

Besluit

Accreditatierapport en -besluit met een positieve beoordeling van de accreditatieaanvraag voor de opleiding Master of Science in de ingenieurswetenschappen: werktuigkunde - elektrotechniek en de Master of Science in Electromechanical Engineering van de Vrije Universiteit Brussel de Engelstalige variant wordt in samenwerking met de Université Libre de Bruxelles aangeboden.

datum	1. Inleiding
30 september 2013	Bij brief van 22 maart 2013 heeft het instellingsbestuur van de Vrije Universiteit Brussel te Brussel een accreditatieaanvraag ingediend bij de Nederlands-Vlaamse
onderwerp	Accreditatieorganisatie (NVAO) voor de opleiding Master of Science in de
Definitief	ingenieurswetenschappen: werktuigkunde – elektrotechniek en de Engelstalige variant
accreditatierapport en -besluit	Master of Science in Electromechanical Engineering die in samenwerking met de Université
(001650)	Libre de Bruxelles (ULB) wordt georganiseerd. Die samenwerking resulteert in gezamenlijke
bijlage	diplomering. Deze aanvraag is ontvangen op 22 maart 2013 en ontvankelijk verklaard op 21
1	mei 2013.

De accreditatieaanvraag steunt op het visitatierapport van een externe beoordeling uitgevoerd door een visitatiecommissie ingesteld door de Vlaamse Universiteiten en Hogescholen Raad (Vluhr).

De visitatiecommissie kende de volgende samenstelling:

Voorzitter:

- Prof. dr. em. Dick van Campen, gewezen decaan faculteit werktuigbouwkunde, Technische Universiteit Eindhoven, gewezen Secretaris-Generaal International Union of Theoretical & Applied Mechanics;

Leden:

- Prof. dr. em. René Van den Braembussche, Honorary professor von Karman Institute;
- Ir. Jan Bens, Directeur-generaal van het Federaal Agentschap voor Nucleaire Controle;
- Prof. dr. Peter Van Petegem, gewoon hoogleraar onderwijskunde, Universiteit Antwerpen (onderwijsdeskundige);
- Dhr. Steven Lecompte, masterstudent werktuigkunde-elektrotechniek Universiteit Gent (student-lid).

Secretaris:

- Dhr. Jasper Stockmans en Dhr. Andreas Smets, stafmedewerkers van de Cel Kwaliteitszorg van de Vlaamse Interuniversitaire Raad (VLIR), traden op als projectbegeleider en secretaris voor deze visitatie.

De visitatie heeft plaatsgevonden op 14 en 15 maart 2012. Het visitatierapport dateert van maart 2013.

De NVAO komt tot de volgende vaststellingen:

- De externe beoordeling is opgesteld en onderbouwd overeenkomstig het toepasselijke Accreditatiekader bestaande opleidingen hoger onderwijs Vlaanderen van de NVAO en volgens de daarbij behorende beslisregels;
- De visitatiecommissie heeft voor de externe beoordeling het door de Vluhr vastgestelde visitatieprotocol gevolgd;
- De externe beoordeling verschaft inzicht in de samenstelling van de visitatiecommissie;
- De externe beoordeling bevat een onderzoek ten gronde naar de aanwezigheid van voldoende generieke kwaliteitswaarborgen.

De NVAO is in het licht van het vorenstaande tot de slotsom gekomen dat de externe beoordeling over de voorliggende opleiding regelmatig en gedegen tot stand is gekomen.

3. Inhoudelijke overwegingen

De NVAO steunt haar inhoudelijke besluitvorming in hoofdzaak op de onderstaande elementen uit het visitatierapport.

Objectives

Objectives of the programmes are defined in general competences and in addition to that specific competences for each of the specializations are defined. The specializations are: Mechatronics-Construction; Aeronautics; Vehicle Technology and Transport and Energy. The Dutch and English language programme use identical competences.

The panel believes that the objectives are in accordance with the Flemish Higher Education Act (article 58) and the Dublin- descriptors. According to the panel, all general and academic-orientated competences are formulated at an advanced master's level. The objectives focus on both academic and professional skills, in order to educate engineers to be deployable in industry and research.

