

Assessment report  
Limited Framework Programme Assessment

**Master Systems and Control**

University of Twente

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## 1. Executive summary

In this executive summary, the panel presents the main considerations which led to the assessment of the quality of the Master Systems and Control programme of University of Twente, which has been assessed according to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, as published on 20 December 2016 (Staatscourant nr. 69458).

The panel is positive about the cooperation of the Master Systems and Control programmes of the three Dutch Universities of Technology, since this cooperation may be beneficial for the contents of all three programmes.

The University of Twente programme is regarded by the panel to be adequately organised and managed.

The panel welcomes the programme objectives, as these give very appropriate descriptions of the systems and control domain and very adequately delineate the objectives regarding the knowledge and skills of students at completion of the programme.

In addition, the panel is pleased to note the programme objectives meet international standards, as exemplified by the correspondence of the objectives with the International Federation of Automatic Control (IFAC) report. The panel welcomes the benchmark study conducted by the three Dutch Master Systems and Control programmes and observes these programmes to be aligned with well-respected programmes in this domain abroad.

In line with the intentions of programme management, the panel advises to install an industry advisory board, to allow the programme to align with trends and developments in the professional field.

The panel regards the programme intended learning outcomes to be elaborate and well-phrased, being adequate operationalisations of the programme objectives and meeting the master programme level. The panel suggests to broaden the intended learning outcomes with aspects of signal processing, communication and computation.

The panel notes the influx of students to be rather small and students with Bachelors Mechanical Engineering, Electrical Engineering or Applied Mathematics not enrolling in this programme. The panel, therefore, advises to promote students with these backgrounds to enter this programme.

The panel appreciates the curriculum. The contents of the courses are relevant and the level of the courses is distinctly high. The panel considers the curriculum coherence to be up to standard, being composed of core courses, specialisation courses, the internship and the graduation project. The course on societal and ethical dimensions of science is a very good course. As the total study load of the core courses is limited, the panel suggests to extend the core curriculum and advises to include an additional course on control theory. In addition, the panel recommends to introduce an experimental set-up in the integration project course. The panel also proposes to ensure all students being taught the multidisciplinary dimensions of the systems and control domain. As the distribution across the specialisations is rather skewed, the panel suggests to try and spread students more evenly over the specialisations, and increase the cohesion between the specialisations. The internship being mandatory is very positive. The panel suggests, however, to schedule either the internship or the graduation project at companies, to allow students to become acquainted with the professional field. Although many internships are abroad, the panel advises to promote students taking parts of the curriculum abroad.

The panel regards the lecturers to be very good researchers in this domain, welcoming the cooperation of the Master Systems and Control programmes in the DISC Research School. The lecturers refer to their research in class. The lecturers are good teachers, as the proportion of UTQ-certified lecturers shows.

The admission requirements and procedures are up to standard. The panel is positive about the bridging programme, enabling students to gain access to the programme.

The panel appreciates the educational set-up of the programme, the study methods and the system of study guidance. The panel advises to improve the student success rates.

The material facilities and the laboratories, provided to the students of the programme, are up to standard.

The examinations and assessments rules and regulations of the programme are adequate. In addition, the panel approves of the position and responsibilities of the Examination Board.

The panel regards the examination methods to be appropriate. In the panel's view, the supervision of the internships and the graduation projects is appropriate. The panel welcomes senior staff members being involved in this supervision. The panel appreciates the procedures governing the assessment of the graduation projects. The panel welcomes the composition of the Assessment Committees, the assessment procedures and the assessment forms. In the panel's opinion, the assessment process of the graduation projects leads to reliable assessments.

The programme has taken satisfactory measures to promote the validity of examinations, the reliability of assessments and the transparency of examinations. The Examination Board is active in monitoring the examinations and graduation projects quality.

The examinations of the courses, the panel studied, are up to standard. The panel supports the grades given to the graduation projects by the programme examiners, at the same time endorsing the Examination Board's intentions to scrutinise projects for too high grades or too many distinctions. The subjects addressed in the projects were within the domain. The projects were good methodologically.

The panel considers the graduates of the programme to be very knowledgeable about and very skilled in this domain and to be very well prepared for the labour market. The career prospects of the graduates are very good, if not excellent. The panel noted the graduates to be able to apply their knowledge and skills both in positions in the professional field or as PhD students.

