Assessment report
Limited Framework Programme Assessment

Bachelor Applied Mathematics

Eindhoven University of Technology

Contents of the report

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 Eindhoven 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 broadly and thoroughly in the mathematics discipline, to provide them with mathematical modelling skills, and to acquaint them with mathematical applications. The panel welcomes students being trained in programming skills as well as in general academic and professional skills. The panel has noted the programme offering a wide range of electives and elective packages, allowing students to study specific fields or subject areas within the mathematics discipline.

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 the Framework and, therefore, correspond to international standards set for the discipline.

The panel supports the programme objectives to educate students to continue their studies at master level. The panel appreciates the programme focus on the internationally oriented professional field of the Eindhoven Brainport region.

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

The admission requirements and procedures of the programme are adequate. The panel is positive about students being introduced to mathematics principles and techniques in various courses.

The programme curriculum matches the intended learning outcomes. The panel regards the curriculum to be up to standard and the curriculum coherence to be appropriate. The panel is positive about the field of modelling being covered, and also about the subject of complex analysis being addressed as the link between pure and applied mathematics. The programme plans to strengthen the ethical dimensions are supported by the panel. Although the fields of algebra and geometry are covered in the curriculum, the panel advises to present these fundamental subjects more strongly. The panel also recommends to strengthen the field of numerical analysis. In addition, the panel suggests to relate the academic and professional skills training more closely to the mathematics discipline. The panel proposes to advise students more extensively on elective courses to be selected or elective packages to be taken. The panel also advises to consider scheduling electives later than the second quarter of the first year to allow students more time to make well-considered decisions.

The staff in the programme have solid research backgrounds and are good and motivated teachers, working on the continuous improvement of their courses. Their educational capabilities are up to standard. The lecturers are appreciated by the students. The panel is positive about educational capabilities being part of the recruitment procedures of staff. The panel supports PhD students and postdoctoral researchers being involved in the programme, but suggests to make supervision by staff members standard practice. As the work load of lecturers is high, the panel advises to recruit extra staff. The panel notes the Department already taking effective action in this respect.

The panel is very positive about the educational organisation of the programme. The educational concept and study methods of the programme meet the programme's characteristics very well. The panel is very positive about the study methods being developed and adapted by the lecturers themselves. The number of hours of face-to-face education is generous. The panel appreciates the student guidance system of the programme, especially in the first part of the curriculum. The panel suggests to avoid predominance of digital instruments in study guidance. Although the material facilities for the programme are adequate, the panel suggests to assure sufficient numbers of study spaces for students. The panel recommends to monitor the drop-out rates and the student success rates.

The programme examination and assessment policies are in line with the Department rules and regulations. The responsibilities and activities of the Examination Committee are up to standard. The panel welcomes the measures taken by programme management to ensure the examinations and assessments validity, reliability and transparency.

The examination methods selected in the courses meet the course contents. The panel appreciates the diversity in examination methods adopted in the courses.

Supervision and assessment of Bachelor final projects are organised 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 final projects, studied by the panel, are up to standard. The level reached by students, is appropriate. The panel supports the grades awarded to the projects by the programme examiners. No projects were found to be unsatisfactory.

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

The panel that conducted the assessment of the Bachelor Applied Mathematics programme of Eindhoven 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, 30 September 2019

Prof. dr. R.H. Kaenders
(panel chair)

drs. W. Vercouteren
(panel secretary)

2. Assessment process

The evaluation agency Certiked VBI received the request by Eindhoven University of Technology 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 Eindhoven 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. R.H. Kaenders, full professor Mathematics and its Education, University of Bonn, Germany (panel chair);
- Prof. dr. D. van Straten, full professor Algebraic Geometry, Johannes Gutenberg University Mainz, Germany (panel member);
- Prof. dr. J. Molenaar, full professor Applied Mathematics, Wageningen University and Research (panel member);
- Dr. ir. H.J. Prins, manager Research & Development, Maritime Research Institute the Netherlands (panel member);
- L. Weedage BSc, student Master Applied Mathematics, University of Twente (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 ensured to 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 of fifteen theses made by the process coordinator.

The assessment panel chair was informed about the procedures regarding the assessment process and the site visit schedule. The panel chair was comprehensively acquainted with the competencies, listed in the profile of panel chairs of NVAO.

