding
    1.1. understands the basic concepts of physics, including the necessary mathematics and computer science, at a level which permits admission a PhD programme;
    1.2. is familiar with the quantitative character of physics and with the relevant research methods;
    1.3. [Experimental Physics specialization] has a thorough understanding of measurement techniques and data analysis, and has a thorough understanding of some topics in theoretical and computational physics;
    1.4. [Theoretical Physics specialization] has a thorough understanding of the main fields in theoretical physics and the mathematical tools used there;
    1.5. [Instrumentation and Informatics specialization] has operational knowledge in the area of instrumentation and information technology in astronomy, physics, and/or space research;
    1.6. [Science, Business and Policy specialization] has operational knowledge of and insight into the functioning of companies and administrations, as well as the relevant legislation;

2. Application of knowledge and understanding
    2.1. is capable to carry out research, aimed at the understanding of physical phenomena and their description in scientific terms;
    2.2. is capable to analyse a (new) complex physical problem, and to develop a structured and well-planned research approach;
    2.3. is capable to apply his/her specific knowledge and skills in his/her own and related subject areas;
    2.4. is capable to collaborate in a (multi-disciplinary) team;

3. Judgement
    3.1. is capable to obtain relevant information using modern information channels, and to interpret this information critically;
    3.2. is capable to judge his/her and others' actions within a scientific context, taking societal and ethical aspects into account;
    3.3. is able to draw conclusions on the basis of limited or incomplete information, and is able to realize and formulate the limitations of such conclusions;

4. Communication skills
    4.1. is capable to communicate clearly, verbally and in writing, on his/her subject and relevant applications, at a level which is understandable to experts and non-experts, and using modern communication tools;

5. Learning skills
    5.1. is capable to address issues inside as well as outside his/her main subject area, therefore and thereby gaining new knowledge and skills;

From 2013
The master graduate in Physics

1. Knowledge and understanding
    1.1. understands the basic concepts of physics, including the necessary mathematics and computer science, at a level which permits admission a PhD programme;
    1.2. is familiar with the quantitative character of physics and with the relevant research methods;
    1.3. [specialization Advanced Materials] has a thorough understanding of materials science, more specifically of structure, functional properties and characterisation of advanced materials;
    1.4. [specialization Quantum Universe] has a thorough understanding of main fields of theoretical physics, more specifically in the fields of general relativity, statistical mechanics, quantum mechanics, particle physics and radiation processes;
    1.5. [specialization Science, Business and Policy specialization] has operational knowledge of and insight into the functioning of companies and administrations, as well as the relevant legislation;

2. Application of knowledge and understanding
    2.1. is capable to carry out research, aimed at the understanding of physical phenomena and their description in scientific terms;
    2.2. is capable to analyse a (new) complex physical problem, and to develop a structured and well-planned research approach;
    2.3. is capable to apply his/her specific knowledge and skills in his/her own and related subject areas;
    2.4. is capable to collaborate in a (multi-disciplinary) team;

3. Judgement
    3.1. is capable to obtain relevant information using modern information channels, and to interpret this information critically;
    3.2. is capable to judge his/her and others' actions within a scientific context, taking societal and ethical aspects into account;
    3.3. is able to draw conclusions on the basis of limited or incomplete information, and is able to realize and formulate the limitations of such conclusions;

4. Communication skills
    4.1. is capable to communicate clearly, verbally and in writing, on his/her subject and relevant applications, at a level which is understandable to experts and non-experts, and using modern communication tools;

5. Learning skills
    5.1. is capable to address issues inside as well as outside his/her main subject area, therefore and thereby gaining new knowledge and skills;

Master's programme Applied Physics

Until 2013
The master graduate in Applied Physics

1. Knowledge and understanding
    1.1. understands the basic concepts of physics, including the necessary mathematics and computer science, at a level which permits admission to a PhD programme;
    1.2. is familiar with the quantitative character of physics and with the relevant research methods;
    1.3. has some knowledge in the field of business and management;
    1.4. [Applied Physics specialization:] has operational knowledge and design skills in the field of applied physics;
    1.5. [Instrumentations and Informatics specialization:] has operational knowledge in the area of instrumentation and information technology in astronomy, physics, and/or space research;

