Assessment report
Limited Framework Programme Assessment

Bachelor Technische Wiskunde

Delft University of Technology

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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 Bachelor Technische Wiskunde programme of Delft University of Technology. The programme was 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, published on 20 December 2016 (Staatscourant nr. 69458).

The panel appreciates the programme objectives to educate students in mathematical methods and techniques to quantify and model phenomena in various domains from analytical, numerical and stochastic perspectives. The panel is positive about the study of fundamental mathematics as the basis for these methods and techniques. The panel also welcomes the programme being research-based.

The panel considers the Domain-Specific Framework of Reference to be an appropriate description of the mathematics discipline and of the standards and requirements graduates of both bachelor and master programme have to meet. The panel welcomes the efforts of the joint Mathematics programmes in the Netherland to have drafted this Framework. The objectives and intended learning outcomes of this programme largely meet the Framework and, therefore, correspond to international standards set for the discipline. The panel supports programme's intentions to strengthen the subjects of geometry, discrete mathematics and algebra to improve the alignment of the programme to the Domain-specific Framework of Reference.

Students are prepared to continue their studies at master level. The panel welcomes the fact that students are educated to enrol in applied mathematics programmes or programmes of other, adjacent disciplines.

The intended learning outcomes of the programme correspond to the programme objectives. These intended learning outcomes are comprehensive and are conform to the bachelor level.

The panel approves of the admission requirements and procedures of the programme. Prospective students are informed appropriately about the challenging nature of the programme. The panel also welcomes the *Caleidoscoop* course, offering students an overview of the mathematics discipline.

The programme curriculum matches the intended learning outcomes well and is well-designed. The panel regards the curriculum to be solid, with strong courses covering the various fields within the applied mathematics discipline. Although the course *Geschiedenis en Filosofie van de Wiskunde* is appreciated, the panel suggests to involve historians and philosophers of mathematics in this course. The panel also proposes to strengthen the subject of ethics in the curriculum. The curriculum coherence is strongly supported by the teaching-learning trajectories. Academic and research skills are adequately covered. The Bachelor colloquium is very appropriate to train students in reporting and presentations.

The staff in the programme have solid research backgrounds and are good and motivated teachers. Their educational capabilities are definitely up to standard. The panel notes the high levels of appreciation of lecturers by the students. The panel is pleased to see that lecturers are allowed to renew their courses. The panel is positive about the co-teacher system. Programme management is very much up to standard. As the work load of lecturers is high, the panel strongly advises to recruit extra staff. The panel is positive about educational capabilities being part of the recruitment procedures of staff.

The educational concept and study methods of the programme meet the programme's characteristics. The students-to-staff ratio is appropriate and allows for small-scale education in tutorials/instructions. The number of hours of face-to-face education is generous. The panel is positive about staff members being involved in tutorials/instructions. The panel appreciates very much the student guidance system of the programme. The panel supports students not being obliged to submit homework assignments, as this may contribute to their self-reliance. Although material facilities for the programme such as lecture halls and study space are available, the panel suggests to ensure sufficient numbers of blackboards. The panel recommends to monitor the drop-out rate and the student success rates.

The programme examination and assessment policies are in line with Faculty rules and regulations. The panel is positive about the responsibilities and activities of the Board of Examiners. The panel considers the measures taken by programme management to ensure the examinations and assessments quality to be very elaborate and very effective.

The examination methods in the courses are approved by the panel, as they meet the course contents. The panel appreciates the diversity in examination methods adopted in the courses.

The supervision and assessment of the Bachelor final projects are organised effectively and in a reliable way. The panel, however, advises to add more extensive arguments to substantiate the assessments of the projects.

The examinations of the courses are up to standard. The panel regards the Bachelor final projects to be appropriate. No projects were found to be unsatisfactory.

The panel is convinced the programme graduates have reached the intended learning outcomes of the programme. Programme graduates have access to quite a large number of master programmes.

The panel that conducted the assessment of the Bachelor Technische Wiskunde programme of Delft University of Technology 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 *satisfactory*. Therefore, the panel recommends NVAO to accredit this programme.

Rotterdam, 4 October 2019

Prof. dr. ir. O.J. Boxma
(panel chair)

drs. W. Vercouteren
(panel secretary)

2. Assessment process

The evaluation agency Certiked VBI received the request by Delft University of Technology to support the limited framework programme assessment process for the Bachelor Technische Wiskunde 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, published on 20 December 2016 (Staatscourant nr. 69458).

