

Assessment report  
Limited Framework Programme Assessment

**Bachelor Electrical Engineering**

Eindhoven University of Technology

*Contents of the report*

1. Executive summary .....	2
2. Programme administrative information.....	5
3. Findings, considerations and assessments per standard .....	6
3.1 Standard 1: Intended learning outcomes .....	6
3.2 Standard 2: Teaching-learning environment .....	10
3.3 Standard 3: Student assessment.....	14
3.4 Standard 4: Achieved learning outcomes .....	16
4. Overview of assessments .....	17
5. Recommendations .....	18
Appendix: Assessment process .....	19

## 1. Executive summary

In this executive summary, the assessment panel presents the main findings and considerations underlying the assessment of the quality of the Bachelor Electrical Engineering programme of Eindhoven University of Technology. The programme was assessed according to the four standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands.

The organisation of the programme is effective, enabling programme management to appropriately monitor and assure the quality of the programme.

Programme management responded adequately to the recommendations of the assessment panel, made during the previous assessment process in 2016.

The programme's objectives specify the requirements of bachelor programmes in the electrical engineering domain. This Bachelor programme is predominantly the stepping stone for subsequent master programmes in this or related domains, and not for directly entering the labour market.

The Domain-specific Frame of Reference is valuable. The electrical engineering domain is well described. International standards and benchmarks have appropriately been taken into account, which allows this programme to be aligned with international trends in this domain.

The programme's intended learning outcomes are well-aligned with the objectives. They meet the Domain-specific Frame of Reference requirements, and the generic bachelor level requirements. The intended learning outcomes of the Bachelor and Master Electrical Engineering programmes of this university are clearly differentiated. The monitoring and updating of the intended learning outcomes are done adequately.

The panel recommends to reconsider the labelling of the structure of the majors/tracks and themes of this programme, achieving more clarity and more coherence in the programme's structure and improving the alignment of the Bachelor and Master programmes. Adapting the labels may also add to the understanding of the programme by prospective students.

The choice for the English name and English as the language of instruction for the programme is well-considered and plausible.

The rising number of incoming students in the programme is positive, as the demand for electrical engineers will continue to increase over the years. The panel advises to attract more Dutch students by advertising the programme more intensively at Dutch high schools. The panel also recommends to take steps to raise the number of female students.

The entry requirements and admission procedures are valid for this programme.

The curriculum has been logically and coherently structured and is well-aligned with the intended learning outcomes of the programme. The courses are well-organised. The study load for mathematics and physics is appropriate and will remain so in the new Bachelor programme. The panel advises to work on the further integration of the professional skills training in the courses.

The teaching staff is very much suited to teach in this programme. Their educational capabilities are up to standard, as 75 % of them are BKO-certified. Teachers relate teaching to their research. Industry representatives teaching in the programme allows students to obtain a view of the professional practice.

The design-based learning concept and the study methods of the programme allow for adequately conveying knowledge and skills in the programme domain. The introduction of challenge-based learning in 2023 is a step forward, building on the concept of design-based learning.

The academic advisors in the programme assure effective student guidance. On the other hand, the panel advises to ensure all student mentors meeting quality requirements. The panel recommends also to balance the study load in the programme. The panel advises also to take steps to improve the student success rates, drop-out rates and first year binding study advice rates. One of the means to do so may be to fine-tune the information to prospective students, providing them with clear views on the programme contents, in particular regarding the Automotive Technology major/track.

The panel is very positive about the study and lab facilities provided for students.

The measures taken by programme management to organise education and examinations during the Covid pandemic are sound. The Examination Committee ensured the intended learning outcomes of the programme to be achieved in the Covid period. Programme management made appropriate efforts to mitigate the effects of the pandemic on students.

The programme examination and assessment procedures are in line with university and department rules and regulations. The measures to assure the quality of examinations and assessments are adequate. The Examination Committee is solid and active in performing their duties.

The assessment plans for the courses allow the examination and assessments of the courses to be well-aligned with the course goals and, through these course goals, with the programme intended learning outcomes. The predominance of written examinations is understandable, but other examination methods are beneficial. The instruments adopted to assess performances of individual students and to counter free-riding are many-sided and effective.

The procedures for the assessment of the Bachelor final projects, with the panel of examiners, the supervisor acting as an advisor, and the standardised final project evaluation form, assure reliable assessments. The introduction of qualitative guidelines for grading or rubrics may further improve the grading of the final projects.