2. Application of knowledge and understanding
    2.1. is capable to carry out research, aimed at understanding of physical phenomena that are potentially usable in applications, or is capable to develop applications of physical phenomena;
    2.2. is capable to analyse a complex applied physical problem, and to develop a structured and well-planned research approach;
    2.3. is capable to apply his/her specific knowledge and skills in his/her own and related subject areas;
    2.4. has developed an attitude aimed at seeking new applications;
    2.5. has experience with the use of complicated apparatus and/or with the use of advanced programming tools;
    2.6. has experience with applied physics in an industrial environment or in a research environment abroad;
    2.7. is capable to collaborate in a (multi-disciplinary) research and design team;

3. Judgement
    3.1. is capable to obtain relevant information using modern information channels, and to interpret this information critically;
    3.2. is capable to judge his/her and others' actions within a scientific context, taking societal and ethical aspects into account;
    3.3. is able to draw conclusions on the basis of limited or incomplete information, and is able to realize and formulate the limitations of such conclusions;

4. Communication skills
    4.1. is capable to communicate clearly, verbally and in writing, on his/her subject and relevant applications, at a level which is understandable to experts and non-experts, and using modern communication tools;

5. Learning skills
    5.1. is capable to address issues inside as well as outside his/her main subject area, therefore and thereby gaining new knowledge and skills.
    5.2. Is able to recognize potential applications of recent advances in physics.

From 2013
The master graduate in Applied Physics

1. Knowledge and understanding
    - 1.1. understands the basic concepts of physics, including the necessary mathematics and computer science, at a level which permits admission to a PhD programme;
    - 1.2. is familiar with the quantitative character of physics and with the relevant research methods;
    - 1.3. has operational knowledge and design skills in the field of applied physics
    - 1.4. has a thorough understanding of materials science and more specifically of structure, functional properties and characterisation of advanced materials;
    - 1.5. has some knowledge in the field of business and management;

2. Application of knowledge and understanding
    - 2.1. is capable to carry out research, aimed at understanding of physical phenomena that are potentially usable in applications, or is capable to develop applications of physical phenomena;
    - 2.2. is capable to analyse a (new) complex applied problem, and develop a structured and well-planned research approach;
    - 2.3. is capable to apply his/her specific knowledge and skills in his/her own and related subject areas;
    - 2.4. has developed an attitude aimed at seeking new applications;
    - 2.5. has experience with the use of complicated apparatus and/or with the use of advanced programming tools;
    - 2.6. has experience in application of applied physics in an industrial environment or in an applied physics research environment abroad;
    - 2.7. is capable to collaborate in a (multi-disciplinary) research and design team;

3. Judgement
    - 3.1. is capable to obtain relevant information using modern information channels, and to interpret this information critically;
    - 3.2. is capable to judge his/her and others' actions within a scientific context, taking societal and ethical aspects into account;
    - 3.3. is able to draw conclusions on the basis of limited or incomplete information, and is able to realize and formulate the limitations of such conclusions;

4. Communication skills
    - 4.1. is capable to communicate clearly, verbally and in writing, on his/her subject and relevant applications, at a level which is understandable to experts and non-experts, and using modern communication tools;

5. Learning skills
    - 5.1. is capable to address issues inside as well as outside his/her main subject area, therefore and thereby gaining new knowledge and skills;
    - 5.2. is able to recognize potential applications of recent advances in physics.

