

## Besluit

### Besluit strekkende tot het verlenen van accreditatie aan de opleiding wo-master Applied Physics van de Technische Universiteit Eindhoven

#### Gegevens

<b>datum</b>	Naam instelling	: Technische Universiteit Eindhoven
31 december 2014	Naam opleiding	: wo-master Applied Physics (120 ECTS)
<b>onderwerp</b>	Datum aanvraag	: 23 december 2013
Definitief besluit	Variant opleiding	: voltijd, deeltijd
accreditatie wo-master	Afstudeerrichtingen	: Nano Science and Technology Plasma Physics and Radiation Technology Physics of Transport in Fluids
Applied Physics van de Technische Universiteit Eindhoven	Locatie opleiding	: Eindhoven
(002495)	Datum goedkeuren	
<b>uw kenmerk</b>	panel	: 27 januari 2014
-	Datum locatiebezoeken	: 14 en 15 januari 2014
<b>ons kenmerk</b>	Datum visitatierapport	: 19 maart 2014
NVAO/20144133/ND	Instellingstoets kwaliteitszorg	: ja, positief besluit van 6 mei 2014
<b>bijlagen</b>		
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#### Beoordelingskader

Beoordelingskader voor de beperkte opleidingsbeoordeling van de NVAO (Stcr. 2010, nr 21523).

#### Bevindingen

De NVAO stelt vast dat in het visitatierapport deugdelijk en kenbaar is gemotiveerd op welke gronden het panel de kwaliteit van de opleiding voldoende heeft bevonden.

#### Advies van het visitatiepanel

Samenvatting bevindingen en overwegingen van het panel (hierna ook: the committee).

#### Standard 1

In the master's programme in Applied Physics of the Department of Applied Physics (AP) at Eindhoven University of Technology (TU/e), basic disciplinary knowledge gained in a bachelor's programme is enhanced and extended with advanced knowledge in a chosen field of specialization. The four main tracks of the programme (Functional (Nano) Materials/Nano Science and Technology, Plasma Physics and Radiation Technology, Physics of Transport in Fluids, and Science and Technology of Nuclear Fusion) allow the

#### Inlichtingen

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Pagina 2 van 7 students to develop disciplinary competences in the majority of areas included in the Domain Specific Framework. The committee is positive about the fact that the programme management has started to redesign the master's programme to adapt to the recent changes in the bachelor's programme. This will lead to a more diverse inflow into the master's programme in 2015 and provides an opportunity to achieve more diversity in the output profile of the graduates. The committee values the fact that the main tracks of the programme are so closely connected to the research groups in the department, which allows students to participate in the existing research, get a thorough training in research skills and competences, and to develop advanced disciplinary competences in the majority of areas described in the reference framework.

The intended learning outcomes of the master's programme are geared toward starting a PhD-trajectory and positions in R&D departments of High-Tech Companies. The committee is of the opinion that they are in line with the domain specific requirements and meet international standards. It advises, however, to specify them in relation to the domain of the programme, in order to provide more focus for the design of the programme and the courses.

#### *Standard 2*

The master's programme (total 120 EC) has the following structure: a general compulsory module (10 EC), a track-specific compulsory/elective module (17 EC), an elective module (14 EC), an (external/industrial) internship (19 EC) and a final graduation project (60 EC). The programme is devised to facilitate the intake of students at two different moments during the year. The master's programme is intended to train students to be independent researchers and designers. Interaction amongst students and lecturers is strong and professional. A significant part of the programme is the final graduation project, which can be carried out in one of the research groups or outside the department, provided that the project is related to one of the research areas mentioned above and closely (co)supervised by a staff member of the department. The committee was impressed by the number of students that go abroad for their internship. They are stimulated and supported to do so. Students of the master's programme are mainly prepared for continuing in research and less so for training in design. The committee recommends paying more attention to context, design and general academic and communication skills in the master's programme, for instance by stimulating industrial internships.

Contrasting the high number of outgoing students, few students from abroad take the master's programme. The committee recommends to try to attract more foreign students, because a more diverse student population is beneficiary for the quality of interaction between students. With an average of 31 months, the study duration is too high. However, students attribute this to the duration of the internship or graduation project, which they often want to finish with a positive result. Students and teachers expect that the average study duration in the master's programme will decrease.

The programme has a favourable student staff ratio. The teaching staff has the disciplinary expertise to teach the master's programme. Also, they seem enthusiastic and intensively involved. The TU/e has a policy for acquiring a BKO (Basic Teaching Qualification Certificate) for the staff; as of now 50% of the teaching staff has a BKO. However, the committee is of the opinion that the department started relatively late with this and recommends to continue paying attention to teacher professionalizing.

Pagina 3 van 7 The committee is of the opinion that the educational committee (OCN) proactively performs its tasks in evaluation of courses and quality assurance. They gather a lot of evaluation results, which generally lead to improvement measures. The committee was impressed by the positive involvement and contribution of the student members of the OCN.