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 24 May 2019, the panel conducted the site visit on the Eindhoven 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 Department Board representatives, programme management, Examination Committee 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:	Eindhoven
Mode of study:	Full-time
Language of instruction:	English
Registration in CROHO:	21PG-56965

Name of institution:	Eindhoven 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 Applied Mathematics programme is one of the programmes of the Department of Mathematics and Computer Science of Eindhoven University of Technology. The programme conforms to the University-wide Bachelor College requirements. The Department Board, chaired by the dean, is responsible for the quality of this and the other programmes of the Department. The director of this programme, assisted by the bachelor coordinator, is responsible for the organisation and delivery of this programme. The director and the dean of the Bachelor College meet every year to discuss the programme and developments of the programme. The lecturers in the programme are mainly staff members of the sub-department Mathematics of the Department of Mathematics and Computer Science. Lecturers do not only lecture in this programme, but also participate in service education for all other programmes of Eindhoven University of Technology. In fact, service education constitutes the major part of the educational activities of most staff members. The Programme Committee, consisting of an equal number of lecturers and students, advises the Department Board and the programme director on quality issues regarding the programme. Students' views on the programme quality are collected by means of written surveys. The Examination Committee for both the Bachelor Applied Mathematics and the Master Industrial and Applied Mathematics programmes is responsible for assuring the quality of examinations and assessments of these programmes.

The objectives of the programme are to educate students broadly and solidly in the mathematics discipline, to train them in mathematical modelling skills, to provide them with the orientation on mathematical applications, to train them in programming and software skills, and to have them acquire academic and professional skills. Students are introduced to the fields of analysis, discrete mathematics and applications, stochastics, probability and operations research, and computational science and engineering. Packages of elective courses are offered, allowing students to specialise in, among others, subject areas stochastics, security, computational science or fundamentals of mathematical physics. The elective package Mathematics is offered by Utrecht University.

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.

Students are not primarily educated to immediately enter the labour market. The minor Education gives students the opportunity to become second-degree teachers in Mathematics in secondary education, though. Students are offered the opportunity to take double degree programmes with the

Bachelor Applied Physics (225 EC) or with the Bachelor Computer Science and Engineering (225 EC). Students may be selected for participation in the University Honors Programme (30 EC extra courses). The last three programmes mentioned are especially meant for talented and motivated students.

The programme prepares students for companies in the Eindhoven Brainport region and beyond, for Bachelor students after having completed one of the subsequent master programmes. The programme being taught in English is mainly to acquaint them early on with this international professional field. In the programme, students do not go to other countries very often.

The objectives of the programme have been translated into the intended learning outcomes. These include, as main elements, knowledge and understanding of mathematics and mathematics applications, knowledge and skills of basic mathematical and computer science techniques, being able to do mathematical research assignments of limited scope, knowledge and understanding to design and handle mathematical models and validate solutions, critical and creative attitude, communication and collaborative skills, and insight in mathematicians' role and responsibility in society.

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 broadly and thoroughly in the mathematics discipline, to provide them with mathematical modelling skills, and to acquaint them with mathematical applications. The panel welcomes students being trained in programming skills as well as in general academic and professional skills. The panel has noted the programme offering a wide range of electives and elective packages, allowing students to study specific fields or subject areas within the mathematics discipline.

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 the Framework and, therefore, correspond to international standards set for the discipline.

The panel supports the programme objectives to educate students to continue their studies at master level. The panel appreciates the programme focus on the internationally oriented professional field of the Eindhoven Brainport region.

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 about 60 students in 2012 and 2013 to about 120 students in 2017. About 20 % to 25 % of these students take double degree programmes. The number of foreign students is small. The entry requirements are the Dutch secondary school diploma, including the Mathematics B certificate. Foreign applicants have to meet equivalent requirements and have to be proficient in English. The programme schedules a number of events to inform prospective students about the programme. In the Study Choice Check procedure, applicants complete on-line questionnaires, take lectures and meet with staff members, in order to verify their choice for the programme. In the first period of the programme, students in small groups of 6 to 8 students are guided by teacher-coaches and student-mentors to accommodate to the programme characteristics. Students are acquainted with mathematics principles and techniques in a number of different courses. Requests for exemptions are handled by the Examination Committee.

