

Assessment report  
Limited Framework Programme Assessment

**Master Applied Mathematics**

Delft University of Technology

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## 1. Executive summary

In this executive summary, the panel presents the main considerations which led to the assessment of the quality of the Master Applied Mathematics programme of Delft University of Technology. The programme was assessed according to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, published on 20 December 2016 (Staatscourant nr. 69458).

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

The panel considers the Domain-Specific Framework of Reference to be an appropriate description of the mathematics discipline and of the standards and requirements graduates of both bachelor and master programme have to meet. The panel welcomes the efforts of the joint Mathematics programmes in the Netherland to have drafted this Framework. The objectives and intended learning outcomes of this programme meet the Framework and, therefore, correspond to international standards set for the discipline. The panel suggests to add ethical awareness to the intended learning outcomes.

Students are educated for PhD positions and for positions in the non-academic professional field. The panel is pleased to see students being offered five specialisations and a number of additional options, such as the double programmes, the first-degree teacher programme and the COSSE programme.

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

The entry requirements and admission procedures are adequate. The panel welcomes, among others, the bridging programme and the mentor groups to accommodate students starting in the programme.

The programme curriculum matches the intended learning outcomes and is appropriately designed. The panel regards the curriculum to be solid, with strong courses covering the various specialisations within the applied mathematics discipline. Academic and research skills are addressed. In the Mastermath courses, students may study additional subjects. The panel proposes to strengthen the subject of ethics. The panel also suggests to monitor the internship regulations, implementation and supervision. The curriculum coherence is assured by means of the Individual Exam Programmes.

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

The educational concept and study methods of the programme meet the programme's characteristics. The students-to-staff ratio is appropriate, allowing for small-scale education. The number of hours of face-to-face education is adequate as well. The panel appreciates very much the student guidance system of the programme. Although material facilities such as lecture halls and study space are available, the panel suggests to ensure sufficient numbers of blackboards. The panel is positive about the student success rates.

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

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

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

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

The panel is convinced the programme graduates have reached the intended learning outcomes of the programme. The fact that programme graduates have found suitable positions shortly after graduation is regarded by the panel to be very positive. The panel welcomes the substantial proportion of graduates having gained PhD positions. The panel recommends to intensify the contacts with alumni.

The panel that conducted the assessment of the Master Applied Mathematics programme of Delft University of Technology assesses this programme to meet the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, judging the programme to be *satisfactory*. Therefore, the panel recommends NVAO to accredit this programme.

Rotterdam, 4 October 2019

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

drs. W. Vercouteren  
(panel secretary)

## 2. Assessment process

The evaluation agency Certiked VBI received the request by Delft University of Technology to support the limited framework programme assessment process for the Master 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 Delft University of Technology programme management, Certiked invited candidate panel members to sit on the assessment panel. The panel members agreed to do so. The panel composition was as follows:

- Prof. dr. ir. O.J. Boxma, full professor Stochastic Operations Research, Eindhoven University of Technology (panel chair);
- Prof. dr. R.H. Kaenders, full professor Mathematics and its Education, University of Bonn, Germany (panel member);
- Prof. dr. D. van Straten, full professor Algebraic Geometry, Johannes Gutenberg University Mainz, Germany (panel member);
- Dr. ir. H.J. Prins, manager Research & Development, Maritime Research Institute the Netherlands (panel member);
- S.C. Jongerius BSc, student Master Industrial and Applied Mathematics, Eindhoven University of Technology (student member).

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

All panel members and the secretary confirmed in writing being impartial with regard to the programme to be assessed and observing the rules of confidentiality. Having obtained the authorisation by the University, Certiked requested the approval of NVAO of the proposed panel to conduct the assessment. NVAO have given their approval.

To prepare the assessment process, the process coordinator convened with management of the programme to discuss the planning of the activities in preparation of the site visit. The site visit schedule was also discussed. In addition, the outline of the self-assessment report and the subjects to be addressed in this report were part of the discussion.