The panel which conducted the assessment of the Master Systems and Control programme of University of Twente assesses this programme to meet the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, judging the programme to be good. Therefore, the panel recommends NVAO to accredit this programme.

Rotterdam, 21 September 2018

Prof. dr. A.J. van der Schaft  
(panel chair)

drs. W. Vercouteren  
(panel secretary)

## 2. Assessment process

The evaluation agency Certiked VBI received the request by University of Twente to manage the limited framework programme assessment process for the Master Systems and Control programme of this University. This objective of the programme assessment process was to assess whether the programme would conform to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, published on 20 December 2016 (Staatscourant nr. 69458).

Management of the programmes in the assessment cluster WO 3TU Systems and Control convened to discuss the composition of the assessment panel and to draft the list of candidates.

Having conferred with management of the University of Twente programme, 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. A.J. van der Schaft, professor in Mathematics, Johann Bernoulli Institute for Mathematics and Computer Science, University of Groningen (panel chair).
- Prof. dr.-ing. J. Lunze, professor and head of Institute of Automation and Process Control, Ruhr-University Bochum, Germany (panel member).
- Prof. dr. P.R.J. Simons, professor emeritus and former director of IVLOS Institute of Education, Utrecht University (panel member).
- dr. ir. M.H.C. Everdij, senior scientist, NLR Air Transport Operations Safety Institute (panel member).
- D. Boehmer BSc, student Master Systems and Control, Delft University of Technology (student member).

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

All panel members and the secretary confirmed in writing being impartial with regard to the programme to be assessed and observing the rules of confidentiality. Having obtained the authorisation by the University, Certiked 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 convened with management of the programme to discuss the outline of the self-assessment report, the subjects to be addressed in this report and the site visit schedule. In addition, the planning of the activities in preparation of the site visit were discussed. In the course of the process preparing for the site visit, programme management and the Certiked process coordinator regularly had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved of the site visit schedule.

Well in advance of the site visit date, programme management sent the list of final projects of graduates of the programme of the most recent years. Acting on behalf of the assessment panel, the process coordinator selected 15 final projects. The grade distribution in the selection was ensured to conform to the grade distribution in the list, sent by programme management. No additional criteria have been taken into account, if these had been found to be relevant for the programme.

The panel chair and the panel members were sent the self-assessment report of the programme, including appendices. In the self-assessment report, the student chapter was included. In addition, the expert panel members were forwarded a number of final projects of the programme graduates, these final projects being part of the selection made by the process coordinator.

A number of weeks before the site visit date, the assessment panel chair and the process coordinator met to discuss the self-assessment report provided by programme management, the procedures regarding the assessment process and the site visit schedule. In this meeting, the profile of panel chairs of NVAO was discussed as well. The panel chair was informed about the competencies, listed in the profile. Documents pertaining to a number of these competencies were presented to the panel chair. The meeting between the panel chair and the process coordinator served as the briefing for panel chairs, as meant in the NVAO profile of panel chairs.

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

Shortly before the site visit date, the complete panel met to go over the preliminary findings concerning the quality of the programme. During this preliminary meeting, the preliminary findings of the panel members, including those about the final projects were discussed. 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 discussed as well.

On 15 June 2018, the panel conducted a site visit on the University of Twente campus. The site visit schedule was in accordance with the schedule as planned. In a number of separate sessions, panel members were given the opportunity to meet with Faculty Board representatives, programme management, Examination Board representatives, lecturers and final projects examiners, students, and alumni and professional field representatives. In addition, the panel was given a tour around the programme facilities and laboratories.

In a closed session at the end of the site visit, the panel considered every one 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 a broad outline of the considerations and conclusions to programme representatives.

Clearly separated from the process of the programme assessment, the assessment panel members and programme representatives met to conduct the development dialogue, with the objective to discuss future developments of the programme.

The assessment draft report was finalised by the secretary, having taken into account the findings and considerations 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 final report. This report was presented to programme management to be corrected for factual inaccuracies. Programme management were given two weeks to respond. Having been corrected for these factual inaccuracies, the Certiked bureau sent the report to the University Board to accompany their request for re-accreditation of this programme.

