

Assessment report  
Limited Framework Programme Assessment

**Master Electrical Engineering**

Delft University of Technology

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## 1. Executive summary

In this executive summary, the assessment panel presents the main findings and considerations underlying the assessment of the quality of the Master Electrical Engineering programme of Delft 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 master programmes in the electrical engineering domain. This Master programme builds upon the Bachelor Electrical Engineering programme and prepares students to enter 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. The intended learning outcomes match the master level requirements, as specified by the Meijers criteria for this level. The monitoring and updating of the intended learning outcomes and the curriculum are done adequately.

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

The gradually 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 understands the reasons of programme management to contain the inflow of international, non-European students, but advises to keep paying attention to their on-boarding and well-being. The panel advises to take steps to raise the number of female students further.

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 themselves are well-organised. Students being allowed to select tracks and specialisations is favourable. The curriculum set-up with common core courses, track-related courses, free electives and Master graduation projects is well-considered.

Teachers are researchers in this domain and connect teaching to their research. The panel endorses the steps programme management is taking to raise the number of female staff. Nevertheless, the panel advises to pay generally more attention to the on-boarding programme for new teachers. The educational capabilities of the teachers are up to standard, as 56 % of them are BKO-certified and another 21 % of them will obtain the certificate in the coming years. Teachers are accessible for students.

The educational concept and study methods of the programme are adequate means to convey knowledge and skills in the programme domain. The mix of theory and practice is well-thought-through, allowing students to connect theoretical concepts to practical, real-world applications.

The student guidance in the programme, as provided by student mentors, master track coordinators and academic counsellor, is effective. The master track coordinators are very helpful in arranging coherent Individual Exam Programmes, enabling students to become knowledgeable and skilful in the specialisation of their choice. The panel advises to improve the internal alignment and communication between staff members in view of staff-student interaction.

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 Board of Examiners 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 examination and assessment procedures in the programme are aligned with university and faculty rules and regulations. The position and responsibilities of the Board of Examiners are clear and well-founded. Through the programme assessment plan, course examinations and assessments are well-aligned with the course goals and with the programme intended learning outcomes. The measures to assure the quality of examinations and assessments are up to standard. The Board of Examiners performs the duties adequately.

The examination methods are in line with the course goals and course contents. Final course grades are transparently deduced from grades of course components. The instruments adopted to assess the performances of individual students in group projects are effective.

The procedures for the assessment of the Master graduation projects, with the committees of examiners and the rubrics assessment forms, are effective to arrive at justified assessments.

The panel advises to continue and strengthen the theses carousel with the programmes of the other universities and to extend this carousel to the Bachelor programmes.

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 Master graduation projects meet the requirements of master programmes in the electrical engineering domain. The Master graduation projects, which the panel studied, match the intended learning outcomes. The panel agrees with the grades given by the programme examiners.

The Board of Examiners monitors the proportion of students graduating cum laude.

The positions, which graduates of this programme manage to secure, showcase the results these graduates have achieved at completion of this programme.

The relations of programme management with the Industrial Advisory Board are instrumental in aligning the programme with professional field requirements.

Having conducted the assessment of the Master Electrical Engineering programme of Delft 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, 7 February, 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: Master Electrical Engineering  
Orientation, level programme: Academic Master  
Grade: Master of Science (MSc)  
Number of credits: 120 EC  
Tracks: Electrical Power Engineering  
Microelectronics  
Signals and Systems  
Wireless Communication and Sensing  
Location: Delft  
Mode of study: Full-time (language of instruction: English)  
Registration in CROHO: 21PF-60353

Name of institution: Delft 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.
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##### *Findings*

From the organisational perspective, the Master Electrical Engineering programme is one of the programmes of the Faculty of Electrical Engineering, Mathematics and Computer Science of Delft University of Technology. The faculty offers a range of bachelor, master and PhD programmes. The management team of the faculty, chaired by the Dean, includes the heads of the six faculty research departments, the heads of human resources and finance and the director of education. The director of education is responsible for the educational processes and quality of the bachelor and master programmes of the faculty. Acting on behalf of the director of education, the director of studies has the responsibility for managing both the Bachelor and Master Electrical Engineering programmes. The Board of Studies for both these programmes, being composed of lecturers and students, advises the director of studies on the quality of these programmes. The Board of Examiners, being positioned at faculty level, monitors and assures the quality of examinations and assessments of all bachelor and master programmes of the faculty. One dedicated subcommittee of this Board oversees the examinations and assessments of both the Bachelor and Master Electrical Engineering programmes.