In the course of the process preparing for the site visit, programme management and the Certiked process coordinator had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved the site visit schedule.

Well in advance of the site visit date, programme management sent the list of final projects of graduates of the programme of the most recent years. Acting on behalf of the assessment panel, the process coordinator selected the theses of fifteen graduates. The grade distribution in the selection was conform to the grade distribution in the list, sent by programme management. The specialisations of the programme were covered in the selection.

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

Before the site visit date, the assessment panel chair and the process coordinator met to discuss the self-assessment report to be provided by programme management, the procedures regarding the assessment process and the site visit schedule. In this meeting, the profile of panel chairs of NVAO was discussed as well. The panel chair was comprehensively informed about the competencies, listed in the profile.

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

Shortly before the site visit date, the panel met to go over the preliminary findings concerning the quality of the programme. During this meeting, the preliminary findings of the panel members, including those about the theses were discussed. The procedures to be adopted during the site visit, including the questions to be put to the programme representatives on the basis of the list compiled, were discussed as well.

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

In a closed session near the end of the site visit, the panel considered every one of the findings, weighed the considerations and arrived at conclusions with regard to the quality of the programme. At the end of the site visit, the panel chair presented a broad outline of the considerations and conclusions to programme representatives.

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

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

### 3. Programme administrative information

Name programme in CROHO: M Applied Mathematics  
Orientation, level programme: Academic Master  
Grade: MSc  
Number of credits: 120 EC  
Specialisations: Analysis  
Computational Science and Engineering  
Financial Engineering  
Optimisation  
Stochastics  
Location: Delft  
Mode of study: Full-time  
Language of instruction: English  
Registration in CROHO: 21PF-60348

Name of institution: Delft University of Technology  
Status of institution: Government-funded  
Institution's quality assurance: Approved

## 4. Findings, considerations and assessments per standard

### 4.1 Standard 1: Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

#### *Findings*

The Master Applied Mathematics programme is one of the programmes of the Faculty of Electrical Engineering, Mathematics and Computer Science of Delft University of Technology. On behalf of the dean, the director of education of the Faculty is responsible for the programmes offered by the Faculty. The director of studies of this programme is responsible for the organisation and quality of this programme. The director is assisted by the Master coordinator and the educational coordinator. The lecturers in the programme are staff members of Delft Institute of Applied Mathematics (DIAM). Lecturers do not only lecture in this programme, but also participate in service education for most other programmes of Delft University of Technology. In fact, service education constitutes the major part of the educational activities of most staff members. The Board of Studies of this programme, consisting of an equal number of lecturers and students, advises management of this programme on quality issues. Students' views are collected by means of written surveys both at the course level and the curriculum level. The Curriculum Committee monitors changes to and updates of the curriculum of the programme. The programme Board of Examiners, being one of the subcommittees of the Faculty Board of Examiners, is responsible for assuring the quality of examinations and assessments of the programme.

The objectives of the programme are to educate students in advanced mathematical methods and techniques to quantify and model phenomena in physics, technical or societal domains. The programme is geared towards the study of mathematical modelling from analytical, numerical and stochastic perspectives. Fundamental mathematics is studied extensively in the programme as the basis for modelling methods and techniques. In the programme, five specialisations are offered. These are Analysis, Computational Science and Engineering, Financial Engineering, Optimisation, and Stochastics. The programme rests on academic research done in the specialisations offered. The programme is comparable to programmes of the other Dutch universities of technology and, internationally, to applied mathematics programmes of ETH Zürich, RWTH Aachen, Chalmers University of Technology and Politecnico di Milano.

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 these 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, and University of Padova.