### 3. Programme administrative information

Name programme in CROHO: M Systems and Control  
Orientation, level programme: Academic Master  
Grade: MSc  
Number of credits: 120 EC  
Specialisations: Control Theory  
Robotics and Mechatronics  
Biomechatronics  
Unmanned Aerial Vehicles  
Location: Enschede  
Mode of study: Full-time (language of instruction: English)  
Registration in CROHO: 21PH-60359  
Name of institution: University of Twente  
Status of institution: Government-funded University  
Institution's quality assurance: Approved

## 4. Findings, considerations and assessments per standard

### 4.1 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*

The Master Systems and Control programme is the result of the collaboration between 4TU, the Dutch Universities of Technology. Although the Master Systems and Control programmes of Eindhoven University of Technology, Delft University of Technology and University of Twente now differ, the programmes share a number of features, such as common core courses and lectures to be taken by students of all three Universities. The Universities maintain close contacts and meet regularly to discuss the programmes.

The Master Systems and Control programme of University of Twente is one of the programmes of the Faculty Electrical Engineering, Mathematics and Computer Science. In the programme, the Faculties Engineering Technology, Behavioural, Management and Social Sciences and Geo-Information Science and Earth Observation take part as well. The programme director with the assistance of the master coordinator manages the programme on a day-to-day basis. For each of the four specialisations of the programme, master track coordinators are appointed. The Programme Committee, consisting of lecturers and students, advises programme management on the programme quality. The Examination Board for the programme has the authority to supervise the examinations and assessments of the programme. This Examination Board is part of the Faculty Examination Board, which, among others, decides on Faculty-wide quality assurance of examinations and assessments. A number of research groups are involved in the programme and provide content knowledge and research expertise for each of the four specialisations. These research groups are Hybrid Systems (Control Theory), Robotics and Mechatronics, Structural Dynamics, Acoustics & -Control (Robotics and Mechatronics), Biomechanical Engineering (Biomechatronics) and Earth Observation Science, Engineering Fluid Dynamics, Industrial Engineering and Business Information Systems and Governance & Technology for Sustainability (four research groups from four Faculties collaborating in the field of Unmanned Aerial Vehicles).

The systems and control domain studies dynamic systems and the optimisation of their performance through modelling, sensor and actuator selection, data analysis and control design. The objectives of the programme are, therefore, to educate students to be able to scientifically analyse, model, simulate, design and implement methods and tools to control dynamic systems and to be able to apply this knowledge and these insights in the fields of, among others, mechanical engineering, electrical engineering and applied physics. As the fundamental and generic systems and control theories and concepts may be applied to different application fields, the domain may be considered to be multidisciplinary.

The programme objectives are aligned with the requirements stated in a recent report, commissioned by the International Federation of Automatic Control (IFAC) and drafted by the task force of a number of leading experts in this domain to describe the domain. The programmes of the three Universities recently conducted a benchmark study, comparing their programmes to other systems and control master programmes of universities in and outside of Europe. The results of this study show these programmes content-wise to be very much comparable to the Dutch programmes.



No industry advisory board has been installed for this programme. Programme management intends to install an advisory board, representing the professional field.

The programme objectives have been translated into the intended learning outcomes of the programme. These specify, among others, in-depth knowledge of and insights in the systems and control domain, knowing how to design controllers for complex dynamic systems, scientific research knowledge and skills, academic skills, collaboration and communication skills, also in multidisciplinary contexts, and ethical and societal awareness.

Programme management showed the intended learning outcomes of the programme to be in line with the Meijers' Criteria, demonstrating these to meet the master level.

#### *Considerations*

The panel is positive about the cooperation of the Master Systems and Control programmes of the three Dutch Universities of Technology, since this cooperation may be beneficial for the contents of all three programmes.

The University of Twente programme is regarded by the panel to be adequately organised and managed.

The panel welcomes the programme objectives, as these give a very appropriate description of the systems and control domain and very adequately delineate the objectives regarding the knowledge and skills of students at completion of the programme.

In addition, the panel is pleased to note the programme objectives meet international standards, as exemplified by the correspondence of the objectives with the International Federation of Automatic Control (IFAC) report. The panel welcomes the benchmark study conducted by the three Dutch Master Systems and Control programmes and observes these programmes to be aligned with well-respected programmes in this domain abroad.