The panel was informed about the recommendations in the previous assessment process, six years ago, and about the follow-up actions by programme management on the recommendations. Firstly, both broadening and deepening courses are offered in the programme, allowing students to be educated as T-shaped engineers. Secondly, the track Telecommunications and Sensing Systems was renamed and redesigned as Wireless Communication and Sensing, being well-staffed by newly recruited staff members and attracting favourable numbers of students. Thirdly, societal and ethical dimensions are addressed in the programme. The recommendation about aligning the intended learning outcomes of the programmes Master Electrical Engineering and Master Computer Engineering applies no longer, as the Master Computer Engineering has been included in a newly designed programme.

This programme is a two-year or 120 EC academic master programme in the electrical engineering domain. The programme objectives are to train students to become responsible engineers of the future, to educate them at master level in this domain, and to enable them to perform professional or scientific activities in this domain self-reliant and at academic level. Students of this programme are 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. In this programme, students are given the opportunity to select one out of the four tracks. The tracks are *Electrical Power Engineering*, *Microelectronics*, *Signals and Systems*, and *Wireless Communication and Sensing*. The intended learning outcomes include students being educated in one of these subdomains of electrical engineering at master level, having the intellectual and acquisitive skills to work in one of these subdomains, being able to work in multi-disciplinary contexts, and having the personal and social capacities to perform the professional activities of electrical engineers.

As was shown in the critical reflection report, the programme's intended learning outcomes comply with the Domain-specific Frame of Reference. As also is demonstrated in the critical reflection report, the intended learning outcomes match the Meijers criteria for master programmes.

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

The programme name is English, meeting international standards in this domain. The language of instruction is English as well. The choice for English derives from the international character of this programme. The programme attracts many international students and also recruits substantial numbers of international staff.

#### *Considerations*

The panel regards the organisation of the programme to be effective and to enable appropriate monitoring and assuring of 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 master programmes in the electrical engineering domain. The panel acknowledges this Master programme to build upon the Bachelor Electrical Engineering programme and to explicitly prepare students to directly enter the labour market,

The panel regards the Domain-specific Frame of Reference as 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 master level, as specified by the Meijers criteria for this level. The panel is positive about the monitoring and updating of the intended learning outcomes and the curriculum of this programme.

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 gradually increased over the last five years from 153 in 2017 to 195 in 2021. In 2020 and in 2021, the intake was at about 200 incoming students, which for programme management is on target. The proportion of female students is on average 23 % over the last five years. Programme management is making efforts to raise the percentage of female students further. The proportion of international students is very substantial at 72 % of total intake with 61 % of the students coming from outside of Europe. Programme management wants to contain the number of international, non-European students and, therefore, decided in 2021 to apply ranked batch admission procedures. In these procedures, only the most qualified students are admitted.

Interested students are offered information sessions to obtain information about the programme. The following categories of applicants are eligible for admission to the programme. Applicants having completed the Bachelor Electrical Engineering programmes of one of the Dutch universities of technology are admitted directly. Applicants with university bachelor degrees in disciplines comparable to electrical engineering have to take (part of) the bridging programme before being admitted. Applicants with university of applied sciences (HBO) diplomas in electrical engineering or similar domains have to take the bridging programme as well. The bridging programme carries 52 EC of study load and must be completed within two years. Students with relevant university degrees coming from abroad need GPAs of at least 75 %, are to write an essay in English about their bachelor programme and their motivation, have to submit two letters of recommendation and must give evidence of their command of English. Applications are screened by the admission committee.