The study load of the curriculum is 180 EC, taking three years to complete. The curriculum is English-taught. Programme management presented a table, showing the curriculum to cover all of the intended learning outcomes. The curriculum is organised along the lines of the University-wide Bachelor College. The Bachelor College format implies five common courses (25 EC), shared by all Bachelor programmes within Eindhoven University of Technology, the major courses (90 EC), academic and professional skills (5 EC), USE (User, Society, Enterprise) courses (15 EC) and elective courses (45 EC). The common courses address calculus, physics, ethics and history of technology, engineering design and data analytics. The major courses cover the fields of analysis, (linear) algebra, discrete mathematics, stochastics, probability and operations research, computational science, modelling and programming. Modelling, programming and using mathematics software have been integrated in the courses. The academic and professional skills include communication skills, collaboration skills, knowing how to process scientific information, planning skills, and reflective competencies. The training in these skills is part of the major courses. In the USE courses, students are offered courses on societal and business aspects of engineering. In the elective courses, students may deepen their knowledge in specific fields, such as computer security, stochastics, mathematics or computational science. The Bachelor final projects (10 EC) are individual research projects, modelling assignments or literature studies. New trends are introduced in the curriculum. The programme plans to strengthen the ethical dimensions in the curriculum.

The permanent staff members, lecturing in the programme, are all members of the sub-department Mathematics of the Department of Mathematics and Computer Science. The total number of permanent staff members are 56 lecturers or 43.5 full-time equivalents, both for the Bachelor Applied Mathematics and the Master Industrial and Applied Mathematics programmes of this University. The staff members are also involved in service education for other departments of the University, which takes up most of their time. All staff members in this programme have PhD degrees and nearly all of

them are active researchers in their fields. Of the staff members 57 % are BKO-certified and another 21 % of them are in the process of obtaining the BKO-certificate. Most of the other staff have been granted exemptions on the basis of long experience in teaching or limited teaching load. The work load is experienced by the lecturers to be high, mostly due to rising student numbers. The Department is planning to recruit additional lecturers. The Mathematics sector plan will also allow the programme to recruit extra staff. In addition, the Department is recruiting PhD students on five-year contracts, which include 25 % teaching loads, as well as postdoctoral researchers with teaching tasks. Teaching assistants are involved in tutorials and in the correction of homework assignments. Every month, lecturers meet to discuss the programme, the practice of lecturing in the programme and educational innovation. Students appreciate lecturers' educational capabilities and accessibility. Educational capabilities are one of the criteria in recruitment procedures of staff members. The lecturers in the programme are assisted by the quality assurance officer in quality assurance processes and by the teaching support officer in course update processes. Lecturers appreciate this support.

The educational concept of the programme is primarily meant to offer small-scale and intensive teaching and learning. Study methods adopted are lectures, instruction classes, practical classes, training sessions, project work, and self-study. New study methods, such as web lectures, video lectures, online exercises and online mathematical tools, are being used. Lectures may be large-scale, whereas instruction and practical classes are small-scale. In most of the periods of the curriculum, the number of hours of face-to-face education is about 24 hours per week. In the instruction classes or practical classes, students work either individually or in groups to solve problems. Students are given feedback on homework assignments. As has been said, students are guided in the first part of the programme by teacher-coaches and student-mentors. The teacher-coaches remain the first point of contact for students throughout the programme. Students have access to digital instruments to schedule courses. The programme director, Bachelor coordinator and academic advisor take part as lecturers and instructors in the first quarter of the first year, to lower the threshold for students to contact them. The academic advisor monitors the study progress of students and invites them to discuss in person study delay issues. The average drop-out rate is about 32 %, calculated for the last six years. The average student success rates are 44 % after three years and 64 % after four years (last four 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 programme. The panel is positive about students being introduced to mathematics principles and techniques in various courses.

The curriculum of the programme matches the intended learning outcomes. The panel regards the curriculum to be up to standard, with courses covering the various fields within the applied mathematics discipline. The curriculum coherence is appropriate. The panel is positive about the field of modelling being covered, and also about the subject of complex analysis being addressed as the link between pure and applied mathematics. The plans by the programme to strengthen the ethical dimensions in the curriculum are supported by the panel. Although the fields of algebra and geometry are covered, the panel advises to present these fundamental subjects more strongly. The panel also recommends to strengthen the field of numerical analysis. In addition, the panel suggests to relate the academic and professional skills training more closely to the mathematics discipline. The panel proposes to advise students more extensively on elective courses to be selected or elective packages to

be taken. The panel also advises to consider scheduling electives later than the second quarter of the first year to allow students more time to make well-considered decisions.

The staff in the programme have solid research backgrounds and are good and motivated teachers, working on the continuous improvement of their courses. Their educational capabilities are up to standard. The panel notes the levels of appreciation of lecturers by the students. The panel is positive about educational capabilities being part of the recruitment procedures of staff. The panel supports PhD students and postdoctoral researchers being involved in the programme, but suggests to make supervision by staff members standard practice. As the work load of lecturers is high, the panel advises to recruit extra staff. The panel notes the Department already taking effective action in this respect.