In line with the intentions of programme management, the panel advises to install an advisory board, representing industry to allow the programme to align with trends and developments in the professional field.

The panel regards the intended learning outcomes of the programme to be elaborate and well-phrased, being the adequate operationalisation of the programme objectives and meeting the master programme level. The panel suggests to broaden the intended learning outcomes with aspects of signal processing, communication and computation.

#### *Assessment of this standard*

These considerations have led the assessment panel to assess standard 1, Intended learning outcomes, to be good.

## 4.2 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 programme is rather small in terms of numbers of students. The number of incoming students was on average 13 students (cohorts 2011 to 2016) and fluctuated between 7 students in 2013 to 24 students in 2016. Over the years, the number of incoming students increased significantly. Students come from University of Twente bachelor programmes (about 60 %) and from abroad (about 30 % to 40 %). The proportion of students with diplomas from higher vocational institutes is limited. Students with bachelor diplomas in Mechanical Engineering, Electrical Engineering or Applied Mathematics tend not to apply for this programme.

The curriculum of the programme has a 120 EC study load and takes two years to complete. Programme management presented a table to show the curriculum to meet the intended learning outcomes. In the first year, students take core and specialisation courses. In the second year, students take the internship and do the graduation project. The four core courses in the curriculum (20 EC) cover the fundamental knowledge and skills components of the systems and control domain, being modelling and simulation, identification and control engineering. One of the core courses is a project, allowing students to integrate the knowledge acquired and to put this knowledge to practice. In addition, students take the non-technical course Philosophy of Engineering (5 EC), introducing them to the societal and ethical dimensions of science. As has been indicated, students select one of the specialisations offered. The distribution of students across the specialisations is rather skewed. Most students take the Robotics and Mechatronics specialisation. The number of students in the other specialisations is limited. In their specialisation, students take 35 EC of courses, introducing them to the specialisation field and preparing them for their graduation project. Students may select these courses from predetermined lists. Internships (20 EC) allow students to gain real-world experiences. Internships (20 EC) are done in companies and partly, but not often at foreign universities. Internships are not done at Dutch universities. The graduation projects (40 EC), mostly conducted in one of the research groups, offering the specialisations, require students to do the individual research project in this domain.

Lecturers involved in the programme are members of the research groups offering the specialisations. Some of the research groups are responsible for the core courses as well. The lecturers are experienced researchers in their fields, practically all of them having PhDs. The Master Systems and Control programmes of the three Universities of Technology work on research together in the Dutch Institute of Systems and Control (DISC). The lecturers of this programme refer to their research in the lectures. About 70 % of the lecturers obtained the UTQ-certificate, testifying to their educational capabilities. Students expressed being very content with the lecturers' capabilities.

Students with bachelor degrees in Mechanical Engineering, Electrical Engineering, Applied Mathematics, Applied Physics or Aerospace Engineering of one of the three Dutch Universities of Technology are admitted to the programme unconditionally. Candidates with other bachelor degrees are admitted either directly or have to take the bridging programme (30 EC). Students with bachelor degrees in this domain from higher vocational institutes have to complete the bridging programme as well. Applications of students coming from abroad are inspected. These students may be admitted directly or may have to complete the bridging programme. Students entering the programme, are registered at the other two Universities of Technology Master Systems and Control programmes as well.

The educational concept of the programme is meant to prepare students for their future work in the professional field. The study methods adopted in the programme include lectures, practical training sessions and projects. In most courses, students sit in class with students from other programmes. Students may take courses at the Master Systems and Control programme of the other Universities of Technology. For study planning issues and study-related problems, students may turn to the programme study advisor. The master coordinator of the programme is available to them to discuss, among others, the specialisation to take. For each of the specialisations, mentors have been appointed. The mentor advises students on specialisation courses to be taken in preparation of their graduation project. The mentor guides students in the specialisation courses. In the second year, they are supervised by the internship supervisor and the graduation project supervisors. The student success rates for the programme are about 29 % of the students completing the programme within two years and about 48 % of them completing the programme within three years (figures for last five cohorts).