The master is closely related to both the scientific research in the domains involved and the professional aspects of engineering.

The panel appreciates the incentives for a competence-based learning in the objectives. However it showed from the interviews that the concept of competence-based learning is not yet fully embraced by the academic staff.

The information on the objectives of the programmes is well available for students on several websites, furthermore, an oral presentation on the learning objectives is given by the professor during the first lecture of each course. Finally, the programmes pay attention to the international dimension in the objectives. On the other hand, the programmes formulate no goals for international exchange and outgoing student mobility. According to the panel, this should be addressed in the future.

The panel considers that the domain-specific requirements are well derived from the requirements of the academic discipline and they are in tune with the requirements set by the international community. Furthermore, the domain-specific requirements are consistent with the guidelines of the European Group E4 (Enhancing European Engineering Education).

Pagina 3 van 11 Next to this the goals are in alignment with the needs of the profession as set by Agoria, the Belgian federation for the Technology Industry. Finally the domain-specific requirements as formulated are in line with the reference framework of the assessment panel. Nevertheless, the panel asks for more explicit attention to the aspects of end of life cycle and disposal of technological machines in the goals.

Programme

The programme combines compulsory courses and specific courses. Next to general scientific and engineering training the program provides an in depth specialisation in one of the following specialisations: "aeronautics", "energy", "mechatronics-construction" or "vehicle technology and transport".

The formulated objectives are adequately translated in the master's programmes with respect to level and orientation and with respect to the domain-specific requirements. The panel is convinced that the programme's design and the content of the courses guarantee that the students are able to attain the formulated final qualifications. Additionally, the panel notes that the students are familiar with the programmes and know what is expected from them in the different course modules.

The compulsory courses give all students a general engineering and physics education, and prepare them for their advanced track courses.

Learning objectives related to the attitude of graduates in general are only implicitly reflected in the course units. The panel suggest the Education board to more systematically verify that all formulated goals are dealt with in the units.

The panel considers that the combination of both mechanics and electro technics results in a broad curriculum. The panel also approves the presence of interdisciplinary elements in the programmes such as communication, economics and management.

The curriculum incorporates some international aspects, such as English manuals and textbooks. Also, the use of English as official language is incorporated in the English version Bruface programme. VUB organizes the Dutch version of the Master course in which the amount of English taught courses is within the legal limits.

The programmes are academic, meaning that they are characterized by close links to the scientific research in the related fields as well as to the profession. The programmes pay much attention to the development of knowledge and to the development of research attitudes and research skills. And they have clear links with the current developments in the professional field. During his or her studies the student frequently comes in direct contact with frontline scientific research and advanced research methods in many disciplines. According to the panel, the presence of elective courses enriches the academic level of the programmes.

The current collaboration and the future integration in the Faculty of Engineering of the Master course in Industrial Sciences (now organized by Erasmushogeschool Brussel) might jeopardize the academic level, since this programme has a different orientation and finality. The panel recommends that the Education Board is considerate to this danger.

There are many concrete links with the labour market. Students have many contacts with the industry, there are company visits, an elective course unit 'Bedrijfseconomie' and also the master's thesis and the contacts with guest professors provide important links with the field.

The panel appraises that the internship is generally well elaborated.

Pagina 4 van 11 The panel, however, suggests to formulate a strong and vigorous policy on the internship and to monitor the implementation.

Finally, the realisations of the labs and projects, organised by either VUB or ULB, are assessed very positively by the panel, given the mix between (and the clear links with) the professional practice and the academic level.

The programme is assessed to be coherent in its contents. They are sequentially structured and contain compulsory courses, specific courses (aeronautics, energy, mechatronics-construction, vehicle technology and transport), a master thesis, an internship and elective courses. Overlaps or gaps are rare and lectures and lab exercises are well harmonised.

Based on the study of the self-evaluation report and the meetings during the visit, the panel states that the effective study time aligns with the estimated study time of 60 ECTS credits per year. The study time is well divided over the two years. The programmes are demanding but the students consider the agreement between the scheduled time and the real time as correct.

