

Assessment report
Limited Framework Programme Assessment

Bachelor Applied Mathematics

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 Bachelor Applied Mathematics programme of University of Twente. 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 comprehensively and thoroughly in the mathematics discipline, to acquaint them with mathematical applications in various areas and to introduce them to modelling and programming skills. The panel welcomes students being acquainted with research and being trained in general academic skills, and to acquire intercultural competencies.

The panel regards the Domain-Specific Framework of Reference to be the appropriate description of the mathematics discipline and of the standards and requirements graduates of bachelor and master programme have to meet. The panel welcomes the efforts by the joint Mathematics programmes in the Netherlands to have drafted this Framework. The objectives and intended learning outcomes of this programme meet to a large extent the Framework and, therefore, correspond to international standards set for the discipline. The panel advises to mention the mathematics fields of optimisation and geometry explicitly in the intended learning outcomes to align these with the Framework.

The panel supports the programme objectives to educate students to continue their studies at master level. The panel appreciates that students are offered opportunities to qualify as grade-two teachers in Mathematics in secondary education.

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

The panel is positive about the growth in student numbers in the last years. The panel approves of the entry requirements and admission procedures of the programme. The panel is positive about the way students are accommodated to adjust to university-level education.

The curriculum of the programme matches the intended learning outcomes. The panel regards the contents to be appropriate, with courses covering the various fields within the applied mathematics discipline. The panel proposes to strengthen the field of geometry in the curriculum. The panel appreciates that complex function theory is addressed, and that vector fields are introduced in combination with electricity and magnetism. The panel advises to strengthen the subjects of history of mathematics and ethics in the curriculum. The curriculum coherence, as supported by the modules of the Twente Educational Model and the learning lines in the curriculum, is up to standard. Academic skills and research skills are addressed prominently in the curriculum. The panel proposes to elaborate the relevance of intercultural competencies for the programme.

The staff lecturing in the programme have solid research backgrounds and are skilled and motivated teachers. Their educational capabilities are up to standard. The panel notes the high level of appreciation of lecturers by students. The work load is experienced by the lecturers to be rather high but manageable. The panel is pleased to see that extra staff is recruited. The panel is positive about educational capabilities being part of the recruitment procedures of staff, suggesting to maybe add test lectures.

The panel is positive about the educational concept and study methods of the programme. The number of hours of face-to-face education and the supervision of students in the courses and in the projects allow for intensive education. The study load is adequate. Although students do not experience extra pressure on account of the 15 EC modules, the panel supports that students are allowed in future to obtain credits for courses within modules. The panel appreciates the student guidance in the programme, especially by the study advisor. The material facilities for the programme are adequate. The panel recommends to monitor the drop-out rates and the student success rates of the programme.

The examination and assessment policies for the programme are appropriate. The panel regards the Examination Board as being professional in executing its duties. The panel welcomes the measures taken by programme management to ensure the examinations and assessments quality.

The examination methods selected in the theoretical and practice-oriented courses as well as in the projects are approved by the panel, these matching the course contents. The panel appreciates the diversity in examination methods adopted. The panel judges the measures, taken to prevent that free-riding has any effect on the assessments of individual students, to be solid. The panel suggests to have examiners always supervise the marking of examinations by teaching assistants.

The assessment and supervision processes of Bachelor Assignments are organised reliably and effectively. The panel, however, advises to add more extensive arguments to substantiate the assessments of these final projects.

The examinations of the courses are adequate. The Bachelor Assignments are appropriate. Bachelor Assignments vary in terms of quality and level. The panel supports the grades awarded to the projects by the programme examiners. No projects were found to be unsatisfactory. The panel agrees that the *cum laude* requirements should be made more strict.

The panel assesses that the graduates have reached the intended learning outcomes of the programme.

The panel that conducted the assessment of the Bachelor Applied Mathematics 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 *satisfactory*. Therefore, the panel recommends NVAO to accredit this programme.

Rotterdam, 23 September 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 University of Twente to support the limited framework programme assessment process for the Bachelor Applied Mathematics 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 University of Twente 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.R. den Breeijen MSc, recently graduated student Master Mathematics, Radboud University Nijmegen (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 final projects of fifteen graduates of these years. 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 12 July 2019, the panel conducted the site visit on the University of Twente 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, Examination Board 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 Applied Mathematics (B Technische Wiskunde)
Orientation, level programme: Academic Bachelor
Grade: BSc
Number of credits: 180 EC
Specialisations: None
Location: Enschede
Mode of study: Full-time
Language of instruction: English
Registration in CROHO: 21PH-56965 (21PH-59336 up to 1 May 2019)