### *Considerations*

The panel notes the influx of students to be rather small, but clearly increasing and students with Bachelors Mechanical Engineering, Electrical Engineering or Applied Mathematics not enrolling in this programme. The panel, therefore, advises to promote students with these backgrounds to enter this programme.

The panel appreciates the curriculum. The contents of the courses are relevant and the level of the courses is distinctly high. The panel considers the curriculum coherence to be up to standard, being composed of core courses, specialisation courses, the internship and the graduation project. The course on societal and ethical dimensions of science is regarded by the panel to be a very good addition. As the total study load of the core courses is limited, the panel suggests to extend the core curriculum. The panel also advises to include an additional course on control theory in the core curriculum. In addition, the panel recommends to introduce an experimental set-up in the integration project course. Although multidisciplinary elements may be discussed in courses, students being introduced to the multidisciplinary dimensions of the systems and control domain is not enforced. Students may remain within their own discipline. The panel recommends to ensure all students being taught the multidisciplinary dimensions of the systems and control domain. As the distribution across the specialisations is rather skewed, the panel suggests to try and spread students more evenly over the specialisations, and increase the cohesion between the specialisations. The internship being mandatory is very positive. The panel suggests, however, to schedule either the internship or the graduation project at companies, to allow students to become acquainted with the professional field. Although many internships are abroad, the panel advises to promote students taking parts of the curriculum abroad.

The panel regards the lecturers to be very good researchers in this domain. The lecturers refer to their research in the classes. The panel welcomes the cooperation of the Master Systems and Control programmes in the DISC Research School. The panel considers the lecturers to be good teachers, as the proportion of lecturers being UTQ-certified shows.

The admission requirements and procedures are up to standard, admitting students who may be regarded to have a fair chance of completing the programme. The panel is positive about the bridging programme, enabling more students to gain access to the programme.

The panel appreciates the educational set-up of the programme and the study methods. The panel is also positive about the system of study guidance by the master coordinator, study advisors, mentors and supervisors. The panel advises to improve the student success rates.

The panel is in general, apart from the integration project, positive about the material facilities and the laboratories, provided to the students of the programme.

*Assessment of this standard*

These considerations have led the assessment panel to assess standard 2, Teaching-learning environment, to be satisfactory.

### 4.3 Standard 3: Student assessment

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

#### *Findings*

The examination and assessment regulations for the programme are in line with the University of Twente Assessment Framework. For all programmes of the Faculty of Electrical Engineering, Mathematics and Computer Science, one Examination Board has been installed, having the authority to ensure the quality of examinations and assessments of these programmes. The programme Examination Board, being part of the Faculty Examination Board, has the authority to monitor the quality of examinations and assessments for this programme.

The course examination methods include written examinations, practical assignments, project reports and, in a few cases, oral examinations.

Internships are partly conducted in companies and partly at Universities, both in the Netherlands (about 50 %) and abroad (about 50 %). The Faculty Office assists students in finding suitable internships. The internship supervisor decides on the internship assignment, ensuring the goals being in line with the contents and level of this programme. Internships are assessed on the basis of written reports and the evaluation of the external supervisor. The University internship supervisor assesses the internship, taking into account the advice of the external supervisor. The external supervisor is not an examiner.

The graduation projects are mostly part of ongoing research of the research groups involved. Topics for these projects are presented to students already in the first year. The supervision of these projects is the responsibility of one of the full or associate professors of these research groups. The day-to-day supervision may be delegated to one of the PhD students. At the beginning of the project, students submit the proposal and the project plan. The supervisors schedule a number of progress meetings in the course of the projects. Students submit interim reports, which are commented on. The graduation projects are assessed by the Assessment Committee, being composed of at least two senior staff members and one examiner, who was not involved in the process. External experts may additionally be members of this committee. The Assessment Committee grades the project, the written report and the oral defence, making use of the thesis assessment form with assessment criteria and facultative comments to be added.

Programme management has taken a number of measures to promote the validity of the examinations, the reliability of the assessments and the transparency of examinations for students. Examiners are appointed by the Examination Board, being required to have their PhD and to be UTQ-certified. The examinations of the courses are drafted by examiners and are peer-reviewed by fellow-examiners on their meeting the course goals. Answer models are used to assess written examinations. Assessment forms are used for written assignments and oral examinations. The Examination Board inspects the examination analyses and looks into examinations with skewed distributions of grades. The Examination Board also reviews regularly a sample of graduation projects, inspecting the procedures and verifying the grades given. Prior to the examinations, students are informed about the assessment process. In case of written examinations, they are provided model examinations. Students may inspect their graded work.