Management of the programmes in the assessment cluster WO Wiskunde convened to discuss the assessment panel composition and to draft the list of candidates. The panel composition for this assessment has been based upon these considerations.

Having conferred with Delft University of Technology programme management, 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. O.J. Boxma, full professor Stochastic Operations Research, Eindhoven University of Technology (panel chair);
- Prof. dr. R.H. Kaenders, full professor Mathematics and its Education, University of Bonn, Germany (panel member);
- Prof. dr. D. van Straten, full professor Algebraic Geometry, Johannes Gutenberg University Mainz, Germany (panel member);
- Dr. ir. H.J. Prins, manager Research & Development, Maritime Research Institute the Netherlands (panel member);
- S.C. Jongerius BSc, student Master Industrial and Applied Mathematics, Eindhoven 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 planning of the activities in preparation of the site visit. The site visit schedule was also discussed. In addition, the outline of the self-assessment report and the subjects to be addressed in this report were part of the discussion.

In the course of the process preparing for the site visit, programme management and the Certiked process coordinator had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved 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 the theses of fifteen graduates. The grade distribution in the selection was conform to the grade distribution in the list, sent by programme management.

The panel chair and the panel members were sent in time 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 theses of the programme graduates, these theses being part of the selection made by the process coordinator.

Before the site visit date, the assessment panel chair and the process coordinator met to discuss the self-assessment report to be 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 comprehensively informed about the competencies, listed in the profile.

Being informed by the process coordinator, 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 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 theses 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 3 May 2019, the panel conducted the site visit on the Delft University of Technology campus. The site visit schedule was as planned. In a number of separate sessions, the panel was given the opportunity to meet with Faculty Board representatives, programme management, Board of Examiners members, lecturers and final projects examiners, and students and alumni.

In a closed session near 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:	B Technische Wiskunde
Orientation, level programme:	Academic Bachelor
Grade:	BSc
Number of credits:	180 EC
Specialisations:	None
Location:	Delft
Mode of study:	Full-time
Language of instruction:	Dutch
Registration in CROHO:	21PF-56965
Name of institution:	Delft University of Technology
Status of institution:	Government-funded
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 Bachelor Technische Wiskunde programme is one of the programmes of the Faculty of Electrical Engineering, Mathematics and Computer Science of Delft University of Technology. On behalf of the dean, the director of education of the Faculty is responsible for the programmes offered by the Faculty. The director of studies of this programme is responsible for the organisation and quality of this programme. The director is assisted by the Bachelor coordinator and the educational coordinator. The lecturers in the programme are staff members of Delft Institute of Applied Mathematics (DIAM). Lecturers do not only lecture in this programme, but also participate in service education for most other programmes of Delft University of Technology. In fact, service education constitutes the major part of the educational activities of most staff members. The Board of Studies of this programme, consisting of an equal number of lecturers and students, advises management of this programme on quality issues. Students' views are collected by means of written surveys both at the course level and the curriculum level. The Curriculum Committee monitors changes to and updates of the curriculum of the programme. The programme Board of Examiners, being one of the subcommittees of the Faculty Board of Examiners, is responsible for assuring the quality of examinations and assessments of the programme.

The objectives of the programme are to educate students in mathematical methods and techniques to quantify and model phenomena in physics, technical or societal domains. The programme is geared towards the study of mathematical modelling from analytical, numerical and stochastic perspectives. Fundamental mathematics is studied extensively in the programme as the basis for modelling methods and techniques. The programme rests on academic research done in the subjects offered. The programme is comparable to programmes of the other Dutch universities of technology and, internationally, to applied mathematics programmes of ETH Zürich, RWTH Aachen, Chalmers University of Technology and Politechnico di Milano. Graduates of this programme are admitted to master mathematics programmes of those four universities.

The joint Mathematics programmes in the Netherlands drafted the Domain-Specific Framework of Reference for both Bachelor and Master Mathematics programmes. In this Domain-Specific Framework of Reference, the generic objectives and the generic intended learning outcomes for these programmes have been listed. These objectives and intended learning outcomes meet the international standard for mathematics of ASIIN in Germany. They also correspond to the Dublin descriptors and the Meijers' criteria. In addition, they are largely comparable to those of the Mathematics programmes of renowned universities abroad, such as ETH Zürich, KU Leuven, Cambridge University and University of Padova. In line with the Domain-Specific Framework of Reference, the subjects of calculus and analysis, probability theory and statistics, numerical analysis, discrete mathematics and algebra, differential equations, and optimisation are studied in the Delft programme. The subjects of

geometry and, to a lesser extent, discrete mathematics and algebra, both mentioned in the Framework, are less pronounced in this programme.

