NVAO • NEDERLAND

WO-BACHELOR BUSINESS ENGINEERING

Maastricht University

ADVISORY REPORT

21 AUGUST 2019

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INITIAL ACCREDITATION PROCEDURE
ADVISORY REPORT

21 AUGUST 2019

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1 Executive summary

The Accreditation Organisation of the Netherlands and Flanders (NVAO) received a request for an initial accreditation procedure regarding a proposed wo-bachelor Business Engineering at Maastricht University. NVAO convened an expert panel, which studied the information available and discussed the proposed programme with representatives of the institution and the programme during a site visit.

The following considerations have played an important role in the panel's assessment.

The panel has based its assessment on the standards and criteria described in the NVAO Assessment framework for the higher education accreditation system of the Netherlands. In the case of an initial accreditation, these standards are: 1. The intended learning outcomes, 2. The teaching-learning environment, and 3. The assessment.
The panel members prepared the assessment by analysing the documents provided by the institution. The panel organised a preparatory meeting on 17 June 2019. During this meeting, the panel members shared their first impressions and formulated questions for the site visit. The site visit took place on 18 June at Maastricht University. During this visit, the panel was able to discuss the formulated questions and to gather additional information in several sessions. Afterwards, the panel discussed the findings and considerations and pronounced its preliminary assessments per theme and standard. At the end of the site visit, the initial findings were presented to the institution.

The proposed BSc Business Engineering programme is a 3-year bachelor programme (180 EC) of Maastricht University. With respect to profile, design and name it is a new study programme in the Netherlands.
The programme aims at delivering graduates with a solid background in the natural sciences, business and engineering that are able to understand and translate challenges and opportunities into new scientific knowledge creation and potential for valorisation. Students learn to respond to the challenges of today's society. Students will learn to bridge the gap between business and STEM (Science, Technology, Engineering and Mathematics) domain in order to develop discoveries and innovations and bring them to the market.
The BSc Business Engineering is jointly co-ordinated by the UM Faculty of Science and Engineering (FSE) and the UM School of Business and Economics (SBE).
The panel was convinced by the documentation and the discussions with the programme management, teachers and employer's representatives that there exists a real need for graduates who possess the knowledge and skills that this study programme intends to offer. The intended learning outcomes are worthwhile and feasible.
These considerations brought the panel to the conclusion that the programme wo-bachelor Business Engineering does meet standard 1.

The panel found the intended study programme to be coherent, well-designed and of an academic level associated with a wo-BA programme. The programme will achieve enough depth—be it not in specific disciplines, but in transdisciplinary knowledge and skills—that will allow students to be successful in their academic and professional careers. The versatile mix of mandatory courses with ample attention for the basic scientific, mathematical, engineering and business knowledge and skills, complemented with the right electives, will indeed allow students to acquire enough depth for a successful academic career.
These considerations brought the panel to the conclusion that the programme wo-bachelor Business Engineering does meet standard 2.

The panel found that the general outline for the assessment system of the BSc Business Engineering programme is well in place and corresponds with the national and university regulations and quality standards.
These considerations brought the panel to the conclusion that the programme wo-bachelor Business Engineering does meet standard 3.

The panel concludes that the programme does meet the assessment standards. Therefore, the panel advises NVAO to take a positive decision regarding the quality of the proposed programme wo-bachelor Business Engineering at Maastricht University.

The Hague, August 21, 2019

On behalf of the assessment panel for the initial limited accreditation assessment of the wo-bachelor Business Engineering at Maastricht University,

Prof. Piet Pauwels (chair)	dr. Frans van Steijn (secretary)

2 Introduction

2.1 The procedure

NVAO received a request for an initial accreditation procedure including programme documents regarding a proposed wo-bachelor Business Engineering. The initial application was received on 7 February 2019 from Maastricht University.

An initial accreditation procedure is required when a recognised institution wants to award a recognised bachelor's or master's degree after the successful completion of a study programme. The procedure for initial accreditation is slightly different as compared to the approach for programmes that have already been accredited. Initial accreditation is in fact an ex ante assessment of a programme. The programme becomes subject to the normal accreditation procedures once initial accreditation has been granted.