#### *Considerations*

The panel considers the examinations and assessments rules and regulations of the programme to be up to standard, complying with University policy statements and frameworks. In addition, the panel approves of the position and the responsibilities of the Examination Board.

The panel regards the examination methods to be adequate, having seen these to meet the course goals and course contents.

In the panel's view, the supervision of the internships and the graduation projects is appropriate. The panel welcomes senior staff members being involved in this supervision. The panel appreciates the procedures governing the assessment of the graduation projects. The panel welcomes the composition of the Assessment Committees, the assessment procedures and the assessment forms. In the panel's opinion, the assessment process of the graduation projects leads to reliable assessments.

The programme has taken satisfactory measures to promote the validity of examinations, the reliability of assessments and the transparency of examinations. The Examination Board is active in monitoring the examinations and graduation projects quality.

*Assessment of this standard*

The considerations have led the assessment panel to assess standard 3, Student assessment, to be satisfactory.

#### 4.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

##### *Findings*

The panel reviewed the examinations of a number of courses in the programme.

The panel also studied fifteen graduation projects of graduates of the programme of the last few years. The average grade of all of the projects of the last nine years (2009 to 2017) was 8.0. Having inspected the graduation projects of the last few years, the Examination Board found the grades to be somewhat inflated and too many distinctions to have been awarded. Therefore, they would like to adjust to some extent the grading of these projects. At the time of this assessment, effects of measures taken to adjust this were not yet fully visible.

In the recently conducted survey among programme alumni, the graduates expressed being very content about their preparation for the labour market and to regard themselves well equipped for positions in the professional field. All graduates found suitable positions shortly after or in many cases even before graduation. The graduates with whom the panel met, confirmed regarding themselves to be very well prepared for positions in this domain or related domains.

Programme graduates may proceed to the Dutch Institute of Systems and Control (DISC) to continue their studies as PhD students.

Programme management recently conducted a survey among employers of programme graduates. These employers expressed experiencing the graduates of this programme to be well educated, definitely meeting the employers' expectations and being knowledgeable about and skilled in the systems and control domain.

##### *Considerations*

The examinations of the courses, the panel studied, are up to standard.

The panel supports the grades given to the graduation projects by the programme examiners, at the same time endorsing the Examination Board's intentions to scrutinise projects for too high grades or too many distinctions. The subjects addressed in the projects were within the domain. The projects were good methodologically.

The panel considers the graduates of the programme to be very knowledgeable about and very skilled in this domain and to be very well prepared for the labour market. The career prospects of the graduates are very good, if not excellent. The panel noted the graduates to be able to apply their knowledge and skills both in positions in the professional field or as PhD students.

##### *Assessment of this standard*

The considerations have led the assessment panel to assess standard 4, Achieved learning outcomes, to be good.

## 5. Overview of assessments

| Standard                                  | Assessment   |
|---|--------------|
| Standard 1. Intended learning outcomes    | Good         |
| Standard 2: Teaching-learning environment | Satisfactory |
| Standard 3: Student assessment            | Satisfactory |
| Standard 4: Achieved learning outcomes    | Good         |
| Programme                                 | Good         |



## 6. 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. These panel recommendations are the following.

- To broaden the intended learning outcomes with aspects of signal processing, communication and computation.
- To install an advisory board, to allow the programme to align with trends and developments in the professional field.
- To promote students with University of Twente Bachelors Mechanical Engineering, Electrical Engineering or Applied Mathematics to enter this programme.
- To extend the core curriculum, now being 20 EC.
- To include an additional course on control theory in the core curriculum.
- To introduce an experimental set-up in the integration project course.
- To try and spread students more evenly over the specialisations, and increase the cohesion of the specialisations.
- To ensure all students being introduced to the multidisciplinary dimensions of the systems and control domain.
- To schedule either the internship or the graduation project at companies, to allow students to become acquainted with the professional field.
- To promote students taking part of the curriculum abroad.
- To improve the student success rates.