The curriculum of the programme consists in the first year of two compulsory courses (8 EC), two common core courses (10 EC), three track core courses and a number of profile or specialisation courses (42 EC), and in the second year of free electives (15 EC), and the Master graduation or thesis project (45 EC). The compulsory courses are *Systems Engineering* and *Profile Orientation and Academic Skills*. The latter course addresses generic academic knowledge and skills, such as oral presentation, writing skills, societal awareness and ethics. The two common courses are to be selected from the set of eight courses offered. Students have to choose one of the four tracks in the programme where each track defines a number of profiles. Profiles are informal, non-restrictive refinements of the track that suggest consistent study paths that can match the individual interests of students. Students' study plans are largely determined by the track and specialisation they opt for. Master track coordinators and, possibly, thesis supervisors assist students in composing their Individual Exam Programme (IEP). These IEPs are sets of courses students have to take in each of the tracks and specialisations, bringing their study plans in line with the track and specialisation they have chosen. The Examination Committee formally approves the IEPs. The free electives

space may be used to take additional specialising or broadening courses, or to do internships or projects, often meant as preparation for the Master graduation project. The graduation project itself is the final part of the curriculum and may be done at one of the research groups within the university, at research centres of companies or at external research institutes. Very good students may opt for the Honours programme. International students tend to try and achieve cum laude distinctions instead of taking this Honours programme.

In the critical reflection report, programme management presented the overview of the relations of the curriculum components to the intended learning outcomes. The correspondence between the curriculum and the intended learning outcomes of the programme has been demonstrated.

Little over hundred staff members are involved in the programme. In recent years, new staff were recruited, accommodating the growth in student numbers. Programme management makes efforts to raise the number of female staff (currently 13 %) for the gender balance and for female students to identify with them (see them as role models). The teaching staff is composed of full professors, associate professors, assistant professors and lecturers. Nearly all staff members have PhDs and are researchers in this domain, connecting teaching to their research. Staff mainly come from the research departments Electrical Sustainable Energy, Microelectronics, or Quantum and Computer Engineering. Teachers from other departments teach specialised subjects. Mathematics courses are offered by the Department of Applied Mathematics. Academic and professional skills training is provided by the Centre for Languages and Academic Skills. PhD students are involved as teaching assistants for some of their contracted time. PhD students with extended, five-year contracts spend more time on education. The proportion of BKO-certified teachers is 56 %, while 21 % of all teachers are in the certification process.

The educational concept of the programme consists of the balanced mix of theory and practice. In the programme, various teaching methods are adopted. These include lectures with presentations and sometimes with homework assignments, practical work and assignments, and projects. The practical work and projects are meant for students to apply theoretical concepts in practice and to relate theory to real-world problems. Projects are larger and more open-ended than practical assignments and may include analysis, design, simulation, experimentation, implementation and testing activities. In a number of courses, students have to work together in groups, overseeing each others' work. These groups are composed of students with various international and intercultural backgrounds.

Students experience this programme as demanding, but understand the more challenging nature of this programme compared to the Bachelor programme. Programme management has organised educational processes and study guidance to support students. The number of hours of face-to-face education is about 12 hours per week in the courses of the first year. The rest of the time is reserved for self-study activities. The students-to-staff ratio is 27 : 1. Students in groups are supported in the first quarter of the first year by second-year student mentors, who are trained for these tasks. Master track coordinators representing the various specialisations in the programme, inform students about the specialisations and guide them to compose their Individual Exam Programmes. These coordinators are the first point of contact for students in case of study-related issues. The

coordinators refer students to the academic counsellor of the programme when personal problems would surface. Every quarter, programme management schedules briefings to inform students and to inquire about any issues they might have.

The proportion of students completing the programme within three years, is on average 78 % for the last five years, with 81 % of the international students finishing within three years and on average 50 % of the Dutch students doing so. The percentage of students dropping out of the programme is very limited to about 6 % per year for the past years.

From the beginning of the Covid pandemic, teachers adapted to the situation and transformed theoretical lectures into online lectures. Practical sessions were replaced by simulations or offered online or rescheduled awaiting on-campus activities being allowed. Programme management took measures to guard students' well-being, the effects of which are reflected in fair results in this respect in student surveys. Programme management intends to retain offering recorded lectures online and servicing communication platforms to facilitate interaction among students and teachers.

#### *Considerations*

The panel welcomes the gradually rising number of incoming students in the programme, as the demand for electrical engineers will continue to increase over the years. Programme management's intentions of containing the influx of international, non-European students is understood by the panel, but the panel advises to keep paying attention to their on-boarding and well-being. The panel notes the relatively low proportion of female students and advises programme management to take steps to raise their numbers further.