Name of institution: University of Twente
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 Applied Mathematics programme is one of the programmes of the Faculty of Electrical Engineering, Mathematics and Computer Science of University of Twente. The Faculty Steering Committee Education, chaired by the Portfolio Holder Education, has the responsibility for the organisation and the quality of this and the other programmes of the Faculty. The director of this programme, assisted by the bachelor coordinator and the study advisor, is responsible for the organisation and delivery of this programme. Lecturers are members of the Department of Applied Mathematics of the Faculty. They do not only lecture in this programme, but are also engaged in service education for other programmes of University of Twente. The Programme Committee, consisting of an equal number of lecturers and students, advises programme management on quality issues regarding the programme. The Examination Board for both the Bachelor and Master Applied Mathematics programmes is responsible for assuring the quality of examinations and assessments of these programmes. This Examination Board is part of the Faculty-wide Examination Board.

The objectives of the programme are to educate students broadly in the mathematics discipline and to train them to apply mathematical concepts and methods to problems in other sciences or in society. The programme educates students to acquire modelling and programming skills. Students also acquire research skills and general academic skills. Academic skills are, among others, communicating and working in multidisciplinary and intercultural settings. The programme is research-based, the subjects and topics taught being based upon research done in these fields.

The joint Mathematics programmes in the Netherlands drafted the Domain-Specific Framework of Reference for 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, as ETH Zürich, KU Leuven, Cambridge University and University of Padova.

In addition to taking the general programme, students may take the double Bachelor programmes Applied Mathematics and Applied Physics or Applied Mathematics and Technical Computer Science. The study load of these programmes is 220 EC to 230 EC. Students are also offered the university-wide honours programme of 30 EC of extra courses.

Students are prepared to enrol in a wide range of master programmes, being master programmes in applied mathematics or in related disciplines. Students are not educated to directly enter the labour market, but some may do so. The minor Education gives students the opportunity to become grade-two teachers in Mathematics in secondary education. The programme is taught in English. This has been done to prepare students for careers in the international professional field.

The objectives of the programme have been translated into the intended learning outcomes for the programme. These include, as main elements, thorough knowledge of the main fields in mathematics; understanding the application of mathematics in various areas; being capable of formal reasoning; research skills; knowledge and skills to design and analyse mathematical models; programming skills; communication skills; awareness of mathematics' societal position; knowing how to prepare for further studies or for the labour market; and intercultural competencies.

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 comprehensively and thoroughly in the mathematics discipline, to acquaint them with mathematical applications in various areas and to introduce them to modelling and programming skills. The panel welcomes it that students are acquainted with research and are trained in general academic skills, and acquire intercultural competencies.

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 Netherlands to have drafted this Framework. The objectives and intended learning outcomes of this programme meet to a large extent the Framework and, therefore, correspond to international standards set for the discipline. The panel advises to mention the mathematics fields of optimisation and geometry explicitly in the intended learning outcomes to align these more with the Framework.

The panel supports the programme objectives to educate students to continue their studies at master level. The panel appreciates that students are offered opportunities to qualify as grade-two teachers in Mathematics in secondary education.

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 substantially from 34 students in 2013 to 64 students in 2018. About 15 % to 20 % of these students are foreign students. The entry requirements are the Dutch secondary education diploma, including the Mathematics B and English certificates. Foreign applicants have to meet equivalent requirements and have to be proficient in English. Students not meeting the entry requirements, may take extra courses before being admitted. The programme schedules a number of events to inform prospective students about the programme. Students who have registered for the programme, are invited to matching days, which include interviews either in person or on-line. Having attended the matching day, applicants are given non-binding advice on entering the programme. The first module in the curriculum accommodates the transition from secondary school to university-level education. The second module in the first year is rather challenging and may induce students, not really able to meet programme requirements, to leave the programme early. The study advisor meets with every one of the students in the first part of the first year, to inform them about the programme.

The curriculum study load is 180 EC. The curriculum takes three years to complete. Programme management presented a table, mapping the intended learning outcomes to the curriculum components. The curriculum has been organised in line with the Twente Educational Model structure, which applies to all bachelor programmes of the university. The curriculum is composed of twelve modules of 15 EC each, scheduled in twelve consecutive quarters. Modules are coherent educational units, each of these being directed towards overarching themes and centred around projects. Courses within modules are either theory or practice courses. Practice courses are, among others, modelling and programming courses. In the module courses, students acquire knowledge and are trained in skills. Knowledge and skills acquired are subsequently applied in the module projects. Projects may be either theoretical or practice-oriented projects. In the curriculum, six learning lines are drafted. Module courses contribute to these learning lines. The learning lines are Analysis and linear algebra, Stochastics, Mathematical modelling and programming, Academic skills, Reflection, and Intercultural skills. Within the learning lines, module courses build upon each other. Task forces keep oversight over the contents and organisation of the first three learning lines. In three of the eight modules of the first two years, students from this programme work together with students from other programmes, such as Applied Physics or Technical Computer Science. In these modules, students learn to work in interdisciplinary teams. In the first two periods of the third year, students may take minors. The number of minors offered is quite extensive. Students may take the Education minor, preparing them for the grade-two teacher qualification. Students may also go abroad in this semester. The Bachelor Assignment (10 EC) is part of the final module of the curriculum, requiring students to conduct an individual research project.