The programme prepares students for positions as mathematical experts in industry and in government institutions as well as for PhD trajectories in mathematics or in disciplines, such as physics or mechanical, electrical or civil engineering. Students may take one of the double programmes offered, combining this programme with other Master programmes of Delft University of Technology. In addition, students are given the opportunity to combine this programme with the Master Science Education and Communication programme, thereby achieving the first-degree teaching qualification in Mathematics in Dutch secondary education. Students may also take the University Honours Programme, implying 20 EC of additional courses. In addition, students may enrol in the Computer Simulation for Science and Engineering programme (COSSE), the collaboration of Delft University of Technology, KTH Institute of Technology in Stockholm and Technische Universität Berlin. Students take one year at one of these universities and the other year at one of the other universities. Upon completion of the COSSE programme, they have reached intended learning outcomes of the Master Applied Mathematics programme and receive degrees of both universities.

The objectives of the programme have been translated into the intended learning outcomes. These include, as main elements, knowledge and understanding of mathematics and applications thereof, being able to develop this knowledge and understanding, knowledge and understanding to draft and analyse mathematical models for solving problems in other disciplines, systematic approach and critical attitude, mathematical and deductive reasoning, communication and collaborative skills, and awareness of the societal impact of mathematics.

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

#### *Considerations*

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

The panel considers the Domain-Specific Framework of Reference to be an appropriate description of the mathematics discipline and of the standards and requirements graduates of both bachelor and master programme have to meet. The panel welcomes the efforts of the joint Mathematics programmes in the Netherland to have drafted this Framework. The objectives and intended learning outcomes of this programme meet the Framework and, therefore, correspond to international standards set for the discipline. The panel suggests to add ethical awareness to the intended learning outcomes.

The panel supports the programme intentions to educate students for PhD positions and for positions in the non-academic professional field. The panel is pleased to see students being offered the five specialisations and a number of additional options, such as the double programmes, the first-degree teacher programme and the COSSE programme.

The intended learning outcomes of the programme correspond to the programme objectives. These intended learning outcomes are comprehensive and are conform to the master 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 33 students in 2012 to 80 students in 2018. About 50 % of these students have the Delft Bachelor Technische Wiskunde programme as their backgrounds. About 10 % to 15 % of the incoming students are from abroad. The admission requirements are Bachelor degrees in Mathematics or Applied Mathematics from Dutch universities. The programme Admissions Committee screens applications by other aspirant students on the level of mathematics knowledge and skills. Students may take the bridging programme, before being allowed to enrol. The bridging programme consists of, among others, abstract mathematics, partial differential equations, numerical analysis, and stochastics. All students enrolling are invited to attend the first day of the programme to meet with fellow students and staff. Mentor groups for students are arranged to foster community building. In the first quarter, the Master coordinator meets with every one of the students to draft their individual study plans (Individual Exam Programmes).

The study load of the curriculum is 120 EC. The curriculum takes two years to complete. Programme management presented a table, showing the curriculum to cover all of the intended learning outcomes. The curriculum is organised in common courses (24 EC), specialisation electives (36 EC to 42 EC), non-mathematical electives (12 EC to 18 EC), and the Master graduation project (42 EC). The common core courses include courses on ethics and scientific writing (6 EC) and three out of five core courses. One of these courses is compulsory for the specialisation to be taken. In addition, 36 EC of specialisation electives are required within each of the specialisations (please refer to standard 1 for these specialisations). The non-mathematical electives may be used to broaden or deepen knowledge and skills in mathematics or in other disciplines or to do an internship. Students may take Mastermath courses, being obliged to take at least one of these courses. As the programme offers many courses, the added value of Mastermath is somewhat less than for other, smaller programmes in the Netherlands. Mastermath is the joint organisation of the Master Mathematics programmes of all nine universities in the Netherlands. The Mastermath organisation offers courses for students of these universities. The Mastermath Board (Regieorgaan), consisting of all programme directors of the participating universities, selects the courses to be offered, chooses the lecturers lecturing in these courses and takes care of the quality control of the courses. For this programme, students take the more generic courses offered by Mastermath. The programme itself offers more specialised courses. For all Mastermath courses, quality control surveys among students are conducted. Two times per year, these surveys and the responses of Mastermath to the outcomes are discussed by Programme Committee representatives, among which Board of Studies representatives of this programme. Students in the programme are introduced to the professional practice. Both the internship and the Master graduation project may be conducted in industry. Students are obliged to either do the internship (18 EC) or the Master graduation project. Only trusted partners are allowed to offer internships. The programme internship coordinator oversees the processes and assesses the internships, having heard the company supervisor. Courses in the curriculum are updated on a regular basis. New, upcoming applications of mathematics are introduced in the curriculum. Examples are data science and quantum technology.