To assess the programme, the NVAO convened an international panel of experts. The panel consisted of:
Chair:

- Prof. Piet Pauwels, dean Faculteit Bedrijfseconomische Wetenschappen, Universiteit Hasselt, Professor of marketing & international business.

Members:

- Prof. Ivo Adan, chair of Manufacturing Networks, department of Industrial Engineering & Innovation Sciences, Technische Universiteit Eindhoven;
- Dr. Barbara Regeer, associate professor Athena Institute for Research on Innovation and Communication, Vrije Universiteit Amsterdam

Student member:

- Duco Mülder, student International Bachelor Econometrics and Operations Research & International Bachelor Economics and Business Economics, Erasmus Universiteit Rotterdam.

The panel was supported by Frank Wamelink (staff member NVAO) as process co-ordinator and Frans van Steijn (independent consultant) as secretary.

All the panel members and the secretary signed a statement of independence and confidentiality.

The panel has based its assessment on the standards and criteria as described in the NVAO limited framework for initial accreditation (Stcrt. 2019, nr 3198).

The following procedure was undertaken. The panel members prepared the assessment by analysing the documents provided by the institution (Annex 2: Documents reviewed). The panel organised a preparatory meeting on 17 June 2019. During this meeting, the panel members shared their first impressions and formulated questions for the site visit.

The site visit took place on 18 June 2019 at Maastricht University. During this visit, the panel was able to discuss the formulated questions and to gather additional information during several sessions (Annex 1: Programme of the site visit). Afterwards, the panel discussed the findings and considerations and pronounced its preliminary assessments per theme and standard. At the end of the site visit, the initial findings were presented to the institution.

Based on the findings, considerations and conclusions, the secretary wrote a draft advisory report that was first presented to the panel members. After the panel members had commented on the draft report, the chair endorsed the report. On 18 July 2019 the advisory report was sent to the institution, which was given the opportunity to respond to any factual inaccuracies in the report. The institution replied on August 15, 2019. All suggested corrections were adopted. Subsequently the final report was endorsed by the panel chair. The panel composed its advice fully independently and offered it to NVAO on August 21, 2019.

2.2 Panel report

The first chapter of this report is the executive summary of the report, while the current chapter is the introduction.

The third chapter gives a description of the programme including its position in the institution, in Maastricht University and within the higher education system of the Netherlands.

The panel presents its assessments in the fourth chapter. The programme is assessed by assessing the themes and standards in the Initial Accreditation Framework. For each standard the panel presents an outline of its findings, considerations and a conclusion.

The outline of the findings are the objective facts as found by the panel in the programme documents, in the additional documents and during the site visit. The panel's considerations consist of the panel's judgments and subjective evaluations regarding these findings and their relative importance. The considerations presented by the panel are at the basis of a concluding overall assessment.

The panel concludes the report with a table containing an overview of its assessments per standard.

3 Description of the programme

3.1 General data

Institution	:	Maastricht University
Study programme	:	Business Engineering
Level	:	WO-bachelor
Degree	:	Bachelor of Science
Location	:	Maastricht
Study Load	:	180 EC
Field of Study	:	Natuur (science)

3.2 Profile of the institution

Maastricht University is a publicly funded university with 18,000 students and 4,400 employees. This young university, founded in 1976, is still growing. The university is renowned for its innovative education model, Problem-Based Learning (PBL). Other characteristics are its international character and multidisciplinary approach to research and education. With about 50% of the students and 40% of the academic staff come from abroad, representing more than 100 different countries. Many of the study programmes are offered either fully or partly in English.
Education and research at Maastricht University is organised in six faculties.
The BSc Business Engineering Programme is organized by the Faculty of Science and Engineering (FSE) and the School of Business and Economics (SBE). The programme is part of the strengthening of Maastricht University in research and education in the STEM-disciplines (science, technology, engineering and mathematics). The STEM bachelor Maastricht Science Programme (MSP) and master programmes Biobased Materials and Systems Biology add to the PBL-approach a strong focus on Research-Based Learning (RBL). Both elements, PBL and RBL, are part of the new BSc Business Engineering programme.