Master's programme Astronomy

The master graduate in Astronomy

1. Knowledge and understanding
    1.1. masters the fundamental astronomical and astrophysical concepts as well as the necessary tools from physics, mathematics and computer science, at a level which permits admission to a PhD programme;
    1.2. is familiar with the quantitative character of astronomy and astrophysics, and with the relevant research methods;
    1.3. [Theoretical and observational Astronomy (Quantum Universe) specialization:] has operational knowledge in an observational or theoretical astronomical or astrophysical subarea;
    1.4. [Instrumentation and Informatics specialization:] has operational knowledge in the area of instrumentation and information technology in astronomy, physics, and/or space research;
    1.5. [Science, Business and Policy specialization:] has operational knowledge of and insight into the functioning of companies and administrations, as well as the relevant legislation;

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

3. Judgement
    3.1. is capable to obtain relevant information using modern information channels, and to interpret this information critically;
    3.2. is capable to judge his/her and others' actions within a scientific context, taking societal and ethical aspects into account;
    3.3. is able to draw conclusions on the basis of limited or incomplete information, and is able to realize and formulate the limitations of such conclusions;

4. Communication skills
    4.1. is capable to communicate clearly, verbally and in writing, on his/her subject and relevant applications, at a level which is understandable to experts and non-experts, and using modern communication tools;

5. Learning skills
    5.1. is capable to address issues inside as well as outside his/her main subject area, therefore and thereby gaining new knowledge and skills.

Appendix 4: Overview of the curricula

Master's programme Physics

Curriculum until 2013

Course // specialization	Experimental Physics	Theoretical Physics	Instrumentation and Informatics	Science, Business and Policy
	EC	**EC**	**EC**	**EC**
Symmetry in Physics	5	5		5
Computational Physics	5	5	5	5
Relativistic Quantum Mechanics		5		
Quantum Field Theory		5		
Theoretical Condensed Matter Physics		5		
Statistical Mechanics		5		
Statistical Methods in Physics	5			
Principles of Measurement Systems	5		5	
Student seminars	5	5		
Control Engineering			5	
Applied Signal Processing			5	
Basic Detection Techniques			5	
Astronomical Space Missions			5	
Numerical Mathematics 1			5	
Optional courses I&I			10	
Optional courses in Science	25	20	5	20
Free electives	10	5		
Course Science, Business and Policy				20
Internship Science, Business and Policy				40
Project Information Technology			10	
Industrial research			20	
Research	60	60	40	30
Total	**120**	**120**	**120**	**120**

Curriculum from 2013

Course // Specialization	Advanced Materials	Quantum Universe	Science, Business and Policy
	EC	**EC**	**EC**
Computational Physics	5	5	5
Statistical Mechanics	5	5	5
Mathematical methods in Physics	5	5	5
Advanced Quantum Mechanics	5	5	5
Cross disciplinary Materials Science	5		
Structure at Macro, Micro and Nano Scale	5		
Functional Properties	5		
Characterization of Materials	5		
General Relativity		5	
Particle Physics Phenomenology		5	
Electrodynamics of Radiation Processes		5	
Student seminar Quantum Universe		5	
Elective specializing courses	20	20	
Optional courses in Science			10

Course Science, Business and Policy			20
Internship Science Business and Policy			40
Project Information Technology			
Research	60	60	30
Total	**120**	**120**	**120**

Master's programme Applied Physics

Curriculum until 2013

Course // specialization	Applied Physics	Instrumentation and Informatics
	EC	**EC**
Device Physics	5	5
Applications of Quantum Physics	5	5
Physical Transport Phenomena 2	5	
Physical Materials Science	5	
Control Engineering		5
Applied Signal Processing	5	5
Basic Detection Techniques		5
Astronomical Space Missions		5
Numerical Mathematics 2		5
Business and Management	10	
Optional courses in Science	10	15
Optional courses I&I		10
Internship in Industry	30	20
Applied Physics Research	45	40
Total	**120**	**120**

Curriculum from 2013

Course	EC
Computational physics	5
Physical Materials Science	5
Mesoscopic Physics	5
Cross-disciplinary Materials Science	5
Structure at Macro, Micro and Nano Scale	5
Functional Properties	5
Characterization of Materials	5
Courses in Business and Management	5
Optional courses in Science and Engineering	15
Internship in Industry	20
Applied Physics Research	45
Total	**120**