The quality and level of the course examinations are up to standard and conform to the goals of the courses.

The quality and academic level of the Bachelor final projects meet the requirements of a bachelor programme in the electrical engineering domain. The Bachelor final projects, which the panel studied, match the intended learning outcomes. The panel agrees with the grades given by the programme examiners.

The master programmes, to which graduates are admitted, showcase the results these graduates have achieved at completion of this programme.

The relations of programme management with the Board of Advice are instrumental in aligning the programme with professional field requirements. Seeing the range of relations between programme management and staff and the professional field, the panel advises to adjust and combine these relations to be more effective.

Having conducted the assessment of the Bachelor Electrical Engineering programme of Eindhoven University of Technology, the assessment panel finds this programme to meet all four standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, and consequently judges the programme to be positive in terms of the NVAO Assessment framework. Therefore, the panel recommends NVAO to prolong the accreditation of this programme for another term of six years.

Rotterdam, 15 January 2023,

Prof.dr.ir. Dr. h.c. R.W. De Doncker  
(panel chair)

W. Vercouteren  
(panel secretary)

## 2. Programme administrative information

Name programme in CROHO: Bachelor Electrical Engineering  
Orientation, level programme: Academic Bachelor  
Grade: Bachelor of Science (BSc)  
Number of credits: 180 EC  
Tracks/majors: Electrical Engineering  
Automotive Technology  
Location: Eindhoven  
Mode of study: Full-time (language of instruction: English)  
Registration in CROHO: 21PG-56953

Name of institution: Eindhoven University of Technology  
Status of institution: Government-funded University  
Institution's quality assurance: Approved

### 3. Findings, considerations and assessments per standard

#### 3.1 Standard 1: Intended learning outcomes

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.

##### *Findings*

From the organisational perspective, the Bachelor Electrical Engineering programme is one of the programmes of the Department of Electrical Engineering of Eindhoven University of Technology. The Departmental Board, chaired by the Dean, is responsible for decisions on research, education, finances, personnel and support at the departmental level. The Vice-Dean Education, who is one of the members of the Departmental Board, serves as the programme director of both the Bachelor and Master Electrical Engineering programmes and has the responsibility to assure the quality of these programmes. The programme director is assisted by two programme leaders, one for each of the two programmes. They take care of the day-to-day management of these programmes. The Programme Committee for both the Bachelor and Master Electrical Engineering programmes, being composed of lecturers and students, advises programme management on the quality of these programmes. The Examination Committee, being positioned at departmental level, monitors and assures the quality of examinations and assessments of both this programme and the Master Electrical Engineering programme.

The panel was informed about the recommendations of the assessment panel in the previous assessment process, six years ago, and about the follow-up actions by management of this programme on these recommendations. Firstly, staff has been recruited to keep up with rising student numbers. Secondly, the number of staff having obtained the University Teaching Qualification (BKO-certified) was raised. Thirdly, professional skills, among which academic writing skills and oral presentation skills, have been embedded more firmly in the curriculum and have explicitly been made part of the Bachelor final project assessment. Fourthly, the grading process of the Bachelor final project has been revised and the form used for the assessment of the project has been updated, with specific attention for students' process and progress achievements during their projects.

This programme is a three-year or 180 EC academic bachelor programme in the electrical engineering domain. The objectives of the programme are for students to acquire academic and professional knowledge and skills in the electrical engineering domain, which will enable them to proceed without major hindrances to programmes at master level in electrical engineering or other technical domains. Students of this programme are not explicitly prepared to directly enter the labour market.

Programme management of the Bachelor and Master Electrical Engineering programmes of the universities of technology in the Netherlands, Delft University of Technology, Eindhoven University of Technology, and University of Twente, convened to draw up the Domain-specific

Frame of Reference for Electrical Engineering studies in the Netherlands. In 2016, the first draft of this Frame of Reference was completed. The current Frame of Reference has been updated, but retains important, still valid parts of this 2016 version. In this Domain-specific Frame of Reference, the domain of electrical engineering has been described and the requirements for academic degree programmes in this domain have been specified. These requirements have been derived from the specifications for programmes in electrical engineering by the international renowned accreditation organisations in this domain ABET, the United States Accreditation Board for Engineering and Technology, and ASIIN, the German Accreditation Organisation for study programmes in Engineering, Informatics, Natural Sciences and Mathematics. In addition, the requirements have been drafted to meet the Meijers criteria. The Meijers criteria are generic academic qualifications for bachelor and master programmes of universities of technology in the Netherlands. The Meijers criteria have been approved by NVAO in this sense. The requirements have also been compared to the Bachelor and Master Electrical Engineering programmes of three reputed universities, ETH Zurich, TU Munich and KU Leuven. In this Frame of Reference, the subdomains of electrical engineering, as represented by the societies within the global organisation IEEE, Institute of Electrical and Electronics Engineers, have been identified. In view of the wide range of subdomains, the Frame of Reference states it not to be feasible for programmes to cover all subdomains. Therefore, programmes are to convey the core of electrical engineering, thereupon allowing students to specialise in subdomains.