1. The programme is situated in Maastricht and parts are offered at the four Brightlands campuses in the Limburg region:
2. Smart materials and sustainable chemical production (Brightlands Chemelot Campus, location Sittard-Geleen);
3. Regenerative medicine, precision medicine and innovative diagnostics (Brightlands Maastricht Health Campus, location Maastricht);
4. Healthy and safe nutrition, future farming and bio-circular (Brightlands Campus Greenport Venlo, location Venlo); and
5. Data Sciences and smart services (Brightlands Smart Services Campus, location Heerlen).
   The Brightlands campuses are a 'triple-helix' collaboration of Maastricht University, Maastricht University Medical Center+, Zuyd University of Applied Sciences, Fontys International Campus Venlo, the Province of Limburg and industry in the Limburg region.

3.3 Profile of the programme

The proposed BSc Business Engineering programme is a 3-year bachelor programme (180 EC) of Maastricht University. With respect to profile, design and name it is a new study programme in the Netherlands.
The programme aims at delivering graduates with a solid background in the natural sciences, business and engineering that are able to understand and translate challenges and opportunities into new scientific knowledge creation and potential for valorisation. Students learn to respond to the challenges of today's society. The programme aims to reduce the discrepancies between academic knowledge and societal problems: it tries to dissolve the boundaries between knowledge and perspectives from different scientific disciplines and non-scientific resources. In addition students will learn to bridge the gap between business and STEM in order to develop discoveries and innovations and bring them to the market.

The BSc Business Engineering is jointly co-ordinated by the Faculty of Science and Engineering (FSE) and the School of Business and Economics (SBE); the FSE is the host of the programme. The programme is embedded in SBE's quality assurance system geared to the international AACSB quality standards. The programme team of the BSc Business Engineering consists of the programme director and the course coordinators of the compulsory courses from both FSE and SBE.

4 Assessment per standard

This chapter presents the assessment by the panel according to the quality standards set by the NVAO Limited framework for initial accreditation (Stcrt. 2019, nr 3198).
For each standard, the panel presents a brief outline of its findings, considerations and conclusion. The assessment is based on (1) the programme documents, additional documents provided by the institution and the interviews with the staff during the site visit, (2) the considerations the panel has taken into account and (3) the panel's conclusion. The panel presents a conclusion for each of the standards, as well as an overall conclusion on the programme.

The panel will substantiate one of three outcomes for each of the standards: (1) satisfies the standard, (2) partially meets the standard or (3) does not meet the standard. In conclusion, the panel comes to an assessment for the whole programme. This overall conclusion derives from the evaluations on the standards, following decision-rules. Also, three grades are available: (1) positive, (2) positive with conditions or (3) negative.

4.1 Intended learning outcomes

Standard 1: The intended learning outcomes demonstrably describe the level of the programme (Associate Degree, Bachelor's, or Master's) as defined in the Dutch Qualifications Framework, as well as its orientation (professional or academic). In addition, they tie in with the regional, national or international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme. Insofar as is applicable, the intended learning outcomes are in accordance with relevant legislation and regulations.

Outline of findings
Maastricht University applies for a new bachelor programme that is founded on the disciplines of chemistry, biotechnology, computer sciences and mathematics and on the domain of business and economics. Students also become familiar with the various functions of business (finance, supply chain management, marketing, economics). The objective is that graduates learn to act as bridge builders between scientists, business developers, managers and engineers.

The BSc Business Engineering addresses five overall intended learning goals. Upon graduation, students have:
1. a breadth of academic knowledge;
2. in-depth academic expertise in the field of natural sciences, business and engineering;
3. a scientific attitude towards learning and problem solving;
4. in-depth insights in the society in which they operate;
5. highly-developed (inter)personal skills.