Students are offered the opportunity to take the double programme with Physics, combining this programme with the Bachelor Applied Physics (Technische Natuurkunde) programme (217 EC in total). Students may also take the University Honours Programme (20 EC extra courses) or the Excellence Programme (36 EC extra courses). All programmes mentioned are especially meant for talented and motivated students. Strict requirements apply to enter these programmes. Students are primarily educated to continue their studies at master level in applied mathematics. Some students proceed to programmes in neighbouring disciplines, such as applied physics. Students are not primarily educated to immediately enter the labour market, although some students do. The minor Education gives students the opportunity to become second-degree teachers in Mathematics in secondary education.

The objectives of the programme have been translated into the intended learning outcomes. These include, as main elements, knowledge and understanding of mathematics and applications thereof and the ability to develop these further; knowledge and understanding to draft and validate mathematical models for solving problems in other disciplines; mathematical and deductive reasoning; communication and collaborative skills; and awareness of the societal effects of science.

The intended learning outcomes of the programme have been compared to the Meijers' criteria for bachelor programmes, to establish their bachelor level.

Considerations
The panel appreciates the programme objectives to educate students in mathematical methods and techniques to quantify and model phenomena in various domains from analytical, numerical and stochastic perspectives. The panel is positive about the study of fundamental mathematics as the basis for these methods and techniques. In addition, the panel welcomes the programme being research-based.

The panel considers the Domain-Specific Framework of Reference to be an appropriate description of the mathematics discipline and of the standards and requirements graduates of both bachelor and master programme have to meet. The panel welcomes the efforts of the joint Mathematics programmes in the Netherland to have drafted this Framework. The objectives and intended learning outcomes of this programme largely meet the Framework and, therefore, correspond to international standards set for the discipline. The panel supports programme's intentions to strengthen the subjects of geometry, discrete mathematics and algebra to improve the alignment of the programme to the Domain-specific Framework of Reference.

The panel supports the programme intentions to educate students to continue their studies at master level. The panel welcomes students being educated to enrol in both applied mathematics programmes and in programmes in other, adjacent disciplines.

The intended learning outcomes of the programme correspond to the programme objectives. These intended learning outcomes are comprehensive and are conform to the bachelor level.

Assessment of this standard
These considerations have led the assessment panel to assess standard 1, Intended learning outcomes, to be satisfactory.

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 number of students entering the programme increased very substantially from 92 students in 2012 to 216 students in 2018. About 20 % to 25 % of these students take the double programme Applied Mathematics-Applied Physics. The entry requirements are the Dutch secondary school diploma, including the Mathematics B certificate. All other applications are screened by the programme admission committee to assess the degree of mathematics knowledge and the level of Dutch language skills. Applicants fill out on-line questionnaires and are thereupon given advice to enrol or not. The programme informs prospective students about the challenging nature of the programme. In the first year, teacher-mentors guide groups of 10 to 15 students. These mentors are also lecturers in the *Caleidoscoop* course along with other lecturers. This course is meant to facilitate the transfer from secondary education to university. This course offers an overview of the discipline and introduces students to computer programmes used in mathematics. Guest lecturers highlight the role of mathematics in society.

The study load of the curriculum is 180 EC. The curriculum takes three years to complete. Programme management presented a table, showing the curriculum to cover all of the intended learning outcomes. The curriculum is organised along five teaching-learning trajectories to structure the curriculum and to promote curriculum coherence. The trajectories are analysis (32 EC), numerical methods and differential equations (20 EC), optimisation and discrete mathematics (26 EC), stochastics (12 EC), and modelling and applications (36 EC). To some extent, the trajectories reflect the Delft Institute of Applied Mathematics sections. Within trajectories, courses build upon each other. Changes in courses in trajectories are discussed to maintain coherence within these trajectories. In addition, students in each of the years may take electives (total 24 EC), the minor in the third year (30 EC) and the Bachelor final project, including the Bachelor colloquium (18 EC). Some of the electives are offered by Leiden University. Minors in the third year may be selected from a wide range of minors in Delft or from other universities. Students may take the minor with advanced mathematics courses offered by Delft and Leiden University. In a number of courses, communication, programming and research skills are addressed. The Bachelor final project (15 EC) is preceded by the Bachelor colloquium (3 EC), which trains students in presentation and reporting skills. Courses are updated on a regular basis. New, upcoming applications of mathematics are introduced in the curriculum. Examples are data science and quantum technology. The curriculum is officially Dutch-taught. The programme considered to convert to English as the language of instruction. This process has been ended. The programme will remain Dutch-taught.