Master's programme Astronomy

Curriculum until 2013

Course // Specialization	Theoretical and Observational Astronomy	Instrumentation & Informatics	Science, Business and Policy
	EC	**EC**	**EC**
Basic Astrophysics course	5		
Advanced astrophysics courses	25	10	30
Optional courses in science	20		
Optional courses I&I		10	
Optional courses	10		
Principles of Measurement Systems		5	
Control Engineering		5	
Applied Signal Processing		5	
Basic Detection Techniques		5	
Space Mission Technology		5	
Numerical Mathematics 2		5	
Project Information Technology		10	
Industrial internship		20	
Course Science Business and Policy			20
Internship Science Business and Policy			40
Master research/thesis	60	40	30
	120	**120**	**120**

Curriculum from 2013

Courses // Specialization	Theoretical and Observational Astronomy (Quantum Universe)	Instrumentation and Informatics (Quantum Universe)	Science, Business and Policy
	EC	**EC**	**EC**
Astrophysics Core courses	20		20
General Relativity	5	5	
Student Seminar Quantum Universe	5	5	
Particle Physics Phenomenology	5	5	
Electrodynamics of radiation processes	5	5	
Optional courses in Theoretical and Observational Astronomy	20		10
Optional courses in Informatics and Informatics		30	
Project Information Technology		10	
Industrial internship		20	
Course Science Business and Policy			20
Internship Science, Business and Policy			40
Master research/thesis	60	40	30
Total	**120**	**120**	**120**

Appendix 5: Quantitative data regarding the programmes

Data on intake, transfers and graduates

Master's programme Physics

Intake master's degree programme Physics (Progress data)

Cohort	Total	Bachelor	HBO	International	Male (%)	Female (%)
2006-2007	19	19			84	16
2007-2008	17	14		3	94	6
2008-2009	10	8		2	100	0
2009-2010	14	14			86	14
2010-2011	16	15		1	81	19
2011-2012	20	16		4	80	20
2012-2013	15	14		1	100	0
2013-20141)	14	12		2	64	36
1) Ongoing year, reference date: October 1, 2013						

Intake master's degree programme Physics (VSNU data)

Cohort	Total	BSc at RUG	BSc in NL	International	M (%)	F (%)
2006-2007	18	17		1	72	28
2007-2008	18	14	1	3	83	17
2008-2009	10	8		2	100	0
2009-2010	13	13			77	23
2010-2011	16	15		1	81	19

Output master's degree programme Physics (Progress data)

Cohort	Intake	within 2 years	within 3 years	within 4 years	within 5 years
2006-2007	19	53 %	74 %	79 %	79 %
2007-2008	17	29 %	76 %	88 %	94 %
2008-2009	10	20 %	60 %	80 %	90 %
2009-2010	14	64 %	78 %	86 %	n.a.
2010-2011	16	50 %	75 %	n.a.	n.a.
2011-2012	20	35 %	n.a.	n.a.	n.a.

Number (#) of graduates and average duration of study in months

		BSc at RUG			BSc in NL		international	
Graduation Year	Total # graduates	#	months MSc	months BSc+ MSc	#	months MSc	#	months MSc
2006-2007	2	1	10	70			1	21
2007-2008	11	10	17	63			1	10
2008-2009	9	8	19	77			1	24
2009-2010	15	13	21	83	1	26	1	36
2010-2011	13	12	22	76			1	30

Masters's programme Applied Physics

Intake master's degree programme Applied Physics (Progress data)

Cohort	Total	Bachelor	HBO	International	M (%)	F (%)
2006-2007	8	7		1	100	0
2007-2008	16	14	1	1	94	6
2008-2009	21	20	1		90	10
2009-2010	8	8			87	13
2010-2011	18	16		2	73	17
2011-2012	19	19			95	5
2012-2013	20	20			100	0
2013-2014 1)	10	9		1	100	0
1) Ongoing year, reference date: October 1, 2013						