The objectives of the programme have been translated into the programme's intended learning outcomes. These intended learning outcomes include students being knowledgeable about electrical engineering core subjects, having adequate knowledge of mathematics and physics, being able to do research under supervision, knowing how to think and reason critically, taking scientific approaches to solve non-complex problems, knowing how to communicate about their work and the results thereof, knowing how to plan their activities, being aware of societal implications of their work, and being able to work in multi-disciplinary or inter-disciplinary contexts.

The programme allows students to select majors/tracks. These are in line with the research themes of the Department of Electrical Engineering. These majors/tracks are *Electrical Engineering* and *Automotive Technology*. Choosing Electrical Engineering allows students to specialise in one of the themes *Connected World*, studying the continuously increasing societal demand for communication services, *Care and Cure*, addressing challenges arising out of the ageing society, or *Smart and Sustainable Society*, dealing with the transition to sustainable energy supplies. Selecting Automotive Technology enables students to study future mobility systems.

As programme management has shown in the self-evaluation report, the programme's intended learning outcomes comply with the Domain-specific Frame of Reference. As is also demonstrated in the self-evaluation report, the intended learning outcomes match the Meijers criteria for bachelor programmes.

This programme meets university-wide Bachelor College requirements. From 2023 onwards, the Bachelor College set-up will be updated. Therefore, this programme will change also. Programme

management sees regular updates in the intended learning outcomes and curriculum as important to adjust to new developments in the electrical engineering domain and to new educational views.

The name of the programme is in English. The language of instruction is English as well. This is the case since 2012. The main reason for adopting English in the name and in education is to prepare students for careers in international organisations, also in the Eindhoven Brainport region. In addition, English allows international students to enrol and enables to recruit international staff. In 2020, Eindhoven University of Technology adopted English as the official working language in research and education.

### *Considerations*

The panel regards the organisation of the programme to be effective and to enable appropriately monitoring and assuring the quality of the programme.

The panel notes programme management responded adequately to the recommendations of the assessment panel, made during the previous assessment process in 2016.

In the panel's view, the programme's objectives specify the requirements of bachelor programmes in the electrical engineering domain. The panel acknowledges this Bachelor programme to be predominantly the stepping stone for subsequent master programmes in this or related domains, and not for directly entering the labour market.

The panel regards the Domain-specific Frame of Reference to be valuable. The electrical engineering domain is well described. International standards and benchmarks have appropriately been taken into account, which allows this programme to be aligned with international trends in this domain.

The programme's intended learning outcomes are well-aligned with the programme's objectives. The panel evaluates the intended learning outcomes to meet the Domain-specific Frame of Reference requirements. Therefore, the programme matches the international standards for programmes in the domain of electrical engineering. The intended learning outcomes also meet the requirements for the bachelor level, as specified by the Meijers criteria for this level. The intended learning outcomes of the Bachelor and Master Electrical Engineering programmes of this university are clearly differentiated, ensuring relevant differences in knowledge and skills between these programmes. The panel is positive about the monitoring and updating of the intended learning outcomes of this programme by programme management.

The labelling of the structure of the majors/tracks and the themes of this programme should, in the panel's eyes, be organised more clearly and more coherently. The panel recommends to reconsider this labelling to achieve more clarity and more coherence in the programme's structure and to improve the alignment of the Bachelor and Master programmes in this respect. Adapting the labels may also add to the understanding of the programme by prospective students, and manage students' expectations better.



The panel endorses the English name of the programme, as it regards the reasons given by programme management for this name as valid. The choice for English as the language of instruction for the programme is seen by the panel as well-considered and plausible as well.

*Assessment of this standard*

These considerations have led the assessment panel to assess the programme to meet Standard 1, Intended learning outcomes.