The panel considers the entry requirements and admission procedures as 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. Students being allowed to select tracks and specialisations is favourable. The curriculum set-up with courses, free electives and Master graduation projects is well-considered. The panel wants to emphasise the importance of internships, which are currently not mandatory included in the curriculum.

The panel welcomes teachers being researchers in this domain and connecting teaching to their research. This way students are made familiar with research and new developments in this domain. The panel endorses the steps programme management is taking to raise the number of female staff. Nevertheless, the panel advises to pay generally more attention to the on-boarding programme for new teachers. The educational capabilities of the teachers are up to standard, as 56 % of them are BKO-certified and another 21 % of them will obtain the certificate in the coming years. Teachers are accessible for students. Involving PhD students as teaching assistants is seen as beneficial by the panel.

The panel evaluates the educational concept and the study methods of the programme as adequate means to convey knowledge and skills in the programme domain. The mix of theory and practice is well-considered, allowing students to connect theoretical concepts to practical applications and real-world situations.

The panel approves the student guidance in the programme, as provided by student mentors, master track coordinators and academic counsellor. The master track coordinators are very helpful in arranging coherent Individual Exam Programmes, enabling students to become knowledgeable and skilful in the specialisation of their choice. The panel notes divergent information provision to students in terms of information on the Brightspace platform versus the programme website, and in terms of the accessibility of teachers and supervisors. The panel advises to improve the internal alignment and communication between staff members in view of staff-student interaction.

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 Faculty of Electrical Engineering, Mathematics and Computer Science Assessment Policy and the Rules and Regulations of the Board of Examiners. The main principle of these assessment policies and regulations is constructive alignment, which implies the correspondence of the programme intended learning outcomes, course learning objectives, contents of courses and course examinations and assessments. For this programme, the principle of constructive alignment has resulted in the programme assessment plan, linking the aforementioned elements. As has been indicated, the Board of Examiners has the authority to monitor and assure the quality of examination and assessment processes and products of all programmes of the faculty. The dedicated subcommittee of this Board oversees the examinations and assessments of both the Bachelor and Master Electrical Engineering programmes.

The assessment of courses in the programme is for most of these courses based upon multiple examination components. The final course grades are determined by the weighted average of the results of the examination components. These components have different examination methods, being written examinations, oral examinations, practical/lab tests, reports or presentations. Written examinations are dominant for the theoretical parts. The practical/lab results are typically assessed in terms of pass/fail judgements. Students have to repeat failed practical work until they pass the test. In the projects, students are assessed in groups of 2 to 4 students on the basis of reports, oral presentations and/or individual Q&A sessions. Multiple assessors are involved in the grading of projects to ensure uniformity. Discussion among assessors allows for grading of individual students. For the assessment of projects, rubrics (or grade descriptors) are used.

The Master graduation projects are individual projects, in which students are guided by their supervisor. Day-to-day supervision may be in the hands of PhD students. In case of external projects, supervisors of host organisations will be involved as well. The graduation projects are assessed by committees, being composed of two to three senior staff members. Extra members may take part in the assessment, such as external supervisors, internal or external experts or PhD students. The assessment is based upon the report, oral presentation and oral defence. For the assessment of these projects, rubrics (or grade descriptors) are used.

Recently, the Master Electrical Engineering programmes of the three universities of technology started the theses carrousel, exchanging theses among them and comparing the assessments.

In addition to the constructive alignment principle and the programme assessment plan, programme management and the Board of Examiners have taken a series of measures to assure the quality of examinations and assessments in the programme. These include draft examinations being peer-reviewed by second examiners, examinations being reviewed by the faculty assessment expert,

learning goals, assessment methods and grade calculations for theory courses being published in course guides, assessment criteria for projects being made available for students, and rules and regulations for fraud or plagiarism being in place.

During the Covid pandemic, examiners designed alternative examinations for courses, such as open-book examinations, oral tests or (proctored) online examinations. The Board of Examiners ensured these examinations to cover the course goals and took measures to counter fraud.

#### *Considerations*

The panel approves of the examination and assessment procedures in the programme, which are aligned with university and faculty rules and regulations. The position and responsibilities of the Board of Examiners are clear and well-founded. The panel welcomes the implementation of the constructive alignment principle in the programme. The assessment plan allows the examinations 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 regards the examination methods to be in line with the course goals and course contents. Final course grades are transparently deduced from grades of course components. The instruments adopted to assess the performances of individual students in group projects are effective.