Based on the study of the self-evaluation report and the meetings during the visit, the panel is positive about the didactic concept. In the first master year most of the courses have a theoretical content and are mostly presented ex cathedra. From the second master year on they work with projects and self-tuition. The didactic concept is in line with the objectives. The programmes use a variety of educational approaches such as lectures, lab and computer exercises, projects and group work, company visits, internship, thesis and extra-curricular activities. The lectures and other methods are organized as interactively as possible. The panel applauds the open atmosphere during the contact hours. The quality of the didactical materials is satisfactory. The didactic formats commonly used are written syllabi, slides, manuals and English textbooks. In the context of the Bruface programme, the students also mention that a lot of courses are not yet available in the teaching language.

The panel has studied the ECTS-files and a selection of the examination questions and is of the opinion that the examinations are aligned with the learning goals of the programmes and the different courses. Both knowledge and skills are evaluated. The panel is very positive about the level of the examinations, but recommends more attention to a competence-based way of examination.

Students told the panel that they are familiar with the evaluation criteria and are satisfied with the transparency of examinations. Students receive examples of exam questions, the lecturers give them feedback and the results are available in time.

The panel studied a number of master's theses and concludes that they portray a satisfying scientific quality. In almost all the master's theses, students show an analytical and independent problem-solving capacity on an academic level. According to the panel, the master's theses also reflect the student's research orientation. However, the panel observed some high scores in relation to the result.

Based on meetings with students and alumni, the panel concludes that both the selection of topics and the guidance are generally well organised but in an informal way. As a recommendation for further improvement the panel believes that, for the common VUB-ULB Bruface programme, the organization and guidance of the thesis must be systematized.

Pagina 5 van 11 The students write a dissertation and give a mandatory public oral defence of the dissertation at the end of the year. Each master's thesis is evaluated by a board of examiners, taking into account the advice of the supervisor and the thesis advisors, and using two predefined evaluation forms and procedures. The panel come to the conclusions that the assessment of the thesis is well organised and that the total score is adequately communicated to the students.

Based on meetings and documents, the panel believes that the qualifications of the student intake are aligned to the form and content of the programmes. Some specific groups of students following an individual programme might face overlap.

Staff

The panel is of the opinion that the expertise of the staff, regarding the contents of the programmes, is satisfactory and guaranteed. Course modules are appointed to lecturers who do research in a domain that is related to the courses they teach. Also, the technical, administrative and organisational expertise of the staff is good. The panel is especially positive about the involvement of the academic staff. Lecturers take all remedying measures they consider necessary as soon as a problem is signalled to them.

The panel is of the opinion that the human resources policy is generally well formed. Nevertheless, it recommends to increase the impact of educational and didactic qualities of the staff (next to the present scientific and research qualifications) in the promotion policy. After consulting the research output of the staff, the panel finds the quality of the research performed at the VUB of a high level. The panel observed a wide range of specialisations among the academic staff.

Because of the many contacts the staff members have with industrial partners, they have a very clear view about the professional opportunities of their graduates.

The panel observed that most of the academic staff members have a VUB- history. The panel recommends that recruitment takes place on a much broader international scale. The panel believes that the number of academic staff members is in accordance with the number of enrolled students. The panel finds that the staff members are not overloaded with teaching duties and that the distribution of these duties is well managed among the different staff members.

The panel is pleased to notice that the implemented Bruface programmes have contributed to a further rationalisation. As a result the teaching load of the ZAP, AAP and BAP is decreased.

Facilities and support

The panel visited the facilities during the visit. The panel concludes that the VUB facilities are of a high level. The panel also praises the quality of different labs at VUB. The Bruface programmes increase exchange and rationalisation in the use of laboratory equipment. Facilities at the ULB Campus are frequently used for electromechanical course units. The panel also visited these facilities. The panel supports the rationalisation, but regrets that some of the ULB-facilities are not up to date. However a new infrastructure is being planned for the ULB faculté Polytechnique.

The information to potential students, mainly bachelor students of the VUB, is adequately given on the website, and during the SID-in fairs and information days.

Pagina 6 van 11 The panel finds that the students are well informed and that they generally receive sufficient study support. Students with complaints about the education or examination can contact the ombudsperson of the faculty.