The permanent staff partly lecturing in this programme are 35 lecturers in total. Practically all staff members are active researchers in the Mathematical Institute, all of them having PhD degrees. Some have a non-mathematical background. About 71 % of the staff members are UTQ-certified and another 17 % of them are in the process of obtaining the UTQ-certificate. Lecturers meet to discuss the programme and to adjust courses. Yearly, formal meetings of lecturers are scheduled. The lecturers with whom the panel met, expressed experiencing the work load as high. The sector plan Mathematics will allow the programme to recruit extra staff. Educational capabilities are part of the recruitment procedures of staff members.

The educational concept of the programme is mainly to train students to become independent scientists. Education is problem-based. Study methods adopted are lectures, tutorials and instructions, computer practical sessions, project work and self study. New study methods, such as blended learning and MOOCs are being implemented. The programme is rather small-scale, the students-to-staff ratio being 19/1. The number of hours of face-to-face education is about 11 hours per week in the first year. In the tutorials/instructions students work either individually or in small groups on solving problems and applying the knowledge gained to these problems. Students hand in assignments. Feedback will be given on the assignments. Project work involves more complex assignments, to be solved individually or in small groups. The first point of contact for students is the Master coordinator. As mentioned before, the Master coordinator meets with students to draft their Individual Exam Programmes. In the course of the programme, quarterly information meetings are scheduled to inform students about the programme and about options available. In case of questions or problems, students may turn to the academic counsellor. The average student success rates are 33 % within two years and 84 % within three years (figures for last six cohorts).

### *Considerations*

The panel approves of the admission requirements and procedures of the programme. The panel welcomes, among others, the bridging programme and the mentor groups to accommodate students starting in the programme.

The programme curriculum matches the intended learning outcomes and is appropriately designed. The panel regards the curriculum to be solid, with strong courses covering the various fields and specialisations within the applied mathematics discipline. Academic and research skills are addressed in the curriculum. In the Mastermath courses, students may study additional subjects. The programme itself, however, offers many courses on an extensive range of topics. The panel proposes to strengthen the subject of ethics in the curriculum. In addition, the panel suggests to monitor the internship regulations, implementation and supervision. The curriculum coherence is assured by means of the Individual Exam Programmes.

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

The educational concept and study methods of the programme meet the programme's characteristics. The students-to-staff ratio is appropriate, allowing for small-scale education. The number of hours of face-to-face education is adequate as well. The panel appreciates very much the student guidance system of the programme, consisting of mentor groups, quarterly information meetings, advice on students' study plans by the Master coordinator and assistance by the academic counsellor. Material facilities for the programme such as lecture halls and study space are adequate. As there are some concerns about the availability of blackboards, the panel suggests to ensure sufficient numbers. The panel is positive about the student success rates.

*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.
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#### *Findings*

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

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

The organisation and assessment of the Master graduation projects are governed by the Faculty protocol. Projects may be done either at one of the research groups within Delft University of Technology or externally, in companies or at research institutes. Students are entitled to individual supervision by one of the staff members. External projects are always supervised by both external supervisors and staff members. Meetings between supervisors and students are scheduled biweekly or sometimes weekly. The Master graduation projects are assessed by the graduation committee, consisting of at least three examiners, one of them being from another section or research group. In case of external projects, the external supervisor sits on the graduation committee. Often, one of the Board of Examiners members is present. The assessment components are quality of work (40 % of the grade), performance (30 %), written report (20 %), and oral presentation and defence (10 %). Having discussed the assessment, the examiners fill out the standardised assessment form, based upon the rubrics form.