These learning outcomes are translated into programme objectives for the BSc Business Engineering. Together they cover the five Dublin descriptors of the European requirements for academic study programmes. The programme aims to address the technological and societal challenges and complexities of today, by teaching students to (help to) develop new business models to address societal challenges, contribute to the solution of complex problems and to create new opportunities, combining insights from the natural sciences , business and engineering. Mastering integrated knowledge from different disciplines is therefore crucial for the students.
The panel discussed these learning outcomes extensively with the management of the programme, a number of its teachers, and representatives of future employers of programme graduates. All discussion partners confirmed that there is a substantial need for a study programme that does not aim at student's knowledge of single engineering or business disciplines, but at transdisciplinary knowledge and skills of a range of disciplines. Since the programme is coordinated by both the Faculty of Science and Engineering (the host of the programme) and the School of Business and Economics the required knowledge base of the courses is guaranteed. The intended BA Business Engineering differs from the programmes in either faculty in its focus on cross-disciplinary skills in science, engineering and business.

The profile of graduates is therefore also different; more than experts in specific disciplines, they will become bridge builders between experts and problem solvers in a business environment. The intended (inter)personal and problem solving skills and social insights will make them stand out. A potential trade-off between breadth and depth is to be avoided by explicitly incorporating transdisciplinary skills into the coherence and outline of the programme courses. In the discussions with the programme management and teachers, the panel learned that these skills and attitudes are implicitly taken into account in many of the courses. The representatives of industry stressed their high expectations of employing graduates with this profile helping them addressing actual social problems and needs of sustainability.

Considerations

The panel was convinced by the documentation and the discussions with the programme management, teachers and employer's representatives that there exists a real need for graduates who possess the knowledge and skills that this—for the Netherlands unique—study programme intends to offer. The intended learning outcomes are therefore worthwhile and feasible, despite the large variety of graduates due to the large share of electives in their individual path through the programme. Whether the programme will offer enough academic breadth and depth for its graduates will find its evidence in the opportunities for enrollment into academic master programmes in the faculties of FSE and SBE of Maastricht University and master programmes offered by other universities. Since there is no dedicated business engineering master programme at Maastricht University, admission to specific master programmes will to a large extent depend on the specific trajectory a student will follow, combining the obligatory courses with the electives that are offered. Based on the discussed personal approach of students and extensive opportunities for study advice, the panel was convinced that in this new study programme students will be allowed—and helped—to design their individual learning paths that will enable them to pursue a suitable academic and professional career. That process may be enhanced by developing—besides the desired freedom of choice for the students—specific tracks through the electives that prepare students for targeted master programmes. Such tracks may also provide the basis for establishing agreements with existing master programmes within and beyond Maastricht University.

Conclusion

The programme meets standard 1.

4.2 Teaching-learning environment

Standard 2: The intended learning outcomes have been adequately translated into educational objectives of (components of) the curriculum. The diversity of the students admitted is taken into account in this respect. The teachers have sufficient expertise in terms of both subject matter and teaching methods to teach the curriculum, and provide appropriate guidance. The teaching-learning environment encourages students to play an active role in the design of their own learning process (student-centered approach). If the programme is taught in a language other than Dutch, the programme must justify its choice. This also applies if the programme bears a foreign language name. The teaching staff must have a sufficient command of the language in which they are teaching. Services and facilities are not assessed, unless they have been set up specifically for the programme concerned.

Outline of findings

The BSc Business Engineering study programme is designed according to the well-proven education concepts of Maastricht University, employing Problem-Based Learning (PBL) and Research-Based Learning (RBL) in an international and multicultural academic community. The curriculum provides the students with a common solid academic background in the sciences, business and engineering and an individually tailored range of electives. Students acquire the necessary academic and professional skills in the regular courses, in the biannual recurring projects, in dedicated skill trainings, and in the third year final Thesis Research Project. A programme team is in place, consisting of the programme director and dedicated staff from both FSE and SBE, fully covering the natural sciences, business and

engineering. According to the transdisciplinary approach of the programme, most modules and courses are developed by more than one staff member from different fields.