Internal Quality Assurance

The key component in the quality assurance system of the VUB is the Council on Educational Affairs (OWR) under the leadership of the Vice Rector for Education. The decisions taken by the Council are translated into practice by the Educational Innovation & Quality Assurance unit. This unit prepares and manages the different evaluation processes and tools (called E-assessment) and reports to the individual lecturers and to the chairman of the Education Boards every semester.

The (Master) Education Board is the driving force behind remediation and quality improvements carried out on the basis of the assessment reports, but only at programme and infrastructure level.

The education board Electromechanical Engineering uses different evaluation instruments, such as student inquiries, alumni inquiries and field inquiries. An online tool for systematic educational evaluations is developed in 1990–1991 and is used every year. The panel is very positive about it. The panel also applauds the high participation rate at the evaluations, which fluctuates between 60% and 70%. The panel finds the questionnaires an excellent quality assessment tool.

In the light of the start of the Bruface programmes, the panel believes that long time scale evaluations of the programmes must be held, as a pro-active working method. The education board takes sufficient measures to guarantee the quality of the programmes, by consulting all actors involved in the programmes. Based on the results of evaluations by lecturers, students and alumni, the education board has defined a number of items where a potential quality improvement is detected. The panel finds the self-evaluation report a very useful document, which was of much help during the visit.

The Education Board Electromechanical Engineering comprises all the relevant stakeholders. The education board is composed of a chairman, the staff, and year representatives of the students and the alumni. The panel is positive about the involvement of the academic staff. The panel observed that the different stakeholders show a strong commitment to the programmes. The programmes also have a close link with the industry. All the ULB lecturers involved in the programmes are invited as advisory members. But the panel believes that the Education Board must pay attention to the involvement of the ULB-staff.

The panel states that the programmes are characterized by their remarkably open and interactive culture, which avoids many problems.

Results

The panel assesses the aspect 'learning outcomes' as good for the master werktuigkunde-elektrotechniek and as satisfactory for the Bruface master electromechanical engineering. The students and alumni told the panel that the programme is of a good quality, and enables students to reach the formulated goals. The alumni acknowledged to be well prepared for their current functions and that they easily find a job.

Pagina 7 van 11 The data available on the employment profile of alumni shows that most alumni work as employee or executive staff in manufacturing and public services. 11% of the alumni started an academic career.

The panel confirms that the programmes realise all their objectives. The panel states that broad programmes, with specializations that open the way to a broad spectrum of professional activities, are offered. This is also illustrated by the quality of some master's theses and of the assessments.

Given the fact that, at the time of the site visit, no students of the Bruface master electromechanical engineering graduated yet, there is not yet a clear image in the context of the learning outcomes. There are no indications that the intended level will not be reached. The panel is hopeful and believes that the students should be able to reach the intended level, but this can, so far, only be regarded as a presumption. For this reason, the panel assesses the aspect 'learning outcomes' as satisfactory for the Bruface master electromechanical engineering.

In academic year 2010–2011 44 students were registered for the Dutch track of the master. 92% of these students obtained their degree in two study years. Based on the information in the SAR, the panel believes that the study progress is effectively followed. The panel observes that the drop out is almost non-existent.

Conclusie

De NVAO is in het licht van het vorenstaande tot de slotsom gekomen dat het eindoordeel van de commissie deugdelijk is gemotiveerd. De NVAO kan zich dan ook aansluiten bij de bevindingen en overwegingen voor alle facetten en onderwerpen, zoals verwoord in het visitatierapport. De eindconclusie uit het visitatierapport wordt gevolgd.

De tabel geeft per onderwerp en per facet het oordeel van de visitatiecommissie weer.