The panel is very positive about the educational organisation of the programme. The educational concept and study methods of the programme meet the programme's characteristics very well. The panel is very positive about the study methods being developed and adapted by the lecturers themselves. The number of hours of face-to-face education is generous. The panel appreciates the student guidance system of the programme, especially in the first part of the curriculum. The panel suggests to avoid predominance of digital instruments in study guidance. Although the material facilities for the programme are adequate overall, the panel proposes to assure sufficient numbers of study spaces for students. The panel recommends to monitor the drop-out rates 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 rules and regulations regarding examinations and assessments are in line with the University and the Department of Mathematics and Computer Science policies. The Examination Committee for the Bachelor Applied Mathematics and Master Industrial and Applied Mathematics programmes assures the quality of examinations and assessments of these programmes.

The examination methods in the programme include written examinations, homework assignments, individual assignments, group assignments, oral examinations, and academic or professional skills tests. The examination methods are in line with the course goals. In most courses, multiple examination methods are scheduled. First-year courses include interim examinations to promote study progress. In second-year and third-year courses, interim examinations are not required. The final course grade is the weighted outcome of the grades of the examinations. The proportion of the course grades awarded to homework assignments is limited to keep the risk of free-riding effects on the course grades within boundaries.

The Bachelor final projects are individual projects, being supervised by one of the staff members of the Department. Day-to-day guidance may be in the hands of PhD students or postdoctoral researchers. Students meet regularly with their supervisor. The projects are assessed by the principal supervisor and the second reader. The students' performances are assessed on the basis of the project execution, written report, oral defence, presentation to a broader audience, and professional skills demonstrated. In rare cases, projects may be done by two students. Then, students are to address different aspects of the subjects studied and are to submit different reports. Both students will be assessed on the basis of their individual performances.

In the programme, a number of measures have been taken to ensure the quality of examinations and assessments. The examination plan for the programme specifies the way the intended learning outcomes are being tested. Examiners are appointed by the Examination Committee. Course examinations are drafted by examiners and are peer-reviewed by their colleagues. Answer models have been adopted for basic courses. The variation in answers in more advanced courses makes the use of answer models in these courses impractical. In case of doubt, second examiners may assess students' work. Students are informed about grading schemes and may inspect their work. Students are informed about fraud and plagiarism regulations.

Considerations
The panel observed the programme examination and assessment policies to be in line with the Department rules and regulations. The panel is positive about the responsibilities and activities of the Examination Committee.

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.

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 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.

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

The panel reviewed the Bachelor final projects of fifteen graduates of the programme with different grades. The Bachelor final projects are individual research projects, modelling assignments or literature studies. In the Bachelor final projects, students are to demonstrate having mastered most of the intended learning outcomes of the programme. The average grade of these projects is 7.9 for the graduates of the last three years. Nearly 21 % of the programme graduates of the last six years graduated *cum laude*.

The Board of Advice for the Department of Mathematics and Computer Science meets twice per year with the Department Board to discuss trends in research and education. The programme intends to install a programme advisory board to advise specifically on the intended learning outcomes and curriculum of the Bachelor and Master Applied Mathematics programmes.

The vast majority of the programme graduates (88 % of all graduates over the past four years) enrol in the Master Industrial and Applied Mathematics of Eindhoven University of Technology. A very limited number of students proceed to the Master Science and Communication programme to become fully-qualified teachers in Dutch secondary education. The remaining graduates either enter other programmes of this university or go to other universities. These numbers are very small. Programme graduates tend not to enter the labour market.

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

The fifteen Bachelor final projects, studied by the panel, are up to standard. The level reached by students, is appropriate. The panel supports the grades awarded to the projects by the programme examiners. No projects were found to be unsatisfactory.

The panel assesses the graduates to 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 present the fields of algebra and geometry more strongly in the curriculum.
- To strengthen the field of numerical analysis in the curriculum.
- To relate academic and professional skills training more closely to the mathematics discipline and to address its ethical aspects.
- To advise students more extensively on elective courses to be selected or elective packages to be taken.
- To consider scheduling electives later than the second quarter of the first year to allow students more time to make well-considered decisions.
- To make supervision by staff members of the lecturing by PhD students and postdoctoral researchers standard practice.
- To continue to recruit additional staff, as the work load of the lecturers is high.
- To provide sufficient numbers of study spaces for students.
- To monitor the drop-out rates and the student success rates of the programme.
- To add more extensive comments and arguments to substantiate the assessments of the Bachelor final projects.