The permanent staff members, lecturing in the programme, are nearly all active researchers in their fields, being members of the Department of Applied Mathematics and having obtained PhD degrees. About 80 % of the lecturers are UTQ-certified. The other lecturers are in the process of obtaining their UTQ-certificate. Teaching assistants, PhD students or postdocs are involved in tutorials and in guiding students in projects. The lecturers are free in designing their courses, as long as they meet the learning goals of the modules. Lecturers lecturing in modules meet to adjust the courses and to ensure the coherence of modules. Module coordinators meet on a regular basis to align modules. All staff come

together twice per year to discuss the programme. Students appreciate lecturers' teaching skills, their accessibility and their readiness to help. The work load is experienced by the lecturers to be rather high but manageable. The Mathematics sector plan will allow the programme to recruit extra staff. In the recruitment processes of new staff members, the teaching capabilities of candidates are taken into account.

The educational concept of the programme, being the Twente Educational Model, is meant to connect subjects and to foster curriculum coherence, and is geared towards offering small-scale and intensive teaching. Study methods adopted in the courses are lectures, tutorials or combinations of lectures and tutorials. Homework assignments are part of the courses. In practice-oriented courses, such as modelling and programming courses as well as in projects, students work in small groups. Diversity is taken into account in group composition. In some modules, groups are composed multidisciplinary. Student groups are guided by tutors, tutors being teaching assistants, PhD students, postdocs or lecturers. The number of hours of face-to-face education is especially substantial in the first year, becoming less in the second and third year. The study advisor monitors the study progress of students, and invites them to discuss in person study delay issues. The study advisor is available for students in case of study-related problems. The bachelor coordinator assists students in drafting their individual study plans. The Twente Educational Model promotes students' study progress. Students having to obtain 15 EC for the modules does not put any unfavourable pressure upon them. Some internal compensation may be granted. The average drop-out rate is about 46 %, calculated for the last five years. The average student success rates are about 41 % after three years and about 70 % after four years (last two to three cohorts; proportions of students re-entering the programme in the second year). Programme management holds exit interviews with students dropping out of the programme and with students who do not proceed to the University of Twente Master Applied Mathematics programme.

Considerations

The panel is positive about the growth in student numbers in the last years. The panel approves of the entry requirements and admission procedures of the programme. Prospective students are informed appropriately about the programme. The panel is positive about students being accommodated to adjust to university-level education in the first module.

The curriculum of the programme matches the intended learning outcomes. The panel regards the contents of the curriculum to be appropriate, with courses covering the various fields within the applied mathematics discipline. The panel proposes to strengthen the field of geometry in the curriculum. The panel appreciates that complex function theory is addressed, and that vector fields are introduced in combination with electricity and magnetism. The panel advises to strengthen the subjects of history of mathematics and ethics in the curriculum, maybe making these parts of the Reflection learning line. The curriculum coherence, as supported by the modules of the Twente Educational Model and the learning lines in the curriculum, is up to standard. Academic skills and research skills are addressed prominently in the curriculum. The panel proposes to elaborate the relevance of intercultural competencies for the programme.

The staff members lecturing in the programme have solid research backgrounds and are skilled and motivated teachers. Their educational capabilities are up to standard. The panel notes the high levels of appreciation of lecturers by students. The work load of lecturers is rather high but manageable. The panel is pleased to see that extra staff is recruited. The panel is positive about educational capabilities being part of the recruitment procedures of staff, suggesting to maybe add test lectures.

The panel is positive about the educational concept and study methods of the programme. The programme has implemented the Twente Educational Model in a way that appears to be effective and stimulating. The number of hours of face-to-face education and the supervision of students in the courses and in the projects allow for intensive education. The panel considers the study load to be adequate. Although students do not experience extra pressure on account of the 15 EC modules, the panel supports that students are allowed in future to obtain credits for courses within modules. The panel appreciates the student guidance in the programme, especially by the study advisor. The material facilities for the programme are adequate. As the drop-out rates and the student success rates of the programme are somewhat disappointing, the panel recommends to monitor these.

