

Besluit

Besluit strekkende tot het verlenen van accreditatie aan de opleiding wo-master Biomedical Engineering van de Technische Universiteit Delft

Gegevens

datum	Naam instelling	: Technische Universiteit Delft
5 maart 2013	Naam opleiding	: wo-master Biomedical Engineering (120 ECTS)
onderwerp	Datum aanvraag	: 21 december 2012
Definitief besluit	Varianteopleiding	: voltijd
accreditatie wo-master	Afstudeerrichtingen	: Medical Instruments and Medical Safety
Biomedical Engineering van de		Biomechatronics
Technische Universiteit Delft		Tissue Biomechanics and Implants
(001373)		Biomaterials
uw kenmerk		Medical Imaging
O&S-UIT-704\EL\dt		Medical Physics
ons kenmerk		Biomedical Instrumentation
NVAO/20130509/ND	Locatie opleiding	: Delft
bijlagen	Datum goedkeuren	
3	panel	: 4 september 2012
	Datum locatiebezoeken	: 23 en 24 oktober 2012
	Datum visitatierapport	: 14 december 2012
	Instellingstoets kwaliteitszorg	: ja, positief besluit 21 november 2011

Beoordelingskader

Beoordelingskader voor de beperkte opleidingsbeoordeling van de NVAO (Stcrt. 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.

Samenvatting bevindingen en overwegingen panel.

The master's programme Biomedical Engineering is a joint programme of three faculties of Delft University of Technology, in collaboration with clinical partners at Leiden University Medical Centre, Erasmus Medical Centre Rotterdam, and Academic Medical Centre Amsterdam.

The committee studied the information available and discussed the programmes with representatives of the institution and the programme during a site visit. The committee weighed their positive comments and the points for improvement found, and concluded that the programme meets the current generic quality standards and shows an acceptable level across its entire spectrum. Therefore, the committee assesses programme Biomedical Engineering as **satisfactory**.

Standard 1: Intended learning outcomes

The committee assesses Standard 1 as **satisfactory**.

The goals of the programme are to educate academic engineers, who are technically high-skilled and have additional medical and biological knowledge. Graduates are capable to: 1) collaborate with clinicians, researchers and other healthcare professionals in order to identify, define and analyse biomedical problems, for the solution of which biomedical engineering principles and methods are important or essential; 2) develop and produce a sound solution to the problem; and 3) present these solutions effectively. The committee noticed that the programme has a strong focus on engineering/technology aspects of biomedical engineering. The students are trained to become engineers, who know how to specifically collaborate with clinical professionals.

The programme formulated eight final qualifications which were benchmarked with the domain-specific requirements as described by the biomedical engineering programmes of the Eindhoven University of Technology, the University of Twente and the University of Groningen. The committee appreciates how this domain is translated into the qualifications. According to the committee, the position within the domain, with a strong focus on the engineering aspect of biomedical engineering, is reflected in the final qualifications. However, the committee regrets that the knowledge and understanding of concepts of physiology, (cell-) biology, anatomy, biochemistry, pharmacology and pathology as applicable in the field of Biomedical Engineering has not been translated into final qualifications.

Standard 2: Teaching-learning environment

The committee assesses Standard 2 as **satisfactory**.

The master's programme Biomedical Engineering is a two-year programme and is taught in English. Most students begin their studies in September, but the programme accommodates mid-year entry as well.

The programme offers seven specializations. These are divided among three orientations. Firstly, there are four specializations with a mechanical engineering orientation. Secondly, there are two specializations focusing on applied physics. The last specialization is based on electrical engineering. Students select their specialization at the beginning of the programme.

Pagina 3 van 8 In the first year, students are expected to take biomedical courses and fundamental engineering courses. Both the biomedical and the fundamental engineering courses are divided between compulsory courses specific to each specialization and electives that are chosen in consultation with the professor responsible for the specialization. The second year involves a traineeship in a biomedical research group or company and a literature survey, followed by a master thesis project.

Students have the possibility to shape their master's programme according to their own individual wishes and interests. They select elective courses that suit their field of specialisation. To ensure a well-balanced programme with sufficient depth and diversity, the complete set has to be approved by the Examining Committee and the graduation supervisor.

The committee studied the content of the curriculum and concludes that all relevant aspects are included. According to the committee the programme is interesting and challenging. The courses comprise basic knowledge in all fields related to biomedical engineering: mathematics, the sciences of the non-living systems, and life sciences. Integration of the various disciplines (including life sciences) occurs whenever possible and appropriate. There is a nice mix of teaching forms. The combination of course based education, assignments and laboratory work provides students with the opportunity to learn in a variation of environments. Within the programme, several essential skills are trained. The programme intends to deliver good researchers and engineers. According to the committee the didactic concept is in line with the aims of the programme; the students are enabled to achieve the intended learning outcomes.

Students participate in research departments and are involved in innovative high level research projects. The committee is convinced that the students receive sufficient guidance and supervision during their traineeship and graduation project.