### 3.2 Standard 2: Teaching-learning environment

The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

#### *Findings*

The number of students enrolling in the programme increased gradually over the last eight years. While in the years 2014 to 2016 the intake was on average 230 incoming students per year, the intake in the years 2021 and 2022 was on average 300 students per year. The number of incoming students taking the major/track Automotive Technology is quite stable over the years at about 90 students. Over the years, about 30 % of the incoming students are international students, coming mainly from European countries. Both staff and students indicated students from different backgrounds to mix well in the programme. The percentage of international students tends to rise. The last year, this percentage increased to about 50 %. Programme management wants to attract more Dutch students to balance the student body. The proportion of female students is low, varying between 6 % and 12 % of total intake. Programme management is making efforts to raise the percentage of female students.

Interested students are offered a range of opportunities to obtain information about the programme. Three categories of applicants are eligible for admission to the programme. These are applicants having Dutch pre-university diplomas with mathematics and physics in their study programmes, applicants having completed the first year of electrical engineering programmes taken at Dutch universities of applied sciences, or applicants from abroad having, officially established, comparable qualifications. International applicants have to meet English language command requirements. To be admitted, applicants have to complete the compulsory Study Choice Check procedures, which include filling out the university questionnaire, attending one of the lectures and discussing their motivation for this programme with one of the academic advisors.

This Bachelor programme is embedded in the university-wide Bachelor College. The programme curriculum, therefore, conforms to the Bachelor College set-up and requirements. All courses offered have 5 EC of study load. Major/track courses constitute 95 EC, including 5 EC professional skills training. The major/track courses introduce students to the electrical engineering or automotive technology domain. Professional skills address, among other, academic writing, oral presentations, reflecting, organising and planning. Basic courses (25 EC) cover mathematics, applied physics, ethics and history of technology, engineering design, and data analytics. The USE-courses (15 EC) go into users', business' or societal aspects of technology, touching upon intellectual property issues as well. The curriculum allows for 45 EC of electives, to be used by students to deepen their major/track knowledge and skills or to broaden their programme. The subject of power electronics is covered in one of the electives, which is taken by many students. Most students take pre-approved elective packages. Students may qualify to be teachers for lower classes of Dutch secondary education by taking the educational package in the elective space. The Bachelor final project, which is part of the major/track, is 10 EC or 15 EC. In the 15 EC project students do additional assignments (e.g. literature study) for 5 EC. The Bachelor final project

requires students to come to realistic designs in their major/track domain, while applying theory, defining models and using design skills. Excellent students may opt for tracks offered by the university Honours Academy, allowing them to take 30 EC of courses on top of their regular programme.

In the self-evaluation report, programme management presented the overview of the relations between the intended learning outcomes and curriculum components, demonstrating for each major the correspondence between the curriculum and the intended learning outcomes of the programme.

The teaching staff is composed of full professors, associate professors, assistant professors and teachers. Staff members are researchers in this domain and connect teaching to their research. About 47 FTE of staff (40 % educational time of the total of 117 FTE of staff in the Department of Electrical Engineering) are involved in teaching in the Bachelor and Master Electrical Engineering programmes. The proportion of BKO-certified teachers is about 75 %. In addition, PhD students in the Department of Electrical Engineering spend 10 % of their contracted time on education (tutoring lab work, instructing in guided self-study sessions, supporting examiners in examinations' correction). Some PhD students have extended, five-year contracts and are for 25 % of their time involved in teaching activities. PhD students are trained to be able to guide students. Some teachers in the programme are working in industry, teaching one day per week in the programme. These hybrid teachers are supported in their teaching and are encouraged to become BKO-certified.

In the programme courses, an array of teaching methods is offered. The methods include lectures, tutorials, guided self-study sessions, practical sessions and design-based learning projects. Design-based learning may be seen as the educational concept of the programme. In design-based learning projects, students work in small groups and are taught to design systems, artefacts or solutions. In the new Bachelor programme to be offered from 2023 onwards, challenged-based learning will be adopted as a further extension of design-based learning, allowing for more open-ended problems to be addressed.