The permanent staff partly lecturing in this programme are 32 lecturers in total. Practically all staff members are active researchers in the Mathematical Institute, about 94 % of them having PhD degrees. Some have a non-mathematical background. About 75 % of the staff members are UTQ-certified and another 16 % of them are in the process of obtaining the UTQ-certificate. Co-teachers are involved in the courses, take part in lecturing and may replace the lecturer in case of absence. Students appreciate greatly lecturers' capabilities, motivation and accessibility. Lecturers meet to discuss the

programme and to adjust courses. Yearly, formal meetings of lecturers are scheduled. The lecturers with whom the panel met, expressed experiencing the work load as high. The Mathematics sector plan will allow the programme to recruit extra staff. Educational capabilities are part of the recruitment procedures of staff members.

The educational concept of the programme is mainly to train students to achieve self-directed learning. Education is problem-based. Study methods adopted are lectures, tutorials and instructions, computer practical sessions, and self study. New study methods, such as blended learning and MOOCs are being implemented. Lectures may be large-scale, whereas tutorials and instructions are small-scale, 35 to 45 students being in class. The students-to-staff ratio is 25/1. The number of hours of face-to-face education is on average 21 hours per week throughout the programme. In the tutorials/instructions, students work either individually or in small groups to solve problems and to apply the knowledge gained to these problems. Both lecturers and teaching assistants teach in the tutorials/instructions. Students hand in assignments, which are no longer obligatory however. When submitted on time, feedback will be given on these assignments. The director of studies, the Bachelor coordinator and the academic counsellor schedule quarterly meetings with students to inform them about the group performances during the current and past quarters and about the study programme of the quarter to come. As has been said, first-year students are guided weekly by mentors. In addition, the Bachelor coordinator advises students on their study plans. In case of study problems, students may turn to the academic counsellor. The average drop-out rate is 40 %, calculated for the last five years. The average student success rates are 34 % after three years and 62 % after four years (last five cohorts; proportions of students re-entering the programme in the second year).

Considerations
The panel approves of the admission requirements and procedures of the programme. Prospective students are informed appropriately about the challenging nature of the programme. The panel also welcomes the *Caleidoscoop* course, offering students an overview of the mathematics discipline.

The curriculum of the programme matches the intended learning outcomes well and is well-designed. The panel regards the curriculum to be solid, with strong courses covering the various fields within the applied mathematics discipline. The panel is pleased to see in the curriculum the mandatory course *Complexe Functietheorie*. Although the panel welcomes the course *Geschiedenis en Filosofie van de Wiskunde*, the panel suggests to involve historians and philosophers of mathematics in this course. In addition, the panel proposes to strengthen the subject of ethics in the curriculum. The panel is positive about the curriculum coherence, being strongly supported by the teaching-learning trajectories. Academic and research skills are adequately covered in the curriculum. The panel finds the Bachelor colloquium very appropriate to train students in reporting and presentations.

The staff in the programme have solid research backgrounds and are good and motivated teachers. Their educational capabilities are definitely up to standard. The panel notes the high levels of appreciation of lecturers by the students. The panel approves of lecturers being allowed to renew their courses. The panel is positive about the co-teacher system. Programme management is very much up to standard. As the work load of lecturers is high, the panel strongly advises to recruit extra staff. The panel is positive about educational capabilities being part of the recruitment procedures of staff.

The educational concept and study methods of the programme meet the programme's characteristics. The students-to-staff ratio is appropriate and allows for small-scale education in tutorials/instructions. The number of hours of face-to-face education is generous. The panel is positive about staff members being involved in tutorials/instructions. The panel appreciates very much the student guidance system of the programme, consisting of mentor groups, quarterly information meetings, advice on students' study plans by the Bachelor coordinator and assistance by the academic counsellor. The panel supports students not being obliged to submit homework assignments, as this may contribute to their self-reliance. The material facilities for the programme such as lecture halls and study space are adequate. As there are some concerns about the availability of blackboards, the panel suggests to ensure sufficient numbers. The panel recommends to monitor the drop-out rate and the student success rates.

Assessment of this standard
These considerations have led the assessment panel to assess standard 2, Teaching-learning environment, to be good.

4.3 Standard 3: Student assessment

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

Findings
The programme policies regarding examinations and assessments are in line with the Faculty of Electrical Engineering, Mathematics and Computer Science rules and regulations. The programme policies have been laid down in the policy document. The Faculty Board of Examiners has the authority to monitor examinations and assessments of Faculty programmes. The subcommittee of the Board for this programme oversees the examinations and assessments of this programme.