The three years of the programme build up from 10 mandatory 5 EC courses in year 1 (8 courses from the natural sciences, mathematics, business and engineering plus 2 skills courses) and 2 four-week projects; to 4 mandatory courses in year 2 and 4 electives plus two skills courses and two projects; and—in last year 3—the last mandatory course (ethical and philosophical reflections), 5 electives, one project and one skills course, and the Thesis Research Project of 20 EC.
Admission to this programme is allowed for students with a Dutch VWO or equivalent degree with a proof of Dutch VWO mathematics B or equivalent. A matching procedure is in place to help applicants and the programme to determine their ability and motivation for entering this study programme. It was explained that the limitations of the bachelor programme, for example with respect to the eligibility of certain (engineering masters) will be brought forward in this procedure.
The programme is student-centered in many ways, by the emphasis on academic, professional and social skills; by the biannual projects in small groups, by the large space to tailor-make their individual curriculum with electives, and by the individual Thesis Research Project. In order to guide students in the process of creating their individual profile, the programme offers support by teachers, tutors, academic advisors and student and career counsellors. The thesis explicitly stresses the ultimate goal of the programme, when students show their ability to use methods and techniques from different disciplines in order to solve a pre-approved transdisciplinary research question.

The teaching language of the programme is English, in line with the UM Code of Conduct for Language and the UM Language Policy, which is in line with the language of the STEM and business courses, with the international classroom in which the BE students work and with the international professional orientation of the programme. Teaching staff of FSE and SBE already have proven their proficiency in English and the new BSc Business Engineering.

Considerations
The panel found the study programme to be coherent, well-designed and of an academic level associated with a wo-BA programme. The programme will most likely achieve enough depth—be it not in specific disciplines, but in transdisciplinary knowledge and skills—that will allow students to be successful in their academic and professional careers. The panel discussed whether the broadness of the programme could prevent students from successfully continuing their education at an academic (master) level. But the versatile mix of mandatory courses with ample attention for the basic scientific, mathematical, engineering and business knowledge and skills, complemented with the right electives, will indeed allow students to acquire enough depth for a successful academic career. The fact that this depth is of a transdisciplinary nature requires special attention from the programme staff and the students themselves. The panel is confident that this aspect will receive due attention.

Conclusion
The programme meets standard 2.

4.3 Assessment

Standard 3: The student assessments are valid, reliable and sufficiently independent. The requirements are transparent to the students. The quality of interim and final examinations is sufficiently safeguarded and meets the statutory quality standards. The tests support the students' own learning processes.

Outline of findings
The BSc Business Engineering applies the concept of 'constructive alignment' as guiding for its assessment programme. This alignment is achieved between programme objectives, teaching and assessment tasks. The assessments engage students, by not only being assessments of learning, but also for learning and as learning approaches. The programme prepares for a continuous development of assessment. The BSc Business Engineering is embedded in SBE's quality assurance system to ensure that AACSB standards are maintained.

Also put in line are the assessments with the intended learning outcomes, the PBL and RBL didactic concepts and the social/industrial orientation. Critical self-reflection and giving and receiving feedback are part of intended competencies of the programme.
The programme employs a variety of assessment forms, besides course examinations also argumentative papers and project assessments. The assessment rules of the 20 EC Thesis Research Project are still under discussion. The panel emphasizes that the transdisciplinary character of the study programme should be reflected in the thesis assessment.

Considerations
The panel discussed the assessment concept and procedures with representatives of the Board of Examiners (BoE) and the Educational Programme Committee (EPC). To a large extent, the assessment concept is already practiced in the parallel courses of the FSE and SBE faculties. The panel concluded that the general outline for the assessment system of the BSc Business Engineering programme is well in place and corresponds with the national and university regulations and quality standards.

Conclusion
The programme meets standard 3.

4.4 Qualification and field of study (CROHO)

The panel advises to award the degree 'Bachelor of Science' to the wo-bachelor of Business Engineering. The panel supports the programme's preference for the CROHO field of study 'Natuur' (Science)

4.5 General conclusion regarding the quality of the programme

The panel assesses the quality of the programme as positive.

4.6 Recommendations

The quality of the new BA-programme Business Engineering of Maastricht University is positive.