Intake master's degree programme Applied Physics (VSNU data)

Cohort	Total	BSc RUG	BSc Dutch	International	M (%)	F (%)
2008-2009	11	11			91	9
2009-2010	8	8			88	12
2010-2011	19	17		2	79	21

Output master's degree programme Applied Physics (Progress data)

Cohort	Intake	within 2 years	within 3 years	within 4 years	within 5 years
2006-2007	8	63	87	87	87
2007-2008	16	88	94	94	94
2008-2009	21	67	95	95	95
2009-2010	8	63	100	100	n.a.
2010-2011	18	51	78	n.a.	n.a.
2011-2012	19	63	n.a.	n.a.	n.a.

Number (#) of graduates and average duration of study in months

		BSc at RUG			BSc in NL		international	
Graduation Year	Total # graduates	#	months MSc	months BSc+ MSc	#	months MSc	#	months MSc
2008-2009	7	7	22	65				
2009-2010	6	6	19	77				
2010-2011	18	17	20	76			1	6

Master's programme Astronomy

Intake master's degree programme Astronomy (Progress data)

Cohort	Total	Bachelor	HBO	International	M (%)	F (%)
2006-2007	2	1		1	0	100
2007-2008	3	3			67	33
2008-2009	7	7			72	28
2009-2010	9	8		1	67	33
2010-2011	3	3			33	67
2011-2012	6	6			100	0
2012-2013	6	5		1	67	33
2013-2014 1)	3	2		1	67	33
1) On-going year, reference date: October 1, 2013						

Intake master's degree programme Sterrenkunde and Astronomy (VSNU data)

Cohort	Total	BSc RUG	BSc Dutch	International	M (%)	F (%)
2006-2007	2	1		1		100
2007-2008	6	6			50	50
2008-2009	4	4			75	25
2009-2010	9	8		1	67	33
2010-2011	2	1		1	50	50

Output master's degree programme Astronomy

Cohort	Intake	within 2 year	within 3 year	within 4 year	within 5 year
2005-2006	2	50 %	100 %	100 %	100 %
2006-2007	2	100 %	100 %	100 %	100 %
2007-2008	3	33 %	100 %	100 %	100 %
2008-2009	7	86 %	100 %	100 %	100 %
2009-2010	9	56 %	78 %	78 %	89 %
2010-2011	3	67 %	100 %	n.a.	n.a.
2011-2012	6	33 %	n.a.	n.a.	n.a.

Number (#) of graduates and average duration of study (in months)

		BSc at RUG			BSc in NL		international	
Graduation Year	Total # graduates	#	months MSc	months BSc+MSc	#	months MSc	#	months MSc
2006-2007	1						1	24
2007-2008	3	1	21	108			2	28
2008-2009	3	3	11	79				
2009-2010	7	7	22	85	1			
2010-2011	4	4	18	74				

Teacher-student ratio achieved

Master's programme Physics

academic year	fte teaching	number of students registered on October 1	number of degrees granted	number of students per fte education	number of granted degrees per fte education
2011-2012	2.0	32	9	16.0	4.5

Data on teaching qualifications of the scientific staff

	MSc	PhD	BKO obtained	BKO in progress	BKO exempted
Percentage	100%	100%	15%	76%	9%

Masters's programme Applied Physics

Teacher-student ratio

academic year	fte teaching	number of students registered at October 1	number of degrees granted	number of students per fte education	number of granted degrees per fte education
2011-2012	1.6	25	8	15.6	5.0

Qualifications of the scientific staff

	MSc	PhD	BKO obtained	BKO in progress	BKO exempted
Percentage	100%	100%	30%	60%	10%

Master's programme Astronomy

academic year	fte teaching	number of students registered on October 1	number of degrees granted	number of students per fte education	number of granted degrees per fte education
2011-2012	0.56	10	4	17.9	7.1