Students experience this programme as very demanding, especially in the second year. In all major/track courses, face-to-face education amounts to eight hours per week. On the basis of 47 FTE of teaching staff, the students-to-staff ratio can be calculated at about 25 : 1. The programme's academic advisors support students with information, track their study progress, provide study advice and refer them to other services, when needed. First-year students are supported in small groups by student mentors. Students with whom the panel met, pointed, nevertheless, to substantial differences in student mentors' guidance quality. The proportion of students with positive BSA's (only positive BSA (binding study advice) gives access to the second year) is more or less stable from 45 % to 60 % for the last seven years, but decreasing through the years. The student drop-out rate in the first year is on average 25 % in the last seven years. The other negative-BSA students switch to other programmes in the university. The student success rate after four years for this programme is on average 50 % of students re-enrolled in the second year. Within the programme, the figures for the Automotive Technology major/track are the least favourable. Programme management acknowledges the relatively disappointing results in terms of BSA's, drop-out rates and student success rates and is working on improvements.

At the beginning of the Covid pandemic, a departmental working group was installed to make the transfer to online education during the pandemic as smooth as possible for students and teachers. Theoretical lectures were transformed into online lectures. Practical sessions were organised on-campus as much as possible. When this was not feasible, online labs were organised and home study kits were made available. Students struggled in the pandemic, but were, as is evident from student surveys held during the pandemic, more positive at the end of the 2020/2021 academic year than in December 2020. At the moment, programme management is in the process of evaluating online education to see which formats may be retained.

### *Considerations*

The panel is positive about the rising number of incoming students in the programme, as the demand for electrical engineers will continue to increase over the years. The panel endorses efforts by programme management to raise the number of Dutch students and recommends to intensify advertising the programme at Dutch high schools to attract these students. The panel notes the low proportion of female students and advises programme management to take steps to raise their numbers.

The panel evaluates the entry requirements and admission procedures to be valid for this programme. These requirements and procedures ensure admitting students who have a reasonable chance to complete the programme.

The panel regards the curriculum to be well-aligned with the intended learning outcomes of the programme. The curriculum has been logically and coherently structured. The courses themselves are well-organised as well. The panel regards the study load for mathematics and physics to be appropriate. The panel is pleased the study load for these disciplines will not diminish in the new Bachelor programme. The panel advises to work on the further integration of the professional skills training in the courses.

The panel considers the staff as very much suited to teach in this programme. The educational capabilities of the teachers are up to standard, as 75 % of them are BKO-certified. The panel welcomes teachers relating lecturing to their research, as students are made familiar with research and new developments in this domain. Involving PhD students in teaching activities is seen as beneficial by the panel. The panel appreciates industry representatives teaching in the programme, as this enables students to get a view of the professional practice.

The panel evaluates the design-based learning concept and the study methods of the programme as adequate means to convey knowledge and skills in the programme domain. The panel evaluates the introduction of challenge-based learning in 2023 as a step forward, building on the concept of design-based learning.

The panel approves the student guidance in the programme, as provided by the academic advisors. The panel, on the other hand, advises to ensure all student mentors meeting quality requirements. In addition, the panel recommends to balance the study load in the programme. As the student success

rates, drop-out rates and first year binding study advice rates are less favourable, the panel advises programme management to take steps to improve these figures. One of the means to do so may be to fine-tune the information to prospective students, providing them with clear views on the programme contents, in particular regarding the Automotive Technology major/track.

Having been offered the opportunity to visit study rooms and labs of the programme, the panel is very positive about the facilities provided for students.

The panel finds the measures taken by programme management to organise education in the Covid pandemic sound. Programme management made appropriate efforts to mitigate the effects of the pandemic on students.

*Assessment of this standard*

These considerations have led the assessment panel to assess the programme to meet Standard 2, Teaching-learning environment.

### 3.3 Standard 3: Student assessment

The programme has an adequate system of student assessment in place.
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#### *Findings*

The examinations and assessments in this programme are subject to the guidelines of the Bachelor College of the university and to the assessment policy of the Department of Electrical Engineering. Along with the Regulations of the Examination Committee, they lay the groundwork for the examinations and assessments. As has been indicated, the Examination Committee has the authority to monitor and assure the quality of examination and assessment processes and products of this and the Master Electrical Engineering programme of the Department.

The final grades for each of the courses in the programme are determined by the weighted average of the results of multiple examination components in the courses. These components have different examination methods, including written examinations, oral presentations, reports, quizzes, assignments, and projects. Examination methods are selected in line with the course goals to be assessed. Because of the programme scale and for efficiency reasons, written examinations are predominant in the programme. In the first year of the programme, summative interim tests are scheduled to promote students' study pace. The course coordinators determine the weights of the components within the courses. The Examination Committee regularly checks the course goals and the course assessment plan with the various components and the weights. Fraud and plagiarism procedures are in place. In the design-based learning projects, students work together in small groups. To prevent free-riding in these projects, individual examinations within these projects are scheduled and additional means, such as peer review among students, are adopted.