ONDERWERP	ORDEEL	FACET	ORDEEL
1 Doelstellingen opleiding	V	1.1 niveau en oriëntatie	V
		1.2 domeinspecifieke eisen	G
2 Programma	V	2.1 eisen gerichtheid	G
		2.2 relatie doelstellingen - programma	V
		2.3 samenhang programma	V
		2.4 studielast	V
		2.5 toelatingsvoorwaarden	V
		2.6 studieomvang	OK
		2.7 afstemming vormgeving - inhoud	V
		2.8 beoordeling en toetsing	G
		2.9 masterproef	G
3 Inzet van personeel	V	3.1 eisen gerichtheid	G
		3.2 kwantiteit	V
		3.3 kwaliteit	V
4 Voorzieningen	V	4.1 materiële voorzieningen	G
		4.2 studiebegeleiding	V
5 Interne kwaliteitszorg	V	5.1 evaluatie resultaten	G
		5.2 maatregelen tot verbetering	V
		5.3 betrokkenheid	G
6 Resultaten	V	6.1 gerealiseerd niveau	G/V*
		6.2 onderwijsrendement	V

* Goed voor de Nederlandstalige variant en voldoende voor de Engelstalige variant

Eindoordeel: positief

Pagina 9 van 11 **5. Globale oordelen NVAO**

De onderstaande tabel geeft per onderwerp het globaal oordeel van de NVAO weer.

ONDERWERP	ORDEEL
1 Doelstellingen	V
2 Programma	V
3 Inzet personeel	V
4 Voorzieningen	V
5 Interne kwaliteitszorg	V
6 Resultaten	V

Eindoordeel: positief

betreffende de accreditatie van de Master of Science in de ingenieurswetenschappen: werktuigkunde - elektrotechniek (master)/ Master of Science in Electromechanical Engineering van de Vrije Universiteit Brussel, de Engelstalige variant wordt in samenwerking met de Université Libre de Bruxelles aangeboden.

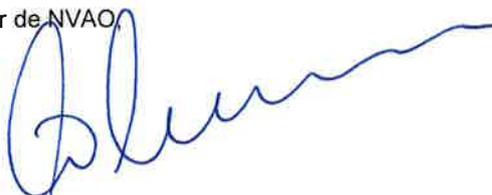
De NVAO,
Na beraadslaging,
Besluit:

Met toepassing van het decreet van 4 april 2003 betreffende de herstructurering van het hoger onderwijs in Vlaanderen, wordt het accreditatierapport en –besluit met positief eindoordeel voor de opleiding Master of Science in de ingenieurswetenschappen: werktuigkunde - elektrotechniek (master)/ Master of Science in Electromechanical Engineering van de Vrije Universiteit Brussel goedgekeurd en wordt de opleiding geaccrediteerd. Het betreft een opleiding met de volgende afstudeerrichtingen die te Brussel wordt georganiseerd: Lucht- en ruimtevaart; werktuigbouwkunde; voertuigtechnologie en transport; energie. De Engelstalige variant wordt in samenwerking met de Université Libre de Bruxelles georganiseerd.

De in het eerste lid bedoelde accreditatie geldt vanaf de aanvang van het academiejaar 2013-2014 tot en met het einde van het academiejaar 2020-2021.

Den Haag, 30 september 2013

Voor de NVAO



Dr. A.H. Flierman
(voorzitter)

¹ Conform de bepalingen vermeld in de handleiding accreditatie kan een instelling opmerkingen en bezwaren formuleren op het ontwerp van accreditatierapport. Bij e-mail van 25 september 2013 heeft de instelling gereageerd op het ontwerp van accreditatierapport. Dit heeft geleid tot enkele aanpassingen in het accreditatierapport.

Pagina 11 van 11 **Bijlage 1 – Gegevens opleiding**

– naam instelling	Vrije Universiteit Brussel
– adres instelling:	Pleinlaan 2 B-1050 BRUSSEL BELGIË
– aard instelling	ambtshalve geregistreerd
– graad, kwalificatie, specificatie	Master of Science in de ingenieurswetenschappen: werktuigkunde – elektrotechniek/ Master of Science in Electromechanical Engineering De Engelstalige variant wordt in samenwerking met de Universit� Libre de Bruxelles aangeboden en leidt tot bidiplomering
– niveau en ori�ntatie	master
– studieomvang	120 studiepunten
– opleidingsvarianten	
– afstudeerrichtingen:	Lucht- en ruimtevaart werktuigbouwkunde voertuigtechnologie en transport energie
– studietraject voor werkstudenten:	nee
– vestiging opleiding	Brussel
– onderwijstaal	Nederlands/Engels
– (delen van) studiegebieden	Toegepaste wetenschappen
– bijkomende titel	burgerlijk ingenieur