Qualifications of the scientific staff

	MSc	PhD	BKO obtained	BKO in progress	BKO exempted
Percentage	100%	100%	54%	31%	15%

Average amount of face-to-face instruction per stage of the study programme

Master's programme Physics

Year	Lectures (contact hours)	Tutorials	Research	Self-study	Total
1	384	40		1256	1680
2			1680		1680

Masters's programme Applied Physics

Year	Lectures (contact hours)	Tutorials	Internship	Research	Self-study	Total
1	278	32	420		950	1680
2			420	1260		1680

Master's programme Astronomy

Year	Lectures	Tutorials	Research	Self-study	Total
1	385	100		1195	1680
2			1680		1680

Appendix 6: Programme of the site visit

Dag 1:		
11.00	12.00	Aankomst commissie en lunch
12.00	15.00	Voorbereidend overleg van de commissie + inzage documenten
15.00	16.00	Inhoudelijk verantwoordelijken • Ir. R. (Reeuwerd) Straatman (coordinator natuurk./technische natuurk./sterrenkunde) • Prof. dr. R.G.E. (Rob) Timmermans (adj. dir. natuurk./technische natuurk. vanaf 1-10-2013) • Prof. dr. E. (Erik) van der Giessen (adj. dir. natuurk./technische natuurk. tot 1-10-2013) • Prof. dr. I.E.E. (Inga) Kamp (adj. dir. sterrenkunde)
16.00	16.45	Bachelorstudenten Natuurkunde + Technische Natuurkunde • Ceri Richards (1e-jaars N) • Arjan Burema (2e-jaars N) • Jonathan Ellen (3e-jaars N) • Jaap de Jonge (1e-jaars TN) • Kai Raatjes (2e-jaars TN) • Tom Bosma (3e-jaars TN)
16.45	17.30	Bachelorstudenten Sterrenkunde • Nick Oberg (1e-jaars SK) • Michael Zuravlovs (1e-jaars SK) • Willeke Mulder (2e-jaars SK) • Tobias Vos (2e-jaars SK) • Anke Arentsen (3e-jaars SK) • Jakob van den Eijnden (3e-jaars SK)
17.30	18.15	Alumni Natuurkunde + Technische Natuurkunde (parallelsessie) Natuurkunde: • Keri Vos (PhD Groningen, Master 2011) • Maaike Wiltjer (Docent aan het Winkler Prins, Veendam, Master 2010) • Robert Broos (Reservoir Engineer, Shell, Master 2009) Technische Natuurkunde: • Jakko de Jong (PhD Groningen, Master 2011) • Arjan van der Pal (Associate Consultant at OC&C Strategy Consultants, Master 2010) • Mark Schenkel (Petrophysicist, Shell Upstream International, Master 2010)
		Alumni Sterrenkunde (parallelsessie) • Jarno Ruwen (ICT, master 2011) • Tessel van der Laan (Astronomer at IRAM (Plateau de Bure), PhD Max-Planck Institute Heidelberg 2012, master 2009) • Wouter Oosterheert (consultant, master neuroscience Nijmegen, bachelor 2010) • Ronniy Joseph (master Leiden, bachelor 2013) • Omar Choudhoury (PhD Potsdam, master 2012) • Boudewijn Hut (junior engineer at ASTRON, master 2013)

18.15	18.30	Intern overleg commissie
19.00		Diner (alleen commissie)

