

Assessment report  
Limited Framework Programme Assessment

**Bachelor Wiskunde**

Radboud University

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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 Wiskunde programme of Radboud University. 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 in the discipline of mathematics and to allow them to go in-depth into one of the fields within the discipline. The panel welcomes that the programme is in particular aimed at teaching students analytical thinking skills. The gradual strengthening of applied mathematics in the programme is supported by the panel. Faculty-wide measures not always fit the specific nature of mathematics education. Therefore, the panel proposes to consider more elaborately the position of the programme when implementing these.

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 intentions to educate students for master programmes. The panel appreciates that students are offered a wide range of programmes they may be admitted to. The panel is positive about the double programmes and the honours programme students may take.

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

The panel approves of the entry requirements and the admission procedures of the programme. The programme accommodates students well in making the transfer from secondary school to academic education. The panel is also positive about the *Inleiding Wiskunde* course.

The curriculum of the programme matches the intended learning outcomes. The panel considers the curriculum to be solid and the courses to be good. The panel recommends to pay more attention to stochastics, numerical analysis and on computer programming. The panel also advises to strengthen the courses in mathematics & physics and mathematics & computing science. These measures may enable students to prepare better for the Master Mathematics programme.

The permanent staff members in the programme are all PhDs and have solid research backgrounds. Their educational capabilities are up to standard. The staff is perceived by the panel to be very committed to the programme. Students are very positive about the educational capabilities and the accessibility of the lecturers. The regular staff meetings on education are positive. The panel welcomes that extra staff is recruited to alleviate the work load of the lecturers. The panel appreciates that educational capabilities are taken into account, when recruiting staff members.

The educational concept and study methods meet the programme's characteristics. The students-to-staff ratio allows for small-scale teaching. Feedback on assignments is organised appropriately. The panel is positive about the study guidance in the programme. The panel considers the programme to be feasible. Some Mastermath courses have become more challenging. Since raising the level of Bachelor courses is not regarded as appropriate, discussions with Mastermath management have been initiated that address the high demands of some Mastermath courses. The panel encourages to continue these discussions. It is suggested by the panel to take the growth and development of the programme into account, when considering organisational measures. The panel advises to monitor drop-out rates and student success rates for the programme.

The programme examination and assessment regulations meet Faculty of Science examination policies. The panel is positive about the responsibilities and activities of the examination board. The panel considers the board to work very solidly. The board could be more pro-active, though.

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 Bachelor project supervision and assessment are organised effectively. The panel finds the written comments on the assessment forms by examiners comprehensive and valuable. The panel, however, advises to add more extensive arguments to substantiate the assessments of the Bachelor projects.

The panel appreciates the measures taken by the programme to ensure the quality of examinations and assessments. These measures enhance the validity of examinations and the reliability of assessments.

The examinations of the courses are of adequate level. The panel supports the grades awarded to the Bachelor projects. No projects were found to be unsatisfactory. The panel regards the projects to be appropriate. The language and style in the theses could be improved.

The panel is convinced that the programme graduates have reached the intended learning outcomes of the programme. Programme graduates are admitted to a wide range of master programmes, which testifies to the learning outcomes achieved. The panel appreciates the labour market orientation activities by the programme and the study association.

The panel that conducted the assessment of the Bachelor Wiskunde programme of Radboud University 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, 27 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 Radboud University to support the limited framework programme assessment process for the Bachelor 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 Radboud University 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 6 May 2019, the panel conducted the site visit on the Radboud University 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 Wiskunde  
Orientation, level programme: Academic Bachelor  
Grade: BSc  
Number of credits: 180 EC  
Specialisations: None  
Location: Nijmegen  
Mode of study: Full-time  
Language of instruction: Dutch  
Registration in CROHO: 21PM-56980

Name of institution: Radboud University  
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 Wiskunde programme is one of the bachelor programmes of the Faculty of Science of Radboud University. Within the Faculty, the programme is organised by the Educational Institute for Mathematics, Physics and Astronomy WiNSt. The director of education of the Educational Institute is responsible for this and the other programmes of the Institute, being accountable to the dean and the vice dean of education of the Faculty. The programme coordinator for the Bachelor Wiskunde programme takes care of the organisation of the programme. The lecturers involved in the programme are employed by the Institute for Mathematics, Astrophysics and Particle Physics, IMAPP. This Institute is primarily concerned with research in, among others, the mathematics discipline. Lecturers are recruited by the WiNSt Educational Institute to lecture in this programme as well as in the Master Mathematics programme. The programme committee for the programme, consisting of both lecturers and students, advises the programme coordinator for this programme as well as the programme coordinator for the Master Mathematics programme on the quality of these programmes. The examination board is responsible for monitoring the examinations and assessments of all programmes of the Educational Institute.