The Bachelor final projects are assessed by panels of examiners from the Department of Electrical Engineering joined by an expert on professional skills. These panels are largely composed of the same examiners. The final project supervisor is no member of the panel, but acts as an advisor in this assessment process. The panel assesses the final projects, using the standardised final project evaluation form. This form lists criteria to determine students' knowledge, research and design qualities, professional attitude, and written and oral communication skills. The last two are to be assessed on the basis of the report and the oral defence of students before the examiners' panel. For the Master Electrical Engineering graduation projects, programme management introduced qualitative guidelines or rubrics for grading. Programme management intends to adopt qualitative guidelines for the grading of the Bachelor final projects as well.

Programme management and the Examination Committee have taken measures to assure the quality of the examinations and assessments in the programme. Assessment plans for courses, exhibiting how the course goals and course contents are assessed, are drawn up. At least two examiners are involved in drafting and assessing examinations. In the programme course catalogue, the assessment plans of courses, including the calculation of the final grades of courses, are clarified for students. Students with whom the panel met, found the grading in courses transparent.

The departmental working group, which was installed at the beginning of the Covid pandemic for the transition to online education, also had the task to make the transfer to online examinations and assessments during the pandemic as smooth as possible for students and teachers. Teachers designed alternative examinations for courses, such as take-home assignments, oral examinations and online examinations. The Examination Committee ensured these examinations to cover the course goals and took measures to counter fraud. At the moment, programme management is in the process of evaluating online examinations to see which formats may be retained.

#### *Considerations*

The panel approves of the examination and assessment procedures in the programme, which are in line with university and department rules and regulations. The panel is positive about the position and responsibilities of the Examination Committee.

The assessment plans for the courses allow the examination and assessments of the courses to be well-aligned with the course goals and through these course goals with the programme intended learning outcomes. The panel understands the reason for the predominance of written examinations, but is pleased to see other examination methods as well. The instruments adopted to assess the performances of individual students and to counter free-riding are many-sided and effective.

In the panel's opinion, the procedures for the assessment of the Bachelor final projects, with the panel of examiners and the supervisor acting as an advisor, are effective to arrive at reliable assessments. The panel is equally positive about the standardised final project evaluation form recently adopted in this assessment process. The panel, nevertheless, feels the introduction of qualitative guidelines for grading (rubrics) may further improve the grading of the final projects.

The panel finds the measures taken to monitor and assure the quality of examinations and assessments to be up to standard. The Examination Committee is solid and active in performing their duties.

The panel regards the measures taken by programme management to organise examinations and assessments in the Covid pandemic to be sound. The Examination Committee ensured the intended learning outcomes of the programme to be achieved.

#### *Assessment of this standard*

These considerations have led the assessment panel to assess the programme to meet Standard 3, Student assessment.

### 3.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.
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#### *Findings*

The panel studied the examinations of a number of courses of the programme. In addition, the panel reviewed fifteen Bachelor final projects of graduates of the programme of the last two years. The average grade for all projects of the last two years is about 7.7.

As explained before, graduates of this programme do not tend to enter the labour market. They continue their studies at master level. The large majority of the graduates continue their studies by enrolling in the Master Electrical Engineering programme or the Master Automotive Technology of this university, depending upon their major/track. Most of the other students enrol in other interdepartmental master programmes of the university, being Embedded Systems, Sustainable Energy Technology, Systems and Control, or Nuclear Fusion. Student survey results indicate students feeling well prepared for these master programmes.

Programme management maintains relations with the professional field, to ensure the programme to be aligned with industry requirements. The Board of Advice, being composed of representatives of the professional field, meets once per year with programme management. The Board comments on the programme's intended learning outcomes, curriculum and relations to industry.

#### *Considerations*

The quality and the level of the course examinations, which the panel reviewed, are up to standard. The panel finds these examinations to conform to and to test adequately the goals of the courses.

The Bachelor final projects the panel studied, match the intended learning outcomes. The panel evaluates the grades given by the programme examiners as being fair. The panel agrees with these grades. No final projects were found to be unsatisfactory by the panel. Some of the final projects are evaluated by the panel as very good. The quality and academic level of the final projects meet the bachelor level requirements in the domain of electrical engineering.

The master programmes, to which the graduates are admitted, showcase the results these graduates have achieved at completion of this programme.