5 Overview of the assessments

Standard	Assessment
Intended learning outcomes *Standard 1: The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.*	Meets the standard
Teaching-learning environment *Standard 2: The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.*	Meets the standard
Student assessment *Standard 3: The programme has an adequate system of student assessment in place.*	Meets the standard
General conclusion	Positive

Annex 1: Programme site-visit

The panel visited the programme BSc Business Engineering on 17 and 18 June 2019
Location: Maastricht University, Faculty of Science and Engineering, Kapoenstraat 2, Maastricht

08:45 – 09:00	Arrival panel and welcome
09:00 – 10:00	Initial panel meeting Internal panel meeting
10:00 - 11:00	Meeting with (Programme) Management Dean Faculty of Science and Engineering Dean School of Business and Economics Programme Director Business Engineering
11:00 – 11:15	Short break Internal panel meeting
11:15 – 12:00	Meeting with teaching staff Course coordinators
12:00 – 12:45	Lunch and break Internal panel meeting
12:45 – 13:15	Meeting with representatives of the Board of Examiners (BoE) and the Educational Programme Committee (EPC)
13:15 – 14:00	Meeting with representatives from industry Brightlands Chemelot Campus Brightlands Innovation Factory Blue Plasma, Blue Engineering UM spin offs
14:00 – 14:30	Short break Internal panel meeting
14:30 – 15:00	Second meeting with (Programme) Management
15:00 – 16:00	Panel meeting Internal panel meeting
16:00 – 16:15	Presentation preliminary findings Panel and staff
16:15	End of accreditation visit

Annex 2: Documents reviewed

Programme documents presented by the institution

BSc Business Engineering – NVAO Initial Accreditation Report 2019
Programme – accreditation visit

Made available on the website:
General
AACSB Accreditation Standards
- Education and Examination Regulations (OER)
- Assessment Policy
- Assessment Programme
- Overview Intended Learning Outcomes
- Rules of Procedure for Examinations
- Study Abroad Requirements

Additional information
- Problem Based Learning Introduction
- Brightlands Chemelot Campus
- Brightlands Maastricht Health Campus
- Brightlands Smart Services Campus
- Brightlands Campus Greenport Venlo
- Video campus School of Business and Economics
- Video campus Maastricht Science Programme
- Video campus Department of Data Science and Knowledge Engineering

Staff members
- Overview staff members – complete
- Overview staff members – staff accreditation visit

Mandatory courses Year 1
- Introduction to Business Engineering – Course Manual
- Calculus – Course Manual
- Fundamentals of Engineering – Course Manual
- Linear Algebra – Course Manual
- Economics for Business Engineering
- Statistics – Course Manual
- Process and Product Engineering – Course Manual
- Experimentation in Science and Engineering – Course Manual

Mandatory courses Year 2
- Multivariable Calculus – Course Manual
- Materials Engineering – Course Manual
- Commercialising Science and Technology – Course Manual
- Corporate Finance and Investment – Course Manual
- Mandatory course Year 3
- Ethical and Philosophical Reflections – Course Manual

Skills training
- Academic Skills and Project Management – Course Manual
- Software Skills – Course Manual
- Computer Science Skills – Course Manual
- Laboratory and Research Skills – Course Manual
- Global Leadership Skills – Course Manual

Projects and Thesis
- Projects – Course Manual
- Thesis – Course Manual

Assessment Thesis
- Research Proposal – Grading Scheme

Practical Work – Midterm Feedback Scheme
Practical Work – Grading Scheme
Written Thesis – Grading Scheme
Defence – Grading Scheme

Assessment – Samples

Examples School of Business and Economics
Examples Maastricht Science Programme
Examples Data Science and Knowledge Engineering

Annex 3: List of Abbreviations

AACSB	The Association to Advance Collegiate Schools of Business
ba	bachelor
BoE	Board of Examiners
BSc	Bachelor of Science
CROHO	Centraal Register Opleidingen Hoger Onderwijs
DKE	Department of Data Science and Knowledge Engineering
EC	European Credit
EPC	Educational Programme Committee
FSE	Faculty of Sciences and Engineering
ma	master
MSP	Maastricht Science Programme
NVAO	Nederlands-Vlaamse Accreditatieorganisatie
PBL	Problem Based Learning
RBL	Research Based Learning
SBE	School of Business and Economics
STEM	Science, Technology, Engineering, Mathematics
UM	Universiteit Maastricht/Maastricht University
wo	wetenschappelijk onderwijs

The panel report was ordered by NVAO for the initial accreditation of the programme wo-bachelor Business Engineering van de Universiteit Maastricht.

Aanvraagnummer: 008025

NVAO

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