The programme offers fundamental mathematics in the full breadth of the discipline. The programme objectives are to provide students with options to be broadly educated in fundamental mathematics, even including aspects of natural sciences, or to go in-depth in one of the fields within the fundamental mathematics discipline. Fields covered within the programme are calculus and analysis, probability theory and statistics, geometry, numerical analysis, discrete mathematics, algebra, differential equations, and optimisation. The programme educates students in these fields within the mathematics discipline, trains them in the theoretical and practical aspects of the discipline, and acquaints them with mathematical thinking and reasoning. The programme educates students strongly in analytical thinking, and in being able to apply concepts both theoretically and practically. The programme is research-based, the subjects and topics taught being based upon research done in these areas. The programme has the intention to strengthen the applied mathematics dimensions in the near future.

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.

Students are being prepared to enrol in master programmes in mathematics or in neighbouring disciplines, such as physics, computer science, neuroscience or econometrics. Students are not primarily educated to enter the labour market, although some students do. The minor Education allows students to become second-degree teachers in Mathematics in secondary education. Talented students may take double programmes, combining the Bachelor Wiskunde programme with the Bachelor Physics and Astronomy or with the Bachelor Computing Science (total study load 225 EC). Students may also opt for the Faculty Honours Programme of 24 EC of extra courses in the second and third year.

The objectives of the programme have been translated into the intended learning outcomes for the programme. These include, as main elements, theoretical and practical understanding of the main fields within the mathematics discipline, understanding of applications of mathematics, knowledge of mathematical research, mathematical reasoning, communication skills, programming skills, awareness of the relevance of mathematics in society, and competencies to continue studies at master level.

Programme management compared the intended learning outcomes of the programme to the Dublin descriptors for bachelor programmes, from which the correspondence of the intended learning outcomes to these Dublin descriptors may be inferred.

#### *Considerations*

The panel appreciates the programme objectives to educate students broadly in the discipline of mathematics and to allow them to go in-depth into one of the fields within the discipline. Students are in particular taught analytical thinking, this goal being supported by the panel. The panel appreciates that the programme is research-based. The gradual strengthening of applied mathematics in the programme is supported by the panel. Faculty-wide measures not always fit the specific nature of mathematics education, as pursued by the programme and may even be counterproductive to the development of the programme. Therefore, the panel proposes to consider more elaborately the position of the programme when implementing these measures.

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

The panel supports the programme intentions to educate students for master programmes. The panel welcomes that students are offered a wide range of programmes they may be admitted to. The panel is positive about the double programmes and the honours programme students may take.

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 quite substantially from 62 students in 2012 to 99 students in 2018. About 30 % of the incoming students are female. About 30 % of these students take one of the double programmes. The entry requirements for the programme are the Dutch secondary school diploma, including the Mathematics B certificate. All other applications are screened by the Faculty International and Admissions Office. The number of these applications is small. Before entering the programme, applicants, especially those with lower grades in secondary education, are invited for non-obligatory meetings to inform them about the nature and challenges of the programme. At the start of the programme, students take an entry test. Students having unsatisfactory results, are to take part in the *Beta-boot camp*. Having been enrolled, students are invited to meet with one of the student advisors. The study advisors in the first year are teachers from secondary school to accommodate students bridging the gap between secondary education and university. The student advisors monitor the grades in the first part of the curriculum and contact students, when these are disappointing. In the beginning of the curriculum, the examinations scheduled are meant to be exemplary for the examinations in the programme as a whole. The course *Inleiding Wiskunde*, scheduled in the beginning of the programme, introduces students to the mathematics discipline. In this and some other courses, the student advisors from secondary school are present as instructors.

The study load of the curriculum is 180 EC. The curriculum takes three years to complete. Programme management explained the curriculum matching the intended learning outcomes. The first year of the curriculum introduces students to the various fields within the mathematics discipline. In the second year, the mandatory courses build on first-year courses, specifically extending knowledge about algebra, analysis and stochastics. In the third year mandatory course *Modellenpracticum*, modelling is covered. Students work in small groups to address problems, put forward by companies or public sector organisations. In the first year, students are allowed to take electives (12 EC). Students may take courses in other disciplines, such as physics, computer science or economics. In the subsequent years, students take additional electives (48 EC). Most students select mathematics courses. The programme has specified which courses prepare for specialisations in the Master Mathematics programme of Radboud University. Two electives (12 EC) are to be mathematics courses within one field. These two electives are often used to prepare for the Bachelor project. The elective space in the first semester of the third year allows students to take minors (30 EC), such as the Minors Physics and Astronomy, Computer Science, Economics or Education. The curriculum includes courses on academic skills and research skills training. Academic skills training is integrated in mathematics courses and are not addressed separately. Courses addressing these skills include the mandatory courses *Inleiding filosofie en ethiek* and *Schrijven over Wetenschap*. In the *Portfolio* (3 EC), students are to take part in and report on career orientation activities and events. The *Bachelor project* (12 EC) is the final project, constituting either original research or a literature survey. New subjects are introduced in the curriculum, such as data science and population dynamics.