In the programme, a number of measures have been taken to ensure the quality of examinations and assessments. Examiners are appointed by the Board of Examiners according to criteria with regard to their UTQ or equivalent certification. The final examinations of the courses are peer-reviewed. Test matrices are being used. Students are presented test questions to prepare for examinations. The educational advisor counsels examiners on the quality of examinations. Projects in courses are assessed on the basis of rubrics forms. Samples of Master graduation projects are reviewed by the Board of Examiners. Students are informed about fraud and plagiarism regulations. Master theses are scanned for plagiarism, but not as a rule. The Board of Examiners monitors the contents and quality of the Mastermath courses and of the examinations of these courses. Mastermath presents the course records, examination reports and the names of the examiners for the courses to the examination boards of the participating universities. These boards verify the quality of the courses and of the examinations. If one board approves of the quality, the other boards accept this decision as their own. The examination boards of all of the programmes, participating in Mastermath, meet yearly to discuss the Mastermath examinations' and assessments' quality assurance. The Teaching and Examination Regulations of this programme apply for the Mastermath courses.

### *Considerations*

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

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

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

The panel welcomes the measures taken by programme management to ensure the examinations and assessments quality. The panel considers these measures to be very elaborate and very effective and to assure valid, reliable and transparent examinations and assessments. The panel approves of the regulations regarding the Mastermath examinations and the quality control of these examinations by the Board of Examiners.

### *Assessment of this standard*

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

#### 4.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.
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##### *Findings*

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

The panel also reviewed the Master graduation projects of fifteen graduates of the programme with different grades. In the graduation projects, students are to demonstrate mastering all intended learning outcomes of the programme. The average grade of these projects is 8.4 for the graduates of the last five years. About 10 % of the projects led to publications.

Students are offered curricular and extra-curricular opportunities to prepare for the labour market. In the curriculum, students are offered internships or external graduation projects to become acquainted with the professional practice. Quite a number of extra-curricular career events are scheduled by the study association Christiaan Huygens in collaboration with the programme and the Faculty. In these events, students visit organisations and companies and are informed about labour market options. The Industrial Advisory Board for the programme, being composed of representatives of the professional field, advises programme management on trends in the professional field. Alumni of the programme are well-represented within the Board. Programme management meets annually with the Board. To be employed in the programme domain, Master graduates are strongly preferred over Bachelor graduates.

The programme keeps in contact with alumni through alumni meetings and through surveys among alumni. The results of the surveys show programme graduates to be satisfied with the programme (score 8.1 out of 10). Nearly all indicate having found positions within a few months after graduation. About 30 % of the graduates secured PhD positions. Other graduates found employment in the professional field, most of them in consultancy (16 %), engineering (16 %) or finance (14 %).

##### *Considerations*

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

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

The panel is convinced the programme graduates have reached the intended learning outcomes of the programme. The fact that programme graduates have found suitable positions shortly after graduation is regarded by the panel to be very positive. The panel welcomes the substantial proportion of graduates having gained PhD positions. The panel recommends to intensify the contacts with alumni.

##### *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	Good
Standard 4: Achieved learning outcomes	Satisfactory
Programme	Satisfactory

## 6. Recommendations

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

- To add ethical awareness to the intended learning outcomes.
- To strengthen the subject of ethics in the curriculum, preferably developed by mathematicians and with mathematics-related examples.
- To monitor the internship regulations, implementation and supervision.
- To recruit additional staff, as the work load of the lecturers is high.
- To ensure sufficient numbers of blackboards.
- To add more extensive comments and arguments to substantiate the assessments of the Master graduation projects.
- To intensify the contacts with alumni.