Dag 2:		
08.30	9.00	Intern overleg commissie + inzage documenten
9.00	10.00	Rondleiding
10.00	10.45	Intern overleg commissie + inzage documenten
10.45	11.30	Masterstudenten Natuurkunde + Technische Natuurkunde (parallelsessie) • Herre Kamsma (N) • Rosa Kappert (N) • Bart Groeneveld (TN) • Rob Jagt (TN)
		Masterstudenten Sterrenkunde (parallelsessie) • Johanna Hartke • Judith ter Horst • Robin Kooistra • Job Feldbrugge
11.30	12.00	Intern overleg commissie
12.00	13.00	Docenten Natuurkunde + Technische Natuurkunde (parallelsessie) • Prof. dr. D. (Daniel) Boer (N) • Dr. S. (Steven) Hoekstra (N) • Prof. dr. H.A.J. (Harro) Meijer (N) • Prof. dr. J.T.M. (Jeff) de Hosson (TN) • Prof. dr. M.A. (Maria) Loi (TN) • Prof. dr. ir. C.H. (Caspar) van der Wal (TN)
		Docenten Sterrenkunde (parallelsessie) • Prof. dr. P.B. (Peter) Barthel • Prof. dr. A. (Amina) Helmi • Prof. dr. M.C. (Marco) Spaans • Prof. dr. F.F.S. (Floris) van der Tak • Prof. dr. E. (Eline) Tolstoy • Prof. dr. S.C. (Scott) Trager
13.00	14.30	Lunch, intern overleg
14.30	15.15	Opleidingscommissies Natuurkunde / Technische Natuurkunde: • Prof. dr. P. (Petra) Rudolf (voorzitter) • Prof. dr. ir. P.R. (Patrick) Onck (staflid) • Hylke Donker (studentlid) • Klaas Hakvoort (studentlid) Sterrenkunde: • Prof. dr. L.V.E. (Leon) Koopmans (voorzitter) • Nikki Arendse (studentlid)
15.15	16.00	Intern overleg commissie
16.00	17.00	Examencommissies Natuurkunde / Technische Natuurkunde: • Prof. dr. ir. E. (Erik) van der Giessen (voorzitter) • Prof. dr. ir. B.J. (Bart) Kooi • Dr. M. (Meike) Stöhr

		Sterrenkunde: • Prof. dr. M.A.M. (Rien) van de Weygaert (voorzitter) • Prof. dr. S. (Saleem) Zaroubi • Dr. K.I. (Karina) Caputi
17.00	17.15	Studieadviseurs • Mw. G.J. (Geartsje) Zondervan (natuurkunde/technische natuurkunde) • Prof. dr. R.M. (Mariano) Mendez (sterrenkunde)
17.15	18.00	Spreekuur/Intern overleg commissie
19.00		Diner (alleen commissie)

Dag 3:		
08.30	9.30	Intern overleg commissie/inzage documenten
9.30	10.30	Eindgesprek met management • Ir. R. (Reeuwerd) Straatman (coordinator natuurk./technische natuurk./sterrenkunde) • Prof. dr. R.G.E. (Rob) Timmermans (adj. dir. natuurk./technische natuurk. vanaf 1-10-2013) • Prof. dr. E. (Erik) van der Giessen (adj. dir. natuurk./technische natuurk. tot 1-10-2013) • Prof. dr. I.E.E. (Inga) Kamp (adj. dir. sterrenkunde) • Prof. dr. J.T.M. (Theo) Elzenga (directeur Undergraduate School of Science) • Prof. dr. G. (Gert) Vegter (directeur Graduate School of Science) • Prof. dr. P.J.M. (Peter) van Haastert (faculteitsbestuur FWN, portefeuillehouder onderwijs) • Prof. dr. J. (Jasper) Knoester (decaan FWN)
10.30	14.00	Slotvergadering commissie, lunch
14.00	14.30	Mondelinge rapportage

Appendix 7: Theses and documents studied by the committee

Prior to the site visit, the committee studied the theses of the students with the following student numbers:

Master's programme Physics:

1631373	1279548	1691538	1607405	1691945
1620061	1610600	1214209	1686143	1741268

Master's programme Applied Phyiscs:

1716867	1666924	1531387	1486799	1381091
1552147	1785389	1770314	1818147	1634666

Master's programme Astronomy:

1528726	1554166	1972855	1605232	1455621
1476998	1553682	1683179	2003066	1769952

During the site visit, the committee studied, among other things, the following documents (partly as hard copies, partly via the institute's electronic learning environment):