The permanent staff in this programme and the Master Mathematics programme constitutes 20.5 full-time equivalents in terms of teaching capacity. Nearly all staff members are active researchers in the Institute for Mathematics, Astrophysics and Particle Physics, IMAPP, all of them having PhD degrees. Practically all staff members are BKO-certified, the BKO-certification being a prerequisite for permanent positions. Staff members offer the lectures, whereas teaching assistants guide students in exercise classes. Lecturers meet to discuss the programme and to adjust courses. Regular formal meetings of lecturers are scheduled. Informal lunch meetings take place as well. The lecturers with whom the panel met, expressed experiencing the work load to be high but manageable. The sector plan Mathematics will allow the programme to recruit extra staff. Educational capabilities are among the main criteria in staff recruitment procedures.

The educational concept of the programme is directed towards intensive and small-scale education. The students-to-staff ratio is about 16/1 for the Bachelor Wiskunde and the Master Mathematics programmes together. Study methods adopted are lectures, exercise classes, practical sessions and self-study. Lectures are offered by staff members. In exercise classes, teaching assistants guide students in doing exercises and completing assignments. Instructed by the lecturers, they give feedback on the homework assignments. Most lectures are recorded and are made available to students. Students may also access the learning system Brightspace for additional information. As has been stated before, students are guided by teachers from secondary education as study advisors in the first year of the programme. In this first year, study advisors and students meet at least twice. In addition to the support by study advisors, students may take part in mentor groups, being guided by elder students. In these groups, practical issues are discussed. In the second and third year, students may turn to the study advisors in case of questions or problems. Study advisors will schedule a meeting in case of study delay. In the near future, students will have the opportunity to turn to *Students of Support*, an initiative by the study associations of this and other programmes. To improve the feasibility of the programme, some measures have been taken. These include limiting lectures to 7 weeks instead of 8 weeks per quarter to allow more time before the examinations at the end of the quarter and limiting the number of examinations, especially in the first year. The average drop-out rate is about 40 %, calculated for the last six years. The average student success rates are about 30 % after three years and about 55 % after four years (last three cohorts; proportions of students re-entering the programme in the second year).

#### *Considerations*

The panel approves of the entry requirements and the admission procedures of the programme. The programme accommodates students well in making the transfer from secondary school to academic education. The panel is also positive about the *Inleiding Wiskunde* course.

The curriculum of the programme matches the intended learning outcomes. The panel considers the curriculum to be solid and the courses to be good. The panel recommends to pay more attention to stochastics, numerical analysis and computer programming. The panel also advises to strengthen the courses in mathematics & physics and mathematics & computing science, areas in which the programme has a strong research tradition. These measures may enable students to prepare better for the Master Mathematics programme.

The permanent staff members in the programme are all PhDs and have solid research backgrounds. Their educational capabilities are up to standard, as the substantial proportions of lecturers being BKO-certified show. The staff is perceived by the panel to be very committed to the programme. Students are very positive about the educational capabilities and the accessibility of the lecturers. The regular staff meetings on education are positive. The panel welcomes that extra staff is recruited to alleviate the work load of the lecturers. The panel appreciates that educational capabilities are taken into account, when recruiting staff members.

The educational concept and study methods meet the programme's characteristics. The students-to-staff ratio allows for small-scale teaching. Feedback on assignments is organised appropriately. The panel is positive about the study guidance in the programme. The panel considers the programme to be feasible. Some Mastermath courses have become more challenging. Since raising the level of Bachelor courses is not regarded as appropriate, discussions with Mastermath management have been initiated that address the high demands of some Mastermath courses. The panel encourages to continue these discussions. It is suggested by the panel to take the growth and development of the programme into account, when considering organisational measures. The panel advises to monitor drop-out rates and student success rates for the programme.

*Assessment of this standard*

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

### 4.3 Standard 3: Student assessment

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

#### *Findings*

The examination and assessment regulations for the programme are laid down in the programme assessment plan. These regulations are in line with the Faculty of Science examination policies. The examination board of the Educational Institute for Mathematics, Physics and Astronomy WiNSt has the authority to monitor examinations and assessments in this programme.