The quality of the staff and of the programme-specific services and facilities enable the students admitted to achieve the intended learning outcomes. Even so the committee recommends to monitor the work load balance closely and readjust demands accordingly.

The programme is composed as a joint programme with a contribution of three different faculties and three clinical partners. The committee feels that this way of organizing holds the risk that the programme does not form a strong unity. The committee believes that community building needs more attention e.g. by involvement of alumni in helping students with job opportunities, teaching motivational lectures, and helping students select themes.

Standard 3: Assessment and achieved learning outcomes

The committee assesses Standard 3 as satisfactory.

For the assessment of this standard the committee studied the test policy and test regulations used in the programme and had a discussion with the Board of Examiners. To assess whether the students achieved the intended learning outcomes the committee studied test material and assessed a selection of fifteen theses.

The assessments used are adequately related to the programme. There is a variety of assessment forms. However, there is no system in place for assessing the traineeships. The committee strongly recommends to develop an assessment system for the traineeship to be

Pagina 4 van 8 commonly used, with a formal sheet including clear learning objectives, linked to the final qualifications.

The committee observes that there is one Board of Examiners for the Faculty of Mechanical, Maritime and Materials Engineering. The tasks and responsibilities for the Board of Examiners are increasing; the Board is already playing a pro-active role. The committee recommends that a subcommittee for Biomedical Engineering should be considered in view of efficiency and to make this subcommittee more knowledgeable on Biomedical Engineering.

The committee established that all selected theses met the requirements for graduation. On average the theses are of sufficient quality. The committee has not seen theses that were on the whole unsatisfactory. The theses illustrate that the students have achieved the intended learning outcomes as formulated by the programme.

Aanbevelingen

De NVAO onderschrijft de aanbevelingen van het panel met name ten aanzien van de beoordeling van de stages en ten aanzien van de examencommissie, gezien de reeds in 2010 in werking getreden Wet versterking bestuur.

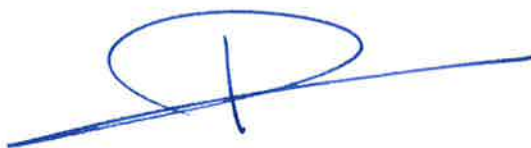
Ingevolge het bepaalde in artikel 5a.10, tweede lid, van de WHW heeft de NVAO het college van bestuur van de Technische Universiteit Delft te Delft in de gelegenheid gesteld zijn zienswijze op het voornemen tot besluit van 29 januari 2013 naar voren te brengen. Bij e-mail van 14 februari 2013, heeft de heer E. Logtenberg namens het college van bestuur ingestemd met het besluit.

Op grond van het voorgaande besluit de NVAO accreditatie te verlenen aan de wo-master Biomedical Engineering (120 ECTS; variant: voltijd; locatie: Delft) van de Technische Universiteit Delft te Delft. De opleiding kent de volgende afstudeerrichtingen: Medical Instruments and Medical Safety, Biomechatronics, Tissue Biomechanics and Implants Biomaterials, Medical Imaging, Medical Physics, Biomedical Instrumentation. De NVAO beoordeelt de kwaliteit van de opleiding als voldoende.

Dit besluit treedt in werking op 1 januari 2014 en is van kracht tot en met 31 december 2019.

Den Haag, 5 maart 2013

Nederlands-Vlaamse Accreditatieorganisatie

A handwritten signature in blue ink, consisting of a large, stylized 'P' with a vertical line through it, followed by a long horizontal stroke.

R.P. Zevenbergen
(bestuurder)

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

De standaarden krijgen het oordeel onvoldoende (O), voldoende (V), goed (G) of excellent (E). Het eindoordeel over de opleiding als geheel wordt op dezelfde schaal gegeven.

Tabel 1: Rendement.

Volgens de instelling bestaat landelijk geen eenduidigheid om de rendementcijfers. Dat maakt het afgeven van cijfers ten bate van onderlinge vergelijkingen niet mogelijk.

Tabel 2: Docentkwaliteit.

Graad	MA	PhD	BKO
Percentage	n.b	n.b	n.b

Tabel 3: Student-docentratio.

Ratio 2011	1:20,7
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Tabel 4: Contacturen.

Studiejaar	1	2
Contacturen	10u/week	4u tot 8u/week

Pagina 8 van 8 **Bijlage 3: Panelsamenstelling**

- Prof. Dr. ir. J. Vander Sloten, professor in Engineering Sciences KU Leuven, Belgium;
- Dr. J. Struijk, associate professor Department of Health Science and Technology Aalborg University Denmark;
- Prof. Dr. Ir. J.A.E. Spaan, professor in Medical Physics, Academic Medical Center, University of Amsterdam;
- Prof. Dr. R. Reilly, professor in Neural Engineering Trinity College Dublin;
- J.Y. de Boer, bachelor student Biomedische Technologie Universiteit Twente.

Het panel werd ondersteund door drs. L. van der Grijspaarde, secretaris (gecertificeerd).