- Study material: books and syllabi, readers, study manuals;
- Minutes and reports of relevant committees (Educational Committee, Board of Examiners);
- Tests and assignments with the assessment criteria and standard answers;
- Course evaluations, summaries and analyses of evaluation results;
- Regulations and manuals for internships and thesis;
- Information and documentation for students;
- Documents on the BKO programme;
- Alumni-surveys;
- Teaching and Exam Regulations;
- Material on student associations;
- Handboek Kwaliteitszorg FWN, Handboek Kwaliteitszorg docenten;
- Document 'Taken en bevoegdheden van de Examencommissie aan de RUG'
- Protocol for the new tasks of the Board of Examiners;
- Overview of percentages cum laude;
- Documents and reports on the 'Wei-dagen'.

Furthermore, the committee has requested al available course materials for a selection of courses of the past academic year. The following courses have been selected:

MSc Physics:

Atomic Interactions
Physics of Lasers

MSc Applied Physics:

Fysische materiaalkunde
Mechatronics

MSc Astronomy:

High Energy Astrophysics
Space Mission Technology

Appendix 8: Declarations of independence

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: D. LENSTRA

PRIVÉ ADRES: HUIZERWEG 58
1261 AZ BLARICUM

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

DESKUNDIGE

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

nvao
nederlands - vlaamse accreditatieorganisatie

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: UTRECHT DATUM: 8 oktober 2013

HANDTEKENING:

2

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: H. P. Blok

PRIVÉ ADRES:

Prinses Ireneplantsoen 18
1191 CB Ouderkerk aan de Amstel

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Nijmegen

DATUM: 3 nov. 2013

HANDTEKENING:

H. P. Blok

2

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: GUIDO VAN OOST

PRIVÉ ADRES: MARKGRAVELEI 137
B-2018 ANTWERPEN

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

NATUUR- EN STERRENKUNDE

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR N ET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: ANTWERPEN DATUM: 13 DECEMBER 2013

HANDTEKENING:

2

[redacted]

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Willem de Boer

PRIVÉ ADRES: Dekan-Hofheinz-Str. 26
D-76229 Karlsruhe

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

[redacted]

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Karlsruhe DATUM: 21. 11. 2013

HANDTEKENING:

2

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: ELIAS BRINKS

PRIVÉ ADRES: CENTRE FOR ASTROPHYSICS RESEARCH
UNIVERSITY OF HERTFORDSHIRE, COLLEGE LANE
HATFIELD AL10 9AB, UNITED KINGDOM

IS ALS DESKUNDIGE / ~~SECRETARIS~~ GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

NATUUR- EN STERRENKUNDE

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Utrecht DATUM: 8 Oktober 2013

HANDTEKENING:

2

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: H. L. Tepper

PRIVÉ ADRES: P/a Nederlands Forensisch Instituut
Laan van Ypenburg 6
2497 GB Den Haag

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Natuurkunde / Sterrenkunde

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

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nederlands - vlaamse accreditatieorganisatie

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Utrecht

DATUM: 8 oktober 2013

HANDTEKENING:

2

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Jelmer J.T. Wagenaar

PRIVÉ ADRES: Ruysdaelhof 32
2251 JK Voorschoten

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Utrecht DATUM: 8-10-'13

HANDTEKENING:

2

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: T.G. Verseput

PRIVÉ ADRES:

Leistraat 20 bis
3572 RE Utrecht

IS ALS ~~DESKUNDIGE~~ / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

BSc Natuurkunde, BSc Technische Natuurkunde, BSc Sterrenkunde, MSc Physics, MSc Applied Physics & MSc Astronomy

AANGEVRAAGD DOOR DE INSTELLING:

Rijksuniversiteit Groningen

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

nvao
nederlands - vlaamse accreditatieorganisatie

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Utrecht

DATUM: 24-02-2014

HANDTEKENING:

2