The examination methods in the programme include written examinations, homework assignments, reports, presentations and, in some cases, oral examinations. The examination methods are aligned with the course goals. In most courses, multiple examination methods are scheduled. The final grade of a course is the weighted outcome of the grades of these examinations. Homework assignments have a limited weight in arriving at the course grade. Written examinations are scheduled in all courses. Students must have at least the grade 5 (out of 10) for written examinations to pass courses.

Students select the topic for their Bachelor project in cooperation with their supervisor. Bachelor projects are done within the Educational Institute WiNSt, but may also be done in companies or organisations. The number of external projects is increasing. The project outline has to be approved by the supervisor. In the projects, students have to demonstrate that they know how to do mathematical research, under supervision. The main assessment criteria to assess the projects are depth and originality of the subject researched, soundness of mathematical reasoning, reporting skills and oral presentation skills. Students are to present their work two times in the course of the projects. The projects are assessed by the supervisor and the second reader. The supervisor informs the second reader about the process. Every one of them completes the assessment form. If their assessments differ more than 0.5 points, they have to discuss their differences in judgements.

In the programme, measures have been taken to ensure the quality of examinations and assessments. The assessment plan for the programme has been drafted, aligning the intended learning outcomes of the programme, course objectives and course examinations. Course dossiers for all courses document, among others, the course goals, examinations and answer models, test matrices, and outcomes of surveys among students and lecturers. The examinations of the courses are peer-reviewed, before being presented to the students. Test matrices for examinations have been adopted. Every year, the examination board reviews samples of course dossiers and samples of Bachelor projects and their assessments. Bachelor theses are checked for plagiarism.

#### *Considerations*

The panel observed the programme examination and assessment regulations to be in line with Faculty of Science examination policies. The panel is positive about the responsibilities and activities of the examination board. The panel considers the examination board to work very solidly. The board could be more pro-active, though.

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 Bachelor project supervision is organised effectively. The assessment of the projects is conducted reliably. The panel notes different assessment forms being used, the latest form not being very informative. The panel finds the written comments on the assessment forms by the examiners comprehensive and valuable. The panel, however, advises to add more extensive arguments to substantiate the assessments of the Bachelor 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 the oral presentation by the student.

The panel appreciates the measures taken by the programme to ensure the quality of examinations and assessments. These measures enhance the validity of examinations and the reliability of assessments. The panel is positive about the regular reviews of examinations and Bachelor projects by the examination board.

*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 also reviewed the Bachelor projects of fifteen graduates of the programme with different grades. In the Bachelor projects, students are to demonstrate having the knowledge and skills to do mathematical research under supervision and to report on this research both orally and in writing. Students may do a literature survey and are not required to do original research. The average grade for the Bachelor projects of the last two years was 7.8. The proportion of students graduating cum laude amounts to 30 % of the total number of graduates, for the last three years.

The programme meets regularly with the Commissie afnemend veld, consisting of professional field representatives, to align the programme to professional practice requirements. The programme in collaboration with the study association DESDA organises labour market orientation meetings with alumni of the programme. In addition, the study association schedules regular site visits to companies.

About 70 % of the graduates of the programme proceed to the Master Mathematics programme of Radboud University. About 10 % of the graduates select mathematics programmes at master level of other Dutch universities, whereas about 16 % of them go to master programmes in other disciplines, such as computer science, econometrics or neuroscience. The number of students entering the labour market is very limited.

##### *Considerations*

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

The panel supports the grades awarded to the Bachelor projects. No projects were found to be unsatisfactory. The panel regards the projects to be appropriate. The language and style in the theses could be improved.

The panel appreciates the labour market orientation activities on the part of the programme and the study association.

The panel is convinced that the programme graduates have reached the intended learning outcomes of the programme. Programme graduates are admitted to a wide range of master programmes, which testifies to the learning outcomes achieved.

##### *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	Satisfactory
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 consider more elaborately the specific position of the programme when implementing Faculty measures, as these may not always fit the specific nature of mathematics education.
- To pay more attention to stochastics and numerical analysis and courses on computer programming to improve the preparation for the Master Mathematics programme.
- To strengthen courses in mathematics & physics and mathematics & computing science as preparation for the Master Mathematics programme.
- To continue the discussions programme management started with Mastermath management to address the high demands of some Mastermath courses, as raising the level of Bachelor courses is not regarded as appropriate.
- To take the growth and development of the programme into account, when considering organisational measures.
- 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 projects.