The examination methods in the programme include written examinations, interim examinations, hand-in assignments, computer assignments, reports, presentations, and, in some instances, oral examinations. The examination methods are aligned with the course goals. In most courses, multiple examination methods are scheduled. The final grade of the courses is the weighted outcome of the grades of the examinations.

Students are proposed topics for the Bachelor final projects by the coordinators of the sections of the Delft Institute of Applied Mathematics. The projects are individual projects, being supervised by one of the staff members of the Institute. The phases in the project are literature study, project execution, written report and oral presentation. Projects are preceded by the Bachelor colloquium. In the colloquium, students are trained intensively in presentation and reporting skills and start with the literature study for the project. The Bachelor final projects are assessed by the graduation committee, consisting of three examiners. The assessment components are research done (40 % of the grade), research process (20 %), written report (20 %), and oral presentation (20 %). Having discussed the assessment, the examiners fill out the standardised assessment form, based upon the rubrics form.

In the programme, a number of measures have been taken to ensure the quality of examinations and assessments. Examiners are appointed by the Board of Examiners according to criteria with regard to their UTQ or equivalent certification. The final examinations of the courses are peer-reviewed. Test matrices are being used. Students are presented test questions to prepare for examinations. The educational advisor counsels examiners on the quality of examinations. Examinations are assessed and graded by groups of lecturers and teaching assistants. Projects in courses are assessed on the basis of rubrics forms. Samples of Bachelor final projects are reviewed by the Board of Examiners. Students are informed about fraud and plagiarism regulations. Bachelor theses are scanned for plagiarism, but not as a rule.

Considerations
The panel observed the programme examination and assessment policies to be in line with the Faculty rules and regulations. The panel is positive about the responsibilities and activities of the Board of Examiners and the subcommittee for this programme.

The examination methods selected in the courses are approved by the panel, as they meet the course contents. The panel appreciates the diversity in examination methods adopted in the courses, including the oral examinations.

The supervision of Bachelor final projects is organised effectively. The assessment of these projects is conducted in a reliable way. The panel, however, advises to add more extensive arguments to substantiate the assessments of these final projects. These may take the form of concise comments on the selection of the topic of the thesis, the preparation of the student on the subject concerned, the summary of the contents of the thesis, the specification of the own contributions by the student, the creativity and mathematical depth of the student contributions, and the quality of writing and oral presentation by the student.

The panel welcomes the measures taken by programme management to ensure the examinations and assessments quality. The panel considers these measures to be very elaborate and very effective and to assure valid, reliable and transparent examinations and assessments.

Assessment of this standard
The considerations have led the assessment panel to assess standard 3, Student assessment, to be good.

4.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings
The panel studied the examinations of a number of courses of the programme.

The panel also reviewed the Bachelor final projects of fifteen graduates of the programme with different grades. In the Bachelor final projects, students are to demonstrate mastering all intended learning outcomes of the programme. The average grade of these projects is 8.1 for the graduates of the last two years.

Extra-curricular labour market orientation events are scheduled by the study association Christiaan Huygens in collaboration with the programme and the Faculty. In these events, students visit organisations and companies and are informed about labour market options. The Industrial Advisory Board for the programme advises programme management on trends in the professional field. Labour market orientation is less relevant for Bachelor students than for Master students.

Programme graduates tend not to enter the labour market. Programme graduates are admitted to a wide range of master programmes, both in the applied mathematics discipline and in other disciplines.

Considerations
The examinations of the courses which were reviewed by the panel are up to standard.

The panel supports the grades awarded to the Bachelor final projects. No projects were found to be unsatisfactory. The panel regards the projects to be appropriate.

The panel is convinced the programme graduates have reached the intended learning outcomes of the programme. Programme graduates have access to quite a large number of master programmes.

Assessment of this standard
The considerations have led the assessment panel to assess standard 4, Achieved learning outcomes, to be satisfactory.

5. Overview of assessments

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

6. Recommendations

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

- To involve historians and philosophers of mathematics in the course *Geschiedenis en Filosofie van de Wiskunde*.
- To strengthen the subject of ethics in the curriculum.
- To recruit additional staff, as the work load of the lecturers is high.
- To ensure sufficient numbers of blackboards.
- To monitor the drop-out rate and the student success rates of the programme.
- To add more extensive comments and arguments to substantiate the assessments of the Bachelor final projects.