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.
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Findings

The rules and regulations for the programme examinations and assessments have been laid down in the programme assessment policy plan. The examinations and assessments are governed by the principle of constructive alignment, linking the course examinations to the learning goals and the contents of the courses. The rules and regulations are in line with the University of Twente assessment framework. The Examination Board has the authority to assure the quality of examinations and assessments of the programme. The Board is part of the Faculty-wide Examination Board. This Faculty-wide Board works on common rules and regulations for all programmes of the Faculty.

The examination methods in theoretical courses are mainly written examinations, sometimes in combination with homework assignments. Practice-oriented courses and projects are assessed on the basis of written reports and students' observed performances in the group processes. The effects of any free-riding within these courses are countered by the tutor observations of the individual performances of students and by the individual examinations of the theoretical courses. Teaching assistants are involved in the marking of homework assignments as well as in the marking of examinations. The latter is done on the basis of detailed answer keys.

In the last module of the curriculum, the Bachelor Assignment is scheduled. Bachelor Assignments are individual research projects. In the course *Reflection on Mathematical Research I* preceding the Assignment, students review literature and draft the research plan for the Assignment. The deadline for submitting the Assignment is very strict. The module coordinator supervises the process. At completion of their Bachelor Assignment, students are to submit the written report and are to present the results. The assignment is assessed by the two examiners, being staff members from two different research groups. Rubrics scoring forms have been adopted for the assessments, which include as assessment criteria mathematics contents, model set-up, literature used, self-reliance, conclusions and recommendations, written report and oral presentation.

In the programme, measures have been taken to ensure the validity, reliability and transparency of examinations and assessments. The Examination Board appoints examiners. Examination drafts are peer-reviewed by fellow examiners. Examinations are documented in course files. The Examination Board inspects course files. Students are presented test examinations and are allowed to inspect their marked work. Examiners of Bachelor Assignments meet to discuss the assessments and the grades. All written assignments, including the Bachelor Assignments are checked for fraud or plagiarism.

Considerations

The panel considers the examination and assessment policies for the programme to be appropriate, these being in line with the University of Twente guidelines. The position and the authority of the Examination Board are adequate. The panel regards the Examination Board as being professional in executing its duties.

The examination methods selected in the theoretical and practice-oriented courses as well as in the projects are approved by the panel, these matching the course contents. The panel appreciates the diversity in examination methods adopted. The panel judges the measures, taken to prevent that free-riding has any effect on the assessments of individual students, to be solid. The panel suggests to have examiners always supervise the marking of examinations by teaching assistants.

The assessment and supervision processes of Bachelor Assignments are organised reliably and effectively. 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 adequate and to promote 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 satisfactory.

4.4 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.

The panel reviewed the Bachelor Assignments of fifteen graduates of the programme with different grades. The Bachelor Assignments are individual projects, requiring students to design and analyse mathematical models. Implementation and verification of the model are part of the assignments. In the Bachelor Assignments, students are to demonstrate having mastered a number of intended learning outcomes of the programme. The average grade for these assignments is 7.9 for the graduates of the last five years. About 16 % of the programme graduates of the last five years graduated *cum laude*. The programme regards this proportion as slightly too high.

In the programme, students are getting acquainted with the professional field. Some of the projects in the modules are derived from real-life cases. In one of the modules, guest lecturers from the professional field take part in the teaching. Some Bachelor Assignments are assignments for external clients from industry.

The programme conducted a survey among programme alumni. The results from this survey reveal that students are generally very content about the programme. Programme graduates tend to continue their studies at master level in the applied mathematics discipline or in related disciplines.

Considerations

The examinations of the courses which were reviewed by the panel are adequate.

The Bachelor Assignments, studied by the panel, are appropriate. The level reached by students is adequate. Bachelor Assignments vary in terms of quality and level. The panel supports the grades awarded to the projects by the programme examiners. No projects were found to be unsatisfactory. The panel agrees that the *cum laude* requirements should be made more strict.

The panel assesses that the graduates have reached the intended learning outcomes of the programme.

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	Satisfactory
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 mention the mathematics fields of optimisation and geometry explicitly in the intended learning outcomes, to align these with the Domain-Specific Framework of Reference.
- To strengthen the field of geometry in the curriculum.
- To include the subjects of ethics and history of mathematics in the curriculum.
- To elaborate the relevance of intercultural competencies for the programme.
- To monitor the drop-out rates and the student success rates of the programme.
- To have examiners supervise the marking of examinations by teaching assistants.
- To add more extensive comments and arguments to substantiate the assessments of the Bachelor Assignments.