### *Standard 3*

The courses in the general compulsory module, the track specific compulsory courses and the elective courses are assessed through the use of various methods, such as written or oral exams, written papers or written assignments. At the end of an external/internal traineeship, the student has to write a report and give a presentation. A final grade for the traineeship is then determined in close consultation with the external supervisor, also taking into account the student's performance during the traineeship. The final graduation project is assessed on a final thesis, an oral presentation, an interview and an oral examination during which the student has to defend his project before the assessment committee, and the student's performance during the execution of the project. The assessment committee consists of the final graduation project supervisor, the daily project supervisor, at least one other member of the research group, and at least one member from one of the other research groups. The committee was impressed by the assessment procedure, which can be considered a best practice. It guarantees involvement of the internal and external examiners and optimizes objectivity, validity and reliability of the final assessment. Since 2010, the assurance of quality and reliability is the responsibility of the Board of Exams (BoE) for Applied Physics. The committee noticed that the implementation of their new responsibilities is not completed yet and that the BoE not yet fully knows the ins and outs of all its tasks, like fraud policy, plagiarism control and the number of cum laude graduates. The committee advises the BoE to take up its new tasks and to proactive control the quality of exams and tests. The committee regards the addition of a testing expert to the BoE as positive.

The committee is of the opinion that the quality of the master's theses is good and, in general, agrees with the marks assigned. However, the way the final grade was assigned was not yet transparent for all theses. The committee advises to document this and to make sure that the assessment forms are filled in and archived. According to alumni, the master's programme perfectly prepares students for a research position. However, they reported that for other jobs, both in university and in industry, they lacked general skills and experiences. The committee advises to pay more attention to context and general skills in the master's programme.

### **Bestuurlijke afspraak**

De NVAO onderschrijft de aanbevelingen van het panel, in het bijzonder om de examencommissie de wettelijke taken ter hand te laten nemen.

Het instellingsbestuur heeft op 12 november 2014 telefonisch bevestigd dat de problemen die door de commissie zijn signaleerd met betrekking tot de examencommissie worden of zijn aangepakt in het kader van de interne kwaliteitszorg.

Ingevolge het bepaalde in artikel 5a.10, derde lid, van de WHW heeft de NVAO het college van bestuur van de Technische Universiteit Eindhoven te Eindhoven in de gelegenheid gesteld zijn zienswijze op het voornemen tot besluit van 3 november 2014 naar voren te brengen. Bij e-mail van 9 december 2014 heeft de instelling gereageerd op het voornemen tot besluit. Dit heeft geleid tot aanvulling van bijlage 2 in het definitieve besluit.

De NVAO besluit accreditatie te verlenen aan de wo-master Applied Physics (120 ECTS; variant: voltijd, deeltijd; locatie: Eindhoven) van de Technische Universiteit Eindhoven te Eindhoven. De opleiding kent de volgende afstudeerrichtingen: Functional (Nano) Materials / Nano Science and Technology; Plasma Physics and Radiation Technology; Science and Technology of Nuclear Fusion. De NVAO beoordeelt de kwaliteit van de opleiding als voldoende.

Dit besluit treedt in werking op 31 december 2014 en is van kracht tot en met 30 december 2020.

Den Haag, 31 december 2014

De NVAO  
Voor deze:



**Ann Demeulemeester**  
Vicevoorzitter

Dr. A. H. Flierman  
(voorzitter)

Tegen dit besluit kan op grond van het bepaalde in de Algemene wet bestuursrecht door een belanghebbende bezwaar worden gemaakt bij de NVAO. De termijn voor het indienen van bezwaar bedraagt zes weken.

Onderwerp	Standaard	Beoordeling door het panel
<b>1. Beoogde eindkwalificaties</b>	De beoogde eindkwalificaties van de opleiding zijn wat betreft inhoud, niveau en oriëntatie geconcretiseerd en voldoen aan internationale eisen	<b>Voldoende</b>
<b>2. Onderwijsleeromgeving</b>	Het programma, het personeel en de opleidingsspecifieke voorzieningen maken het voor de instromende studenten mogelijk de beoogde eindkwalificaties te realiseren	<b>Voldoende</b>
<b>3. Toetsing en gerealiseerde eindkwalificaties</b>	De opleiding beschikt over een adequaat systeem van toetsing en toont aan dat de beoogde eindkwalificaties worden gerealiseerd	<b>Voldoende</b>
<b>Eindoordeel</b>		<b>Voldoende</b>

**Tabel 1: Rendement.**

Cohort	2009	2010	2011	2012
Rendement	64%	79%	-%	-%

**Tabel 2: Docentkwaliteit.**

Graad	Ma	PhD	BKO
Percentage	100%	100%	50%

**Tabel 3: Student-docentratio.**

Ratio	16:1
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**Tabel 4: Contacturen.**

Studiejaar	1	2 <sup>1</sup>
Contacturen	400	0

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<sup>1</sup> Het tweede studiejaar bestaat volledig uit een stage en afstudeerproject.

- Prof. dr. Martin Goedhart, hoogleraar didactiek van de Wiskunde en Natuurwetenschappen en opleidingsdirecteur master Educatie en Communicatie in de Wiskunde en Natuurwetenschappen, Rijksuniversiteit Groningen;
- Prof. dr. Wim de Boer, Professor of Physics, Karlsruhe Institute of Technology, Duitsland
- Prof. dr. ir. Guido van Oost; Full Professor Plasma Physics, Department of Applied Physics van de Universiteit Gent, België;
- Dr. Jan Hoogenraad, eigenaar Spoorglaren voor verandermanagement en kwantitatieve dienstverlening voor het openbaar vervoer;
- Lisanne Coenen BSc, student masteropleiding Technische Natuurkunde, Technische Universiteit Delft;

Het panel werd ondersteund door dr. B.M. van Balen, secretaris (gecertificeerd).