The panel welcomes the relations of programme management with the Board of Advice as a means to align the programme with professional field requirements. Having seen multiple relations of programme management and staff with the professional field, the panel advises to adjust and combine the relations to be more effective.

#### *Assessment of this standard*

These considerations have led the assessment panel to assess the programme to meet Standard 4, Achieved learning outcomes.



#### 4. Overview of assessments

Standard	Assessment
Standard 1. Intended learning outcomes	Programme meets Standard 1
Standard 2: Teaching-learning environment	Programme meets Standard 2
Standard 3: Student assessment	Programme meets Standard 3
Standard 4: Achieved learning outcomes	Programme meets Standard 4
Programme	Positive

## 5. Recommendations

In this report, a number of recommendations by the panel have been listed. For the sake of clarity, these have been brought together below.

- To reconsider the labelling of the structure of the majors/tracks and themes, achieving more clarity and more coherence in the programme's structure, improving the alignment of Bachelor and Master programmes, and adding to the understanding of the programme by prospective students.
- To attract more Dutch students by advertising the programme more intensively at Dutch high schools.
- To take steps to raise the number of female students.
- To work on the further integration of the professional skills training in the courses.
- To ensure all student mentors meeting quality requirements.
- To balance the study load in the programme.
- To take steps to improve the student success rates, drop-out rates and first year binding study advice rates.
- To adjust and to combine the relations with the professional field to be more effective.

## Appendix: Assessment process

Eindhoven University of Technology requested evaluation agency Certiked VBI to support the limited framework programme assessment process for the Bachelor Electrical Engineering programme of this University. The objective of the programme assessment process was to assess whether the programme conforms to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands of September 2018 (officially published in Stcrt. 2019 no. 3198, on 29 January 2019).

The assessment process of this programme was part of the assessment of the Electrical Engineering cluster (WO Elektrotechniek), constituting the Bachelor and Master Electrical Engineering programmes of the universities of technology in the Netherlands, Delft University of Technology, Eindhoven University of Technology, and University of Twente.

Programme management of the Bachelor and Master Electrical Engineering programmes of the these three Universities in the Netherlands drafted the list of panel candidates. Having conferred with programme management of these programmes, Certiked invited candidate panel members to sit on the assessment panel. The panel members agreed to do so.

The panel composition was as follows:

- Prof.dr.ir. Dr. h.c. R.W. De Doncker, full professor, RWTH Aachen University, Germany (panel chair);
- Prof.dr.ir. J. Bauwelinck, associate professor, Ghent University, Belgium (panel member);
- Dr.ir. K. Philips, general manager, IMEC at Holst Centre, Eindhoven, the Netherlands (panel member);
- Dr. C. Terlouw, independent expert in secondary and higher education, Enschede, the Netherlands (panel member);
- R. Helmantel BSc, student Master Educational Sciences, University of Amsterdam, the Netherlands (student member).

On behalf of Certiked, W. Vercouteren served as the process coordinator/secretary in the assessment process.

All panel members and the process coordinator/secretary confirmed in writing that they had no conflict of interest with regard to the programme to be assessed and that they would observe the rules of confidentiality. Having obtained the authorisation by Eindhoven University of Technology, the process coordinator/secretary requested the approval of NVAO of the proposed panel to conduct the assessment. NVAO have given their approval.

To prepare the assessment process, the process coordinator/secretary met with management of this programme to determine, among other things, the outline of the self-evaluation report, the subjects to be addressed in this report, and the site visit schedule. In addition, the planning of activities in preparation of the site visit were discussed. In preparation of the site visit, programme management

and the process coordinator/secretary had contact to fine-tune the process. The activities were performed as planned. Programme management approved the schedule for the site visit.

Well in advance of the site visit date, programme management forwarded the list of Bachelor final projects of students graduated in the most recent years (2019, 2020, 2021). Acting on behalf of the assessment panel, the process coordinator/secretary selected fifteen projects from this list. The grade distribution in the selection matched the grade distribution in the list forwarded by programme management. In the selection of the projects, the programme tracks/majors as well as the programme themes were covered.

The self-evaluation report of the programme was sent in advance to the panel chair and the panel members. In this report, the four standards of the NVAO Assessment framework were discussed. The student chapter was part of the self-evaluation report. The appendices to the self-evaluation report included the following documents.