In the panel's opinion, the procedures for the assessment of the Master graduation projects, with the committees of examiners, are effective to arrive at justified assessments. The panel is equally positive about the rubrics form adopted in this assessment process.

The panel advises to continue and strengthen the theses carousel with the programmes of the other universities and to extend this carousel to the Bachelor programmes.

The panel considers the measures taken to monitor and assure the quality of examinations and assessments to be up to standard. The Board of Examiners performs their duties adequately.

The panel regards the measures taken by programme management to organise examinations and assessments in the Covid pandemic to be sound. The Board of Examiners 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 Master graduation projects of students in the programme who graduated in one of the most recent four years. The average grade for all the graduation projects of these years is nearly 8.0. Almost 30 % of the students, graduated in the academic year 2020/2021, (co-) authored at least one scientific paper.

The proportion of students graduating with the cum laude distinction is about 13 % in the last few years. The Board of Examiners monitors the proportion of students graduating cum laude, with the objective of keeping this proportion at no more than 10 %.

As explained before, graduates of the programme are explicitly prepared to enter the labour market. Graduates tend to find suitable positions very easily. About 75 % of them secured positions within three months after graduating. About 19 % of the graduates continued their studies in PhD trajectories. The rest of them obtained positions in industry. In the survey held in 2022, programme alumni rated the programme quality at 7.9 out of 10.

Programme management maintains relations with the professional field, to ensure the programme to be aligned with industry requirements. The Industrial Advisory Board, being composed of representatives of the professional field, was installed in 2019 and met before the beginning of the Covid-pandemic with programme management. The Board comments on, among other things, 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 Master graduation 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 graduation projects were found to be unsatisfactory by the panel. Some of the projects are evaluated by the panel as very good or even surpassing the master level. The quality and academic level of the projects meet the master level requirements in the domain of electrical engineering.

The panel welcomes the monitoring of the proportion of students graduating cum laude in this programme by the Board of Examiners.

The positions, which graduates of this programme manage to secure, showcase the results these graduates have achieved at completion of this programme.

The panel welcomes the relations of programme management with the Industrial Advisory Board as a means to align the programme with professional field requirements.

*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 take steps to raise the number of female students further.
- To keep paying attention to the on-boarding and well-being of international students.
- To pay more attention to the on-boarding programme for new teachers.
- To improve the internal alignment and communication between staff members in view of staff-student interaction.
- To continue and strengthen the theses carousel with the programmes of the other universities and to extend this carousel to the Bachelor programmes.

## Appendix: Assessment process

Delft University of Technology requested evaluation agency Certiked VBI to support the limited framework programme assessment process for the Master 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 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 Delft 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 critical reflection 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 sent the list of Master graduation projects of students having graduated in the three most recent examination years (2018, 2019, 2020). 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. All of the programme tracks were included in the selection.

The critical reflection 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 critical reflection report. The appendices to this report included the following documents.

- Follow-up to recommendations in programme assessment 2016
- Data on student intake, performance and contact hours
- 3TU Domain-Specific Frame of Reference Electrical Engineering
- Descriptions of content of curriculum
- Course descriptions
- Teaching and Examination Regulations
- Overview of lecturing staff and staff qualifications
- Overview of theses
- Selection of course study materials
- Selection of course examinations
- Annual reports of Board of Studies
- Annual reports of Board of Examiners
- Faculty of Electrical Engineering, Mathematics and Computer Science Assessment Policy
- Electrical Engineering Assessment Plan
- Board of Examiners Rules and Regulations

In addition, all of the expert panel members studied a number of Master graduation 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 critical reflection report and the graduation 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 the 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 Master graduation 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 17 November 2022, the panel conducted the site visit on the campus of Delft 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	Faculty representatives, department heads, and director of studies
09.30 – 10.30	Director of studies, core lecturers, study advisor
10.45 – 11.15	Board of Examiners
11.30 – 12.15	Lecturers, graduation 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 Board of Studies student members, and programme alumni
14.45 – 16.15	Deliberations panel (closed session)
16.15 – 16.30	Presentation main findings by panel chair to programme representatives
16.30 – 17.00	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.