- Relation between study components and intended learning outcomes
- Student data
- Overview of study methods and examination methods
- 3TU Domain-Specific Frame of Reference Electrical Engineering
- Bachelor College Guidelines, 2021
- Examination Committee Regulations Electrical Engineering, 2020/2021
- Programme and Examination Regulations Bachelor Electrical Engineering, 2020/2021
- Quality assurance plan Electrical Engineering, 2021/2022
- Assessment policy Electrical Engineering, 2021
- Examination Committee annual reports, 2019/2020 and 2020/2021
- Programme Committee annual reports, 2019/2020 and 2020/2021
- Education 2030, drivers of change, Eindhoven University of Technology
- Department of Electrical Engineering educational vision
- Overview of professional skills
- Overview teaching staff
- 4TU BKO regulations
- Language policy, Eindhoven University of Technology
- Minutes departmental Board of Advice, June 2021
- Innovation proposal Redesign Bachelor Electrical Engineering, 2022
- Board decisions related to Coronavirus measures
- Electrical Engineering Corona regulations, 2020/2021
- Student project regulations during the Corona period
- Use of proctorio, Eindhoven University of Technology
- Report evaluations Bachelor final project Electrical Engineering, 2020/2021
- Report end-of-year surveys Electrical Engineering, 2020/2021
- Report hybrid education survey Electrical Engineering
- Alumni survey results Bachelor Electrical Engineering
- Course descriptions
- Course material and course examinations

In addition, all of the expert panel members studied a number of Bachelor final projects of programme graduates, the total of these projects making up the selection made by the process coordinator/secretary.

Well before the site visit, the panel chair and the process coordinator/secretary discussed the procedures with respect to the assessment process. The panel chair was also informed about the competencies, listed in the profile of panel chairs of NVAO. The meeting between the panel chair and the process coordinator/secretary served as the briefing for panel chairs, as meant in the NVAO profile of panel chairs. The panel chair agreed to work in line with the profile of panel chairs.

The panel members were sent the Trained Eye document of Certiked evaluation agency, this document being the explanation of the NVAO Assessment framework.

Prior to the site visit date, all panel members sent in their preliminary findings, based on the self-evaluation report and the Bachelor final projects studied, and forwarded a number of questions to be put to programme representatives on the day of the site visit. The process coordinator/secretary summarised this information, compiling a list of questions, which served as a starting point for the discussions during the site visit.

On 15 November 2022, the panel met to go over the preliminary findings concerning the quality of the programme. During this meeting, the preliminary findings of the panel members, including those about the Bachelor final projects were exchanged. The procedures to be adopted during the site visit, including the questions to be put to the programme representatives on the basis of the list compiled, were also discussed.

On 16 November 2022, the panel conducted the site visit on the campus of Eindhoven University of Technology. The site visit schedule was in accordance with the schedule as planned.

The site visit schedule included the following meetings.

- 09.00 – 09.30 Department of Electrical Engineering representatives and programme management
- 09.30 – 10.30 Programme management, core lecturers, academic advisor
- 10.45 – 11.15 Examination Committee
- 11.30 – 12.15 Lecturers, final projects' examiners
- 12.15 – 12.45 Open-office hours
- 12.45 – 13.15 Panel lunch (closed session)
- 13.15 – 14.00 Tour around programme labs and facilities
- 14.00 – 14.45 Students, with Programme Committee student members, and programme alumni
- 14.45 – 15.15 Representatives professional field
- 15.15 – 16.45 Deliberations panel (closed session)
- 16.45 – 17.00 Presentation main findings by panel chair to programme representatives
- 17.00 – 17.30 Development dialogue between panel and programme management

Open-office hours were communicated in a timely way by programme management to programme staff, lecturers and students. No-one, however, came forward to make use of these open hours.

In a closed session at the end of the site visit, the panel considered all of the findings, weighed the considerations and arrived at conclusions with regard to the quality of the programme. At the end of the site visit, the panel chair presented the broad outline of findings, considerations, assessments and recommendations to programme representatives.

At the end of the site visit and clearly separated from the process of the programme assessment, panel members and programme representatives met to conduct the development dialogue. The objective of this dialogue was to discuss future developments of the programme.

The assessment draft report was finalised by the process coordinator/secretary, taking into account the findings, considerations, assessments and conclusions of the panel. The draft report was sent to the panel members, who studied it and made a number of changes. Thereupon, the secretary edited the report. This report was then presented to programme management to be corrected for factual inconsistencies. Programme management were given two weeks to respond. Having been corrected for factual inconsistencies, the final report was sent to the University Board to accompany their request to